CHAPTER FIVE

Systematics wars[1]

Temminck's debates

Temminck was quite cryptic when it came to describing his more philosophical views on nature and how to best comprehend it, even though these were fundamental in his practice of systematics. Only in two contexts do we learn more about them: through his law on the geographical distribution of animals and in his rebuttals of other naturalists' criticisms of his methods of zoological classification. His law allows us to understand Temminck's type concept, which is intimately linked to his ideas of genus and species, as we have seen in the previous chapter. His reactions to other naturalists will give us a better understanding of Temminck's daily practice in systematics as well as provide a broader context for his work. Temminck's discussions with other systematists revolved mostly around the rules of zoological nomenclature, the establishment of genera and the best methods for arriving at a natural system of classification. Although these issues may seem quite technical to the non-specialist, they are actually at the very core of how naturalists understand the world around us, and therefore these debates dealt with much more profound issues than just naming species and grouping them into categories.

Temminck's disputes with the French ornithologist Louis Pierre Vieillot and with the Irish zoologist and politician Nicholas Aylward Vigors can serve as the starting point to place Temminck's ideas on classification in the context of his time as well as to illustrate three main points. Firstly, between 1800 and 1840 the main goal of classification was to find a natural system, one that reflected the true organization in nature. Secondly, although this goal was shared by most naturalists, their approach varied according to their scientific backgrounds, cultures and beliefs. This resulted in a variety of systems of

[1] This chapter is partly based on a previously published article, M. Eulàlia Gassó Miracle, "On Whose Authority? Temminck's Debates on Zoological Classification and Nomenclature: 1820–1850," *Journal of the History of Biology* 44, no. 3 (2011). Changes have been made to include new insights and references, and to avoid duplications in this book.

classification, chaos in nomenclature and heated discussions. Thirdly, as more and more naturalists participated in these discussions, natural history changed from being the dominion of a few learned men into a field of expertise of many devoted naturalists. During the first decades of the nineteenth century, natural history was transformed from an autocracy into a democracy. The pursuit of standardization of rules, practices and forms of communication was a main occupation—and preoccupation—of naturalists at the time. As a result, scientific progress only became possible through debate and consensus. This shift had important consequences for the practice of natural history as well as for Temminck's influence and reputation as an ornithologist. I will return to this point in the next chapter.

Temminck and Vieillot had already clashed when the French naturalist copied some descriptions of new species from Temminck's *Catalogue Systématique* of 1807 and gave them Latin binomials—something Temminck, inexperienced as he was, had neglected to do. Nearly ten years later, Vieillot wrote a seventy-page book entitled *Analyse d'une nouvelle ornithologie élémentaire*, in which he proposed a whole new classification system and described many new species, some already described before him by other naturalists.[2] Temminck was quick to respond to what he considered an attack on his credibility while stating very clearly his ideas on how the classification and nomenclature of birds should be carried out. In 1817, he published the *Observations sur la classification méthodique des oiseaux, et remarques sur l'Analyse d'une Nouvelle Ornithologie Élémentaire par L. P. Vieillot*. It was an act of war.

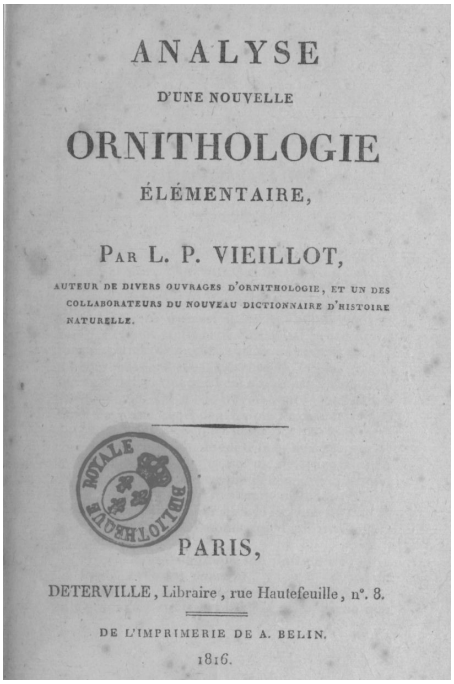
Vieillot answered him a year later, in the entry on ornithology in the *Nouveau Dictionnaire d'Histoire Naturelle*. Vieillot aimed to demolish Temminck's system, accusing him of plagiarism but ignoring the *Observations* of 1817, much to Temminck's surprise.[3] Temminck wondered, not without sarcasm, if the reason why Vieillot only mentioned works published up to 1815 was to avoid referring to Vieillot's own *Analyse* from 1816 and Temminck's *Observations* from 1817.[4] However, Temminck may have been wrong, as the second edition of the *Nouveau Dictionnaire* had been commissioned several years before, and it is possible that Vieillot had already submitted his article to the editors before Temminck's *Observations* had been published in 1817. On the other hand, Howard Saunders suggested that Vieillot may in fact have modified his classification:

[2] Louis Pierre Vieillot, *Analyse d'une nouvelle ornithologie élémentaire* (Paris: Deterville, 1816); Paul H. Oehser, "Louis Jean Pierre Vieillot (1748–1831)," *Auk* 65, no. 4 (1948); Stresemann, *Ornithology from Aristotle to the Present*, 122-23.

[3] Louis Pierre Vieillot, "Ornithologie," in *Nouveau Dictionnaire d'Histoire Naturelle, Appliquée aux Arts, à l'Agriculture, à l'Économie rurale et domestique, à La Médecine, etc.*, ed. Charles Sigisbert Sonini (Paris: Deterville, 1818), 96-98.

[4] Temminck, "Introduction," *Manuel d'ornithologie*, 2 ed., vol. 1, xv.

"The main principles of classification adopted by Vieillot are applied by him in his portion of the *Nouveau Dictionnaire d'Histoire Naturelle* (1816–1819), although some appear to have been modified in consequence, perhaps, of the criticisms passed upon the *Analyse* by Temminck."[5]


ANALYSE

D'UNE NOUVELLE

ORNITHOLOGIE

ÉLÉMENTAIRE,

PAR L. P. VIEILLOT,

AUTEUR DE DIVERS OUVRAGES D'ORNITHOLOGIE, ET UN DES COLLABORATEURS DU NOUVEAU DICTIONNAIRE D'HISTOIRE NATURELLE.

PARIS,

DETERVILLE, Libraire, rue Hautefeuille, n°. 8.

DE L'IMPRIMERIE DE A. BELIN.

1816.

FIGURE 5.1. Title page of Louis Pierre Vieillot's *Analyse d'une nouvelle ornithologie élémentaire* (1816).

The main point of Vieillot's criticism of Temminck's system of classification was that it seemed to him to be nothing more than a compilation of previous ornithological systems. By comparing Temminck's groups with those of other naturalists, Vieillot concluded that Temminck's work was simply not original. Temminck's bitter answer to the *Dictionnaire* appeared in the introduction of the second edition of the *Manuel d'ornithologie* in 1820. A few years later, Temminck engaged again in a dispute, this time with Nicholas Vigors, who in 1825 published an article questioning Temminck's classifications, his concept of genera and his general views on the advance of science. For some reason, Temminck did not answer in a short article directed at Vigors, but he did so indirectly, in the second edition of the *Manuel*—as he had done with Vieillot's

[5] Howards Saunders, "Preface," in *Vieillot's Analyse d'une nouvelle ornithologie élémentaire*, ed. Howards Saunders (London: The Willughby Society, 1883), iv.

criticisms. Not only did Temminck's answer appear ten years after Vigors' article had been published, but Temminck did not mention Vigors' name at all. Whether Temminck noticed the 1825 article rather late or whether he deliberately chose to include his rebuttal in the *Manuel,* remains unclear. In any case, the delay explains why their discussion has not been noticed before and, in all probability, it went unnoticed in Temminck's time too. Temminck's remarks, however, are clearly an answer to Vigors. The altercations between Temminck and Vigors were less nasty than those with Vieillot in that they were less personal and more technical, but in them we also find vital clues to these men's understanding of the natural world and of natural history. What follows is an account of the subjects in dispute between Temminck, Vieillot and Vigors, and an attempt to link these issues with their common ideal of attaining a natural and universal system of classification of animals that reflected the true order of nature.

Nomenclatural chaos

In the period when Temminck and Vieillot were engaged in their disputes, natural history collections and literature were rapidly growing. A multitude of works were published dedicated to European and exotic birds. Many were iconographic in nature, other works were strictly descriptive and some were accounts of *naturalistes voyageurs*.[6] One of the most immediate and obvious problems to appear on the scene of natural history was the multiplication of scientific names. As more naturalists dedicated themselves to the study of local and tropical faunas, it became very difficult to keep track of new discoveries and to have access to all publications. Sometimes, the same species was described independently by different naturalists and thus given two names at more or less the same time. Similarly, naturalists could easily be unaware that a species had already been described and proceed to give it another binomial. Additional confusion came from the practice of substituting older names by new ones that seemed more appropriate. On top of this, and also as a consequence of the increase in the number of naturalists devoted to cataloguing nature, classification systems and the ranking of species within those systems were constantly changing. Knowledge increased and classification systems were in constant revision. Genera were split into two or more new ones, species were moved from genus to genus and the suprageneric levels were just as unstable. Consequently, specific names changed with every review.

In the midst of this proliferation of works on birds, Temminck was determined to put some order into the nomenclature, beginning by listing the names known to him, followed by a validation process for each. Temminck had set his mind on minimizing

[6] Farber, *Emergence of Ornithology*, chap. 5.

the problem of synonymies, in order to present other naturalists with the most complete and accurate nomenclature.[7] Consequently, in his monographs on pigeons and gallinaceous birds, as well as in the *Manuel d'ornithologie,* Temminck compiled all names known to him and revised the status of the synonymy, then decided which name was to be preferred in each case on the basis of priority or suitability: "I have spared neither effort nor means to bring the *General Index* [of the *Manuel*] to the level of the current knowledge in ornithology, that is, I have purged it as much as possible of the double, triple and often quadruple names which clutter the works of Gmelin, Latham as well as more recent publications."[8]

Vieillot's and Temminck's imputations of plagiarism were a direct consequence of the absence of a canon or code for zoological nomenclature. By the early nineteenth century, most binomials in zoology followed the precepts set by Linnaeus, later amended by Johann C. Fabricius in 1778.[9] After them, the Swiss botanist Augustin Pyramus de Candolle published his version of the rules for botanical nomenclature in 1813.[10] By the early 1800s every natural historian was familiar with these rules of nomenclature, although there had been no explicit agreement on which rules were universal and when exceptions might be made. Naturalists held different opinions and interpretations of the rules of nomenclature and this gave rise to heated discussions about the validity of many scientific names. Also, they were inconsistent in their publications when it came to applying these rules; some, including Temminck, changed their minds along the way, finding justifiable exceptions and breaking the rules as they went. Not surprisingly, these discussions were always quite complex and almost never conciliatory.

One of the most important and debated rules since Linnaeus was the rule of priority. There was a general agreement on preserving the first scientific name ever given to a species or genus. The original name in the literature for a species at the time of its first

[7] Temminck, "Avant-propos," *Manuel d'ornithologie*, 1 ed., ix.

[8] Temminck, "Introduction," *Manuel d'ornithologie*, 2 ed., vol. 1, xviii.

[9] Carolus Linnaeus, *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*, 1 ed. (Leiden: Theodor Haak, 1735), and subsequent editions; *Philosophia Botanica in qua explicantur fundamenta botanica cum definitionibus partium, exemplis terminorum, observationibus rariorum, adjectis figuris æneis* (Stockolm: G. Kiesewetter, 1751); *Species plantarum: exhibentes plantas rite cognitas ad genera relatas, cum differentiis specificis, nominibus trivialibus, synonymis selectis, locis natalibus, secundum systema sexuale digestas*, 2 vols. (Stockholm: Holmiae, 1753); Johann Christian Fabricius, *Philosophia entomologica sistens scientiae fundamenta, adiectis definitionibus, exemplis, observationibus, adumbrationibus* (Hamburg: Impensis Carol. Ernest. Bohnii, 1778).

[10] Augustin Pyramus de Candolle, *Théorie élémentaire de la botanique; ou, Exposition des principes de la classification naturelle et de l'art de décrire et d'étudier les végétaux* (Paris: Déterville, 1813). See also Melville, *Towards Stability*; Antonello La Vergata, "Au nom de l'espèce: classification et nomenclature au XIXe siecle," in *Histoire du concept de l'espèce dans les sciences de la vie: colloque international (mai 1985) organisé par la Fondation Singer-Polignac, Paris*, ed. Scott Atran (Paris: Fondation Singer-Polignac, [1987]).

description was to be kept for the sake of clarity and stability. Any name later given to the same species was considered a junior synonym and invalid.[11] The rule of priority was widely acknowledged, but far from being strictly applied. Many, including Temminck, accepted that there were exceptions to this rule. Consequently, a new name was proposed to replace the original one if it was considered more suitable, a better description of a certain character, behavior or the place where the animal had been collected. This was not a mere technicality: by changing a name, a naturalist invalidated the work of the author who had coined it, undermining his authority. The author's credibility was thus challenged and it is also partly for this reason that we find such bitterness in discussions on nomenclature.

The arguments between Temminck and Vieillot revolved around two main points: firstly, on the validity of the names coined by these two men and secondly, on the validity of their classification systems as a whole. Regarding nomenclature, each accused the other of appropriating the names of species and higher taxonomic categories from other works. In his *Analyse* from 1816, Vieillot described several known species by using other naturalists' names and descriptions, without giving any credit to the original author and thus committing plagiarism. This was an unforgivable crime in Temminck's eyes, "an insolent pillage, consisting in appropriating the research and the nomenclature published by other modern authors, who are nowhere mentioned, altering their ideas by changing the meaning of the words or their orthography."[12] Vieillot's plagiarism was met with anger and cynicism by Temminck: "it is hardly imaginable that our savant believed in good faith that his plunder would go unnoticed, and that his new classification and nomenclature would be quoted as the fruits of his own discoveries, and of the conceptions of his genius."[13]

Other naturalists joined Temminck in condemning Vieillot's practice of borrowing descriptions, but his classification system was partly accepted by some ornithologists. For example, the British zoologist William Swainson echoed Temminck's complaints: "M. Temminck has publicly protested against these plagiarisms, and others have spoken

[11] Linnaeus wrote: "Nomen genericum dignum; alio, licet aptiore, permutare non licet. […] Abstinendum ab hac innovatione quæ numquam cessaret, quin indies aptiora detegerentur ad infinitum" ("A generic name, that is worthy to be retained, ought not to be changed for any other, though more fit and proper. [...] Such innovations ought by no means to take place, because new names more fit might be every day invented without end." In Linnaeus, *Philosophia Botanica*, 196). The German botanist and pharmacist Carl Ludwig Willdenow proposed the same law of priority in 1792 in his *Grundriss der Kraüterkunde zu Vorlesungen* (Berlin: Haude und Spener, 1792).

[12] Coenraad Jacob Temminck, *Observations sur la classification méthodique des oiseaux, et remarques sur l'Analyse d'une Nouvelle Ornithologie Élémentaire par L. P. Vieillot, auteur de divers ouvrages d'ornithologie, et un des collaborateurs du Nouveau dictionnaire d'histoire naturelle* (Paris: Gabriel Dufour, 1817), 7.

[13] Temminck, *Observations sur la classification méthodique*, 55-56.

of them in terms of severe censure."[14] Nevertheless, Swainson remained objective and noted that Temminck "does not attempt to grapple with the more difficult and intricate groups, such as the old genera *Picus, Psittacus, Sylvia, Columba*, &c., all of which he leaves nearly in the same state as they are to be found in Latham, and other Linnaean writers. In this respect, his divisions are far inferior to those of Vieillot [*Analyse*, 1816], and even of Cuvier."[15]

Outraged by Temminck's harsh critique, Vieillot pointed out that Temminck had replaced existing names for new ones, disregarding the work of others. Furthermore, he found Temminck was relying too heavily on the main groups as established by his predecessors, Latham and Illiger.[16] Because of this, Vieillot concluded that the *Manuel* was hardly anything more than an assemblage of previous works: "This is the compilation that the author [Temminck] claims to be the fruit of his efforts and the model to be followed by modern ornithologists. Does this not remind us of the Fable of the Jay?"[17] Temminck was infuriated: "Rest reassured, too scrupulous Vieillot! I will not evoke in turn other allegories of the good La Fontaine."[18] The disputes on names between Temminck and Vieillot were a bitter contest for credibility. Temminck wrote:

> Some of my readers have undoubtedly already done justice to the conduct of M. Vieillot, and perhaps they will blame me for responding to puerilities; but being attacked, as I am, by a censor who seeks fame, no less by his literary pretensions than for by scientific works, I will in turn display my competence by employing other weapons than his.[19]

That said, Temminck presented his counterarguments to Vieillot's practices of zoological nomenclature.

Vieillot had replaced existing names with new ones by translating Latin names into Greek, suppressing a few letters or altering the orthography, and then presenting the new names as his own. For Temminck, it was not only a grave impropriety not to quote the author of the original name, but it was also against the fundamental principles of nomenclature and the practice of science itself. By universal agreement since Linnaeus every new name had to be a Latin or Greek one and to be formulated according to the

[14] Swainson, *Treatise on the Geography*, 182.
[15] Swainson, *Natural History and Classification of Birds*, vol. 1, 201.
[16] John Latham, *Index ornithologicus, sive Systema ornithologiae; complectens avium divisionem in classes, ordines, genera, species, ipsarumque varietates: adjectis synonymis, locis, descriptionibus, &c.*, 2 vols. (London: Leigh et Sotheby, 1790); Johann Karl Wilhelm Illiger, *Prodromus systematis mammalium et avium; additis terminis zoographicis utriusque classis, eorumque versione germanica* (Berlin: C. Salfeld, 1811).
[17] Vieillot, "Ornithologie," 97-98. Here Vieillot referred to the Fable "The Jay Dressed in Peacock's Plumes" of Jean de La Fontaine; "Le geai paré des plumes du paon," in *Fables*, vol. 4, fable 9 (Paris: Barbin, 1668).
[18] Temminck, "Introduction," *Manuel d'ornithologie*, 2 ed., vol. 1, xv.
[19] Temminck, "Introduction," *Manuel d'ornithologie*, 2 ed., vol. 1, xi-xii.

grammar of these languages. However, if a binomial was a hybrid of both languages, a "barbarian" one (that is, not derived from Greek or Latin) or incorrect either in grammar or orthography, it was common practice to replace it. This was particularly annoying to Temminck. For him, the new systems and the alternative nomenclature slowed down the progress of zoology and destroyed the work done by previous naturalists.[20] As an example, Temminck mentioned the thirteenth edition of Linnaeus' *Systema Naturae*, edited by Johann Friedrich Gmelin. According to Temminck: "[Gmelin] had the talent of making of the thirteenth edition of Linnaeus the most indigestible book there is: therefore, those who insist on following it slavishly cannot fail to fall into the greatest errors."[21] Even though a name may not be derived from Greek or Latin, Temminck said, it was always better to preserve it, provided of course it had been widely recognized and accepted:

> In my view it is preferable to keep the ancient name of a species that has been accepted around the world (even though the name might be barbarous in its composition, not having Greek or Latin roots), rather than substitute it with another name that, although it might be better chosen or grammatically more correct, it will likely cause misunderstandings, because nothing is worse for the development of the natural sciences, and in particular for the natural history of birds, than all these different opinions about the names of genera and species.[22]

Naturally, he meant opinions other than his own. When Temminck decided to change a scientific name, he said, it was to correct misidentifications and mistakes such as when variations due to sexual dimorphism or molting stages had been incorrectly described as new species.

There were, however, in Temminck's view a few cases that justified the replacement of a scientific name by a new one. One of these had to do with geography. Often, animals received names denoting the geographical origin of the species, like *javanicus*, or *borneensis*, shortly after their discovery but without having an accurate picture yet of their actual distribution. Later, new discoveries proved that the name was actually mismatched. In such cases, Temminck felt that a correction was called for. He argued that during an age of continuous discovery and with such large areas yet to be surveyed, naturalists should avoid "the unfortunate fancy of giving to animals the names of places," causing confusion about their actual geographic distribution.[23] However, other

[20] Temminck, "Avant-propos," *Manuel d'ornithologie*, 1 ed., xi-xiv.
[21] Temminck, "Avant-propos," *Manuel d'ornithologie*, 2 ed., vol. 1, xxxii.
[22] Temminck, "Avant-propos," *Manuel d'ornithologie*, 1 ed., xi.
[23] Coenraad Jacob Temminck, "Monographie over een nieuw geslacht van Knaagdier, onder den naam van Nyctocleptes," *Bijdragen tot de natuurkundige wetenschappen* 7 (1832): 3, footnote.

naturalists had different opinions on the matter. Frédéric Cuvier, for instance, thought that naming animals after countries had an irrefutable advantage: after all, a geographic epithet recorded the place where particular specimens had been first discovered.[24] Consider the Sunda leopard cat, a small wild cat that inhabits the islands of the Philippines, Sumatra, Borneo, Java and Bali. Demarest named it *Felis javanensis* in 1816. By 1824 it had become clear that the cat's distribution was actually wider than only Java, so Temminck decided to change its name into *Felis minuta.*[25] The American naturalist Thomas Horsfield felt that the change was unjustified: after all, the cat did actually live in Java, even if not only there. He responded to Temminck's "inconsiderate" change by quoting a passage from the *Histoire naturelle des mammifères* by Geoffroy Saint-Hilaire and Frédéric Cuvier:

> Men have objected, apparently with reason, to the practice of giving names of countries to specimens that may have a wider distribution; but considering that these names are given when these organisms are discovered for the first time, when their distribution is still unknown; and as everybody knows, as it is easy to agree that these designations are not absolute, one may recognize that of all names that mean something, names of countries are the ones with less disadvantages.[26]

But, if a species name was completely misleading (for example, when Cuvier named a Sumatran bear *javanensis*), Horsfield accepted that "this is a case therefore in which a topical name is erroneously applied and cannot be retained."[27] Accordingly, he provided a catalogue of Javanese birds listing their names as accepted in 1820, and the changes made since then by "the rejection of topical names, by the introduction of several names employed in the *Nouveau recueil de planches coloriées d'oiseaux*, published by M.M. Temminck and Laugier, and by other necessary alterations in Nomenclature."[28] The changes were sometimes needed to correct misidentifications, and sometimes, to restore older names by applying the law of priority. But on average, in the

[24] Frédéric Cuvier, "Nouveau Recueil de planches coloriées d'oiseaux… par M. Temminck, conservateur du cabinet d'histoire naturelle de Leyde, et M. Meiffren Laugier, baron de Chartrouse," *Journal des Savants, 2 Sér*, no. 17 (1832): 645.

[25] Temminck, *Monographies de mammalogie,* vol. 1, 132.

[26] Étienne Geoffroy Saint-Hilaire and Frédéric Cuvier, "Ours de Sibérie," in *Histoire naturelle des mammifères, avec des figures originales, coloriées, dessinées d'après des animaux vivans*, vol. 5 (Paris: A. Belin, 1824), livraison 42; quoted by Thomas Horsfield, "Description of the Helarctos euryspilus; Exhibiting in the Bear from the Island of Borneo, by the Type of a Subgenus of Ursus," *Zoological Journal of the Linnaean Society* 2 (1826): 230, footnote.

[27] Horsfield, "Description of the Helarctos euryspilus," 229, footnote.

[28] Thomas Horsfield, "General Catalogue of Javanese Birds," in *Zoological Researches in Java, and the Neighbouring Islands* (London: Kingsbury, Parbury, & Allen, 1824).

1820s, nomenclatural practices still depended very much on the author's personal views. An anonymous reviewer of Temminck's *Monographies de mammalogie* warned the reader:

> But the propriety or impropriety of employing such names does not fall fairly into discussion in this instance; such an enquiry, how indispensable soever previous to designating a species, becomes too late when the name has been applied. It must then be of necessity retained, unless it conveys a decidedly false impression; and even in this case, considerable hesitation would be experienced by every naturalist, who felt unwilling to increase the disarray already too prevalent in synonymy.[29]

Horsfield noticed that "the employment of names taken from the countries where animals are found, or have been discovered, is a constant theme of discussion and declamation with Continental naturalists."[30] This did not mean that all British naturalists agreed on this. The question of names derived from geography was viewed differently by William Swainson. He believed that names of species could, occasionally, be derived from their geographic range, "provided it is peculiar," but he warned the reader that such names should not be used when all the species of the same genus inhabit one and the same country. He added: "when a species has been so designated by old writers, we think its name should be cancelled."[31]

If deciding how to apply the rules of nomenclature when it came to topical names was complicated, how to proceed with double descriptions and priority was a can of worms. Often, species already described were re-baptized and described again, even multiple times by different people in a few years. The difficulty here was often one of interpretation: had the author who duplicated the description been unaware of previous publications? Or did he intend to replace it with a better description and a more suitable name? There was also the possibility that the first author had misidentified the species, for example, taking a female as a new species because it was so different from the male. Authors usually explained their reasons for replacing existing names, but naturalists who failed to do so could expect rebukes from their peers.

There were naturalists who thought that the law of priority had to be followed strictly—no exceptions. George Robert Gray, zoologist and keeper of the British Museum in London, referred to it in 1842 as "the inflexible law of priority." He wrote: "In accordance with established practice, however, I regard the names first given,

[29] "Analytical Notices of Books. Monographies de Mammalogie, ou descriptions de quelques genres de Mammifères dont les Espèces ont été observées dans les différens Musées de l'Europe. Par C. J. Temminck, livraison 4ème," *Zoological Journal of the Linnean Society* 2 (1826): 532.
[30] Horsfield, "Description of the Helarctos euryspilus," 229, footnote.
[31] Swainson, *Natural History and Classification of Birds*, vol. 1, 240.

notwithstanding the anathema which has been pronounced against them by some of our law givers, as sacred, and have quoted the subsequent series only as their synonyma."[32] While taking up the monumental task of cataloguing all genera of birds ever described, Gray concluded, understandably, that the tangle generated by all the synonyms impeded the progress of science. He then listed all the names known to him in his *List of the Genera of Birds*. The first version of the list appeared in 1840 and then, rather overcome, he left it to the "judgement of each individual who chooses to pursue the subject, to select those which he considers tenable, and to erase the rest." To this he immediately added, maybe as a warning, that "no individual possesses the right of dictating what are, and what are not, good generic groups, or of erasing from the list of genera those of his fellow naturalists which may not exactly square with his own particular view."[33] As we will see, Temminck could not agree less.

Temminck found himself being criticized for intentionally renaming species already named by others. In a number of cases, Temminck seemed unaware of the plagiary or, at least, he offered no explanation at all. But on other occasions he was fully aware of the replacements, which he made mostly for two reasons: firstly, when he considered that the species belonged to a different group than the to which it had been previously assigned, and secondly, when the original description was for him somehow insufficient or based on defective specimens. For example, Temminck decided to redo the description of a particular hornbill that Levaillant had named *Calao rhinoceros*, arguing that Levaillant's description was based on a mutilated specimen, one made of parts that belonged to different species—an artifact.[34] Then, using drawings made from a living specimen (in all probability, by a member of the Natuurkundige Commissie, Pieter van Oort) he placed this bird in another genus and renamed it as *Buceros lunatus* Temm.:

> We have made known in the index of the genus and in its supplement, that the details published up to now concerning this species, plate 546, a precise figure from a live specimen, are based on Levaillant's description and on the figure of a mangled specimen, artistically made of assembled pieces. We now possess this specimen; it has only four tail feathers, in particular, those in the middle, the anterior and posterior parts of the helm have been mutilated and repaired, it seems, with pieces of cork on which a horny layer has been carefully glued; this

[32] George Robert Gray, "Preface," in *Appendix to a List of the Genera of Birds* (London: Richard and John E. Taylor, 1842), iv.
[33] George Robert Gray, "Preface," in *A List of the Genera of Birds: with their Synonyma and an Indication of the Typical Species of Each Genus*, 2 ed. (London: Richard and John E. Taylor, 1841), vii.
[34] François Levaillant, *Histoire naturelle d'une partie d'oiseaux nouveaux et rares de l'Amérique et des Indes* (Paris: J. E. Gabriel Dufour, 1801).

is the condition of the specimen used as model for plate 13 of Levaillants' *Oiseaux rares*.[35]

FIGURE 5.2. Original watercolor of a Rhinoceros Hornbill, possibly by Pieter van Oort, from a live specimen.

FIGURE 5.3. Plate by Jean-Gabriel Prêtre of the rhinoceros hornbill from a stuffed specimen from the Leiden museum, in Temminck and Laugier's *Nouveau recueil de planches enluminés*, vol. 2, Pl. Col. 546 (1838). Prêtre probably used Van Oort's drawing to improve his lithograph.

[35] Temminck and Laugier de Chartrouse, "Calao en casque en croissant. Bucerus lunatus Temm," in *Nouveau recueil de planches coloriées*, vol. 2, 65.

As Temminck grew older, more redundant descriptions slipped into his works. The reviewers of Temminck's great iconographic work, the *Nouveau recueil de planches coloriés d'oiseaux*, pointed this out on several occasions. When the first installments were published, the authors received many positive reviews for the exactitude of the figures, for the accurate descriptions of the species, and for the synonymy lists that accompanied every name.[36] A review in the *Annales Générales des Sciences Physiques* from 1820 read:

> We have delayed telling our readers about this important collection, and we are now most certain of the praise it should receive. The sixth installment that has just been published equals, if not surpasses, the installments that preceded it in beauty and perfection. After all, this is what one should expect from the reputation of its authors and from the authority these scholars have enjoyed for a long time.[37]

A year later, the reviewer stated: "This beautiful enterprise continues with admirable zeal, and its authors receive everywhere the satisfactory reviews they are entitled to expect from the many enthusiasts of the natural history of birds."[38]

But by the time the work was finally finished, in 1840, it had received mixed reviews along the way. Apparently, the quality of the last installments didn't live up to expectations, and Temminck had introduced new names for species that had already been described. The *Annals and Magazine of Natural History* published a review that praised the work for the clear descriptions of the species and the accuracy of the plates, but criticized Temminck's nomenclatural practices:

> the greatest blemish of the work is the passing of the discoveries of contemporary writers, with whose works M. Temminck should have been conversant; thus from the commencement of the series many birds are given under new denominations which had previously been described by other naturalists. A difference of opinion may have existed, but prior and contemporary labourers in the same field could scarcely all be unworthy of notice; even in the concluding Livraisons this is apparent.[39]

---

[36] "Nouveau Recueil de Planches Coloriéés d'Oiseaux pour servir de complement aux Planches Enluminés de Buffon. Par MM. C. J. Temminck, d'Amsterdam, et Meiffren Laugier, baron de Chartrouse, de Paris," *Annales Générales des Sciences Physiques* 7 (1820); and "Nouveau Recueil de Planches Coloriéés d'Oiseaux. Par MM. Temminck et Meiffren Laugier," *Annales Générales des Sciences Physiques* 8 (1821).

[37] "Nouveau Recueil," *Annales Générales* (1820), 361.

[38] "Nouveau Recueil," *Annales Générales* (1821), 395.

[39] "Bibliographical Notices. Nouveau Recueil de Planches Coloriées d'Oiseaux… par M. Temminck et Meiffren Laugier Baron de Chartrouse, Livr. 98–102, 1839," *Annals and Magazine of Natural History; Zoology, Botany, and Geology* 4 (1840): 267.

Charles Lucien Bonaparte detected a similar trend in Temminck's *Monographies de mammalogie*, in particular in his treatise on a genus of bats called *Vespertilio*. He listed a number of species that were misidentified and otherwise invalid: "His *Vespertilio brachyotus*, Baill., is nothing else than the *V. pipistrellus*. The *Vespertilio schreibersi* is perhaps the same with *Miniopterus ursinii* of my *Fauna Italica*, in the description of which he considered that the account of the teeth was wanting (of which, on the contrary, I gave a most minute description). This arose from his not knowing the proper place to seek it, for I having given these characters under the genus, could not repeat them under the species. The *Vespertilio limnophilus*, published by him as new in Plate 48 of the work, is the *Vespertilio dasycnemus* of Boie."[40] Straightening this chaos was one of the main concerns of early nineteenth century zoologists.

Strickland was particularly worried about it. A bit discouraged, he wrote: "Any one who will take the trouble to examine the various papers on ornithological nomenclature in the *Analyst*, will find that specific names are as variable as the London fashions." For him, the solution lay in applying the rule of priority: "Then will the nomenclature of Linnaeus, Cuvier, and Temminck triumph over the crude inventions of a host of anonymous scribblers."[41] In an attempt to create some order, he published a set of twenty-two rules for zoological nomenclature. However, the state of systematics was such that even these rules left plenty of room for interpretation and creativity. For instance, in his opinion there were some exceptions to the principle of priority, and rule number six was so ambiguous that it actually invited controversy: "A name may be expunged whose meaning is false, as applied to the object or group which it represents. Yet, in some few cases, where a name, though false, does not really mislead, it should be retained, if long established."[42] In general, Swainson's 1837 rules were badly received or, if approved of, regarded as guidelines and recommendations. It would not be until 1842 that zoological rules for nomenclature were formalized by an established scientific organization, the British Association for the Advancement of Science.[43] The consequences, as we will see later on, went far beyond the stabilization of nomenclature: the rules marked a shift of the seat of authority from individual practitioners to a self-governing collective of naturalists.

---

[40] Charles Lucien Bonaparte, "Observations of the State of Zoology in Europe, as Regards the Vertebrata," in *Reports on the Progress of Zoology and Botany, 1841, 1842* (Edinburgh: Ray Society, 1845), 22.

[41] Hugh Edwin Strickland, "On the Inexpedience of Altering Established Terms," *Magazine of Natural History and Journal of Zoology, Botany, Mineralogy, Geology and Meteorology* 1 (1837): 128.

[42] Hugh Edwin Strickland, "Rules for Zoological Nomenclature," *Magazine of Natural History and Journal of Zoology, Botany, Mineralogy, Geology and Meteorology* 1 (1837).

[43] Rookmaaker, "Early Endeavours by Hugh Edwin Strickland."

Stability and reliability: these were the means for science to advance and to allow zoologists to understand each other. In order to attain the desired stability naturalists must follow certain rules and these rules should be accepted universally. So far, everyone agreed; but agreeing on the rules themselves was a very different matter. Vieillot coined his own names to replace older ones and created new ones by altering their original orthography; Temminck also gave new names to species that had been, in his eyes, incorrectly named or not sufficiently well-described. But because they had different reasons to make these changes, each accused the other of plagiarism. There were no universal rules and no recognized authority to settle the matter, a reflection of the fact that nomenclature and classification were still developing fields of natural history. Nicholas Vigors, convinced that nomenclature was more a tool than the foundation of classification, wrote in 1825:

> Nomenclature itself is variable. From its very nature it cannot remain stationary: it must be enlarged to suit the increasing bulk of materials which it is meant to regulate; it must be altered to meet the more accurate information of every day. But the principles which direct its art never vary. Standing on the philosophical basis upon which they were placed by Linnaeus, they are suited to every change of the science; in every alteration of views, in every modification of knowledge, they remain the same, unchanged, unchangeable. Ought it not to be the undeviating principle therefore to which we should adhere, and not the inconstant name?[44]

The rub was that naturalists could not agree on which "principles direct the art of nomenclature." But there was yet another issue that ruffled feathers and on which compromising was out of the question: the genus concept.

Establishing genera

Since the works of Latham and Illiger there had been a general agreement that the bulky Linnaean genera had to be sliced into smaller units in order to deal with the incredible number of new birds discovered since 1800. In the last edition of Linnaeus' *Systema naturae* of 1766, seventy-eight genera were listed, which contained over nine hundred species. In 1790 Latham's *Index Ornithologicus* listed almost three thousand bird species in a little over one hundred genera. Vieillot listed over two hundred and seventy genera in the *Analyse d'une nouvelle ornithologie élémentaire* in 1816; Temminck catalogued almost two hundred genera in the second edition of the *Manuel d'ornithologie* (1820–1840). In

[44] Nicholas Aylward Vigors, "Some Observations on the Nomenclature of Ornithology; Particularly with Reference to the Admission of New Genera," *The Zoological Journal* 1, no. 2 (1824): 190.

1844 Gray described eight hundred and fifteen genera and listed over two thousand four hundred generic *names* known to him at that time.

Obviously, naturalists disagreed on what a genus actually was. They held very divergent views on the splitting of genera, ranging from the most conservative ones, apprehensive to change the Linnaean system, to the most innovative ones who divided genera into multiple new ones. Species were moved from group to group, shedding their generic names with every rearrangement. Classification systems changed and groups were either enlarged or split into smaller ones. Every modification reflected each naturalist's theoretical premises. Gray sketched the situation in 1841: "an author will not hesitate to state, that he cannot adopt the genera of certain Ornithologists, because they are not what he is disposed to consider 'natural divisions'; he therefore proposes his own divisions, and designates them by his own names."[45]

In 1824, Nicholas Vigors wrote a passionate letter about Temminck's classification of birds as published in his works between 1813 and 1820.[46] The letter was addressed to the Editors of *The Zoological Journal* and published in 1824 as "Some Observations on the Nomenclature of Ornithology; particularly with reference to the admission of new genera." This article received an equally passionate response from Temminck, in the introduction of the third volume of the second edition of the *Manuel* in 1835. Their discussion revolved around three main questions. First, was a genus better than the old Linnaean sub-generic category, the *section*? Second, where should naturalists place those species that fell in between genera? Third, which were the best characters to define a genus? The debates about these three points give us very interesting clues as to why these two naturalists could not agree and illustrate the state of zoological classification at the time.

The first disagreement between Temminck and Vigors was about the use of genera versus the use of sections. As is reflected in the fact that they were usually not given Latin names of their own, sections constituted an informal systematic category that helped to cluster groups of species within the same genus. Sections were particularly useful for large genera containing many species, breaking them up into smaller units, and were used both in botany and in zoology. In this way no additional generic names were needed to place these species in a separate genus. Temminck was very critical of the proliferation of genera that had taken place in ornithology between 1800 and 1820.

[45] Gray, "Preface," *List of the Genera of Birds*, 2 ed., v.

[46] Vigors was one of the leading reformists in Britain, who advocated a change in nomenclature as well as in methods of classification. This "Vigorian reform" and the situation of nomenclature and classification in Britain have been described by Gordon McOuat; see "Species, Rules and Meaning" and "Cataloguing Power." It would be very useful if similar studies were made for the same period for the Netherlands, especially if attention is paid to links to changes in politics and culture.

He particularly disliked those descriptions that, in his eyes, were not supported by a careful comparison between forms, varieties and related species from different geographic regions. He had harsh words for Vieillot's new classification,

> which is unnecessarily divided into tribes and subfamilies belonging to groups too vaguely characterized and too imprecise, subdivided without reason into multiple genera; these genera (if we wish to follow the plan outlined by the author) are too few in relation to all the organisms known, which have not been part of his research, and then again subdivided into so many sections that he is one step away from making the species disappear and thus making ornithology comprise only genera and sections.[47]

It was not only Vieillot's system that Temminck was criticizing, but the general practice of splitting groups into smaller genera and describing a new genus for a handful of new species if these, according to Temminck, could be placed in an existing genus. Such a practice complicated the systems and impeded the advance of science. These new vague genera did nothing except create confusion, especially if they were made to include species that were difficult to place within the existing system:

> But what fate awaits the *anomalous species*, so numerous within the class of birds? Minutiae will not always help to dissipate the uncertainty; in this case, the species is destined to be bounced from one genus to another, the source of many errors and multiple synonyms; rendering naturalists less likely to understand each other […] When in doubt, to avoid this problem, a *new genus* is made. This procedure is the order of the day, and it indulgently stimulates the self-esteem.[48]

Consequently, Temminck kept the big genera and synonymized many new names with the old ones. To make the large genera more manageable, to Vigors's dismay, Temminck used *sections*.

Nicholas Vigors objected to Temminck's use of sections because when such groupings could be detected within a large genus, he argued, naturalists had two options. One, to upgrade the genus and make it a family, then create new genera to accommodate these clusters—Vigors' choice—or the second option, which consisted in keeping the original genus name and then to refer to sections as sub-generic categories to group similar species within the existing genus. The main defect of this procedure was, for Vigors, that it complicated nomenclature and sacrificed the brevity of Linnaean binomials. With the use of sections, genera became too big to be useful. To try to place a species within the system, in a genus containing dozens of species, sometimes hundreds,

[47] Temminck, *Observations sur la classification*, 6-7.
[48] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xxviii-xxix.

became an impossible exercise. Therefore, Vigors concluded, sections were not in accordance with the spirit of zoological classification:

> if it should occur, that, owing to the increase of materials or of our knowledge respecting them, the terms assigned to certain groups should become too vague and limited in their application, with reference either to the magnitude of the group itself, or the variety of forms that enter into it, - as, for instance, where an original genus receives such a numerous accession of species, and such an addition of new forms, as renders the name, as generick, inapplicable to them all; – it becomes a question whether we should make an alteration in the terms of the nomenclature itself, or violate the principles which have been established for its direction.[49]

For him, it was natural that names changed to suit the growth of knowledge. The principles of nomenclature and classification, on the other hand, were immutable: "there are no terms more definite in their meaning and application than those of genus and species."[50] Therefore, similar species should be placed in one genus, creating a new one if required, even if it meant introducing changes in the nomenclature. Vigors considered Temminck's attempts to avoid creating new genera simply pointless. Even worse, new names did not create confusion in science, but the use of sections did. If sections were so distinct as to be separated from each other and adjoining genera then, Vigors said, "I cannot conceive that the subdivisions so characterized can be considered ought else than genera."[51] In this situation, he saw no reason to refrain from describing a genus:

> The follower of the modern views in science discovers, in an extensive family, a distinctly characterized group; he calls it a genus, and designates it by a scientifick name. The adherent to the Linnaean nomenclature acknowledges the same distinct group; he calls it a section of the Linnaean genus, and designates it by an unscientifick name. The process is precisely the same; the terms made use of alone are different.[52]

Sections and genera were synonyms for Vigors. That was not the case for Temminck. He saw them as two very distinct categories of different meaning and consequently, with a different function within the classification system. Temminck's sections were meant to facilitate research and could be changed in view of new discoveries without fundamentally altering the classification system or the nomenclature. Sections could even be regarded as temporary, if needed. To him, sections were always preferable to

[49] Vigors, "Observations on the Nomenclature," 190.
[50] Vigors, "Observations on the Nomenclature," 199.
[51] Vigors, "Observations on the Nomenclature," 199.
[52] Vigors, "Observations on the Nomenclature," 189.

redundant genera, because they "may be adopted, modified or removed entirely without affecting the systematic order, and without hindering, by a series of new names, the understanding between naturalists throughout the world."[53] He concluded: "The division into sections, if used with precision, seems better to me than excessive division of genera: the first can depend on one's viewpoint and it is comparable to the rules of propriety in society; the second should serve as a universal rule."[54]

Temminck perceived yet another advantage in the use of sections instead of genera: they were not followed by the author's name, as genera were. That was why someone who wished to see his name perpetuated chose to create a new genus instead of a section: "to flatter his self-esteem, it is usual to rub the sponge over the name of his predecessor and to say, by means of MIHI or by NOBIS in capital letters: *A moi la cargaison!*, and to very often give priority to the genus.''[55] Ironically, Temminck was accused of the same fault. Vigors wrote of him: "if it is an innovation to create and characterize a new genus, he [Temminck] is himself one of the greatest innovators of the present day. I have too high an opinion of the talents of that distinguished naturalist, and too high a respect for his character, to suppose that he would be influenced by any motives of prejudice or personal importance."[56]

Temminck's use of sections instead of genera followed from his understanding of what a genus actually ought to be: a permanent category in the system. He made an important distinction between convenient classification tools, the sections, and true classificatory groups, the genera. Vigors and Temminck were arguing about the use of sections and genera, but because their definition of these terms differed, they could never come to an agreement. They were, in fact, talking at cross-purposes.

The second issue in this discussion was the creation of new genera to include intermediate forms, species showing characteristics of two or more different genera. The main reason why Temminck considered many new genera to be superfluous was that, even though there were recognizable groupings of species within a big genus—the sections—the differences between them were so gradual that one could not discern where one section ended and the next started. Temminck repeated this often in his descriptions of birds. In the particular case of finches, he wrote:

> It is a vain endeavor to invent double and even triple new names to form groups that are strictly methodical. I have compared very carefully more than one hundred exotic species with our native ones; the result of this examination has

[53] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xxx.
[54] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xxxi.
[55] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xxxii.
[56] Vigors, "Observations on the Nomenclature," 194.

> confirmed my view that there is a gradual passage, without any demarcation, from one species to the other.[57]

It had often been the case, Temminck said, that two separate genera had been described by taking species from the two ends of the morphological continuum of one single genus, without knowledge of the intermediate forms. By observing the differences between these two groups of species one might indeed believe that they belong to different genera, but a few of the intermediate or transitional species, in the middle of the gradation, would prove that they belong to the same genus, and that therefore the one new genus that has been created is invalid.[58] When finding a "gradual passage" of characters from one group of species to the next, with many species showing characters from two or more sections at the same time, Temminck always preferred including related species in one genus. He argued that without a clear demarcation between groups, it was impossible to define a new genus with enough precision to have any diagnostic value. Any new genus should exhibit distinct characters and clear-cut boundaries with other genera, or not be described at all. Consequently, he wrote, he was happy to accept new genera, provided the author had done enough comparative research to back up his description, and if the generic characters were defined with enough exactitude and precision to create a clear boundary around it.[59]

Vigors shared Temminck's view on this point: absolute divisions did not exist in nature. But this realization led him to a very different approach to classification. Every group does indeed gradually pass into another, in an uninterrupted chain of affinities that connects all living forms. From this he concluded, not without sarcasm, that if this is what Temminck considered to be a genus, then "we must admit one group, one genus alone, in Ornithology, which we may denominate the genus *Avis*."[60] The only way to deal with this apparent unity, Vigors wrote, was to admit the artificial nature of classification: divisions were ideal and man-made, because nature shows none. Boundaries were set around a group of species as they more or less approach the type species of each genus: the one exhibiting the defining characters of the genus. Vigors' "type-species," the one that displays the main characteristics of its genus, was the tool that allowed him to outline his generic groups. He did this by comparing the morphological differences of a species from the types resembling it most before deciding

[57] Temminck, *Manuel d'ornithologie*, 2 ed., vol. 1, 342-43.
[58] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xiv.
[59] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xxii; Temminck, "Urotrichus," 1.
[60] Vigors, "Observations on the Nomenclature," 195.

in which genus to place the species: "Upon these typical eminences I plant those banners of distinction round which corresponding species may congregate as they more or less approach the types of each."[61] He compared this method to the process of naming hills in an undulating scenery: "And thus it is that I conceive my groups to be at once separated and united; separate at their typical elevations, but united at their basal extremes."[62]

Temminck rejected Vigors' method with the following argument: if a genus is composed of those species that most resemble its type, every genus must have an accurately defined type. And that was exactly what the new systems with their vaguely defined genera lacked, in Temminck's opinion. Every type was unique and separate from other types; each species showed deviations from it, but it always exhibited the type's main characters.[63] Therefore, Temminck said, only when the type was well defined was it possible to allocate species to their type and to set the limits of the genus. So genera might be, as Vigors said, man-made, but Temminck believed that by ascribing the species to its right type (provided its main characters were known), natural or true genera could be discovered. This method would in due course close the gap between the artificial genus and the natural entity. The first step was to define the characters of the type as accurately as possible, before describing any new genus. To this, William Swainson remarked: "Our author's [Temminck's] forte, indeed, like that of Illiger, is detail; but he seems, unfortunately for his own fame, to have imbibed the ancient notion that no genus is to be retained, if the links by which it is connected to another are discovered."[64]

The third issue in their dispute was how to differentiate a genus and its type. A type, said Temminck, should be defined by a few essential characters, intrinsic only to the form it represents, leaving no room for mistake. As types are the blueprints for genera, they should be clearly outlined by a small number of fundamental traits. A neat and concise definition of a type was an essential component of Temminck's system. He argued that, without it, the descriptions of new genera (those made for the intermediate forms) must forcibly include a long list of minor or auxiliary characters on top of those already used for the types of the existing genera. "A good diagnosis is not as easy to make as one might think. Naturalists do not always know how to clearly define a species using a few words. A long description full of minute details is precisely the most

[61] Vigors, "Observations on the Nomenclature," 196.
[62] Vigors, "Observations on the Nomenclature," 196.
[63] Farber, "Type-concept in Zoology"; McOuat, "Species, Rules and Meaning," 511-12; Witteveen, "Naming and Contingency."
[64] William Swainson, *On the Natural History and Classification of Birds*, vol. 2, The Cabinet Cyclopædia. Natural History (London: John Taylor, 1837), 184.

confusing."[65] In fact, any group exhibiting morphological characters also present in other genera could not stand on its own as a true category. If a genus was made to include these intermediate forms one must use many "minute characters," listed in interminable and complex descriptions.

This point had already been a major argument in Temminck's 1817 criticism of Vieillot's system, whose tribes and families had been described using an endless number of characters. This, Temminck said, undermined the validity of Vieillot's system, as its categories were poorly supported.[66] Ill-defined types only served to confuse classification and blur the true types within the system. The key was to define genera by using the *right* set of characters. Temminck pleaded for using a set of carefully chosen characters—the same for each genus—to make comparisons between groups possible. In ornithology, these characters should include not only the external characteristics such as the feet, the beak, the plumage or the wings, but also skeletal features, as well as traits from their geographic distribution and behavior. No minor characters such as variations in color or in size should be included, as these only clouded the real relation between species and genera, and none of the main features should be left out either. That would only hinder the comparison between groups. The essential point in his argument is that, for Temminck, there were key characters and minor characters to define a genus, and that not all of them should weigh equally in zoology:

> When one tries to establish a new subdivision within an existing genus, it is essential to know, by examining nature, all or at least most of the known species related to those one wishes to isolate. It is also necessary to examine the series of specimens with greater or smaller affinity to those that might be included in the new genus. Furthermore, it is imperative to know if the way of life, nutrition and anything related to behavior and habitat of these species are markedly different from their congeners. It is important to distinguish mere varieties in a natural series of species from characters of a higher order, which are indicative of a different organization and behavior: generally, the eye of the experienced naturalist is usually better able to identify these accurately than those first and foremost devoted to the theory of natural sciences.[67]

There are two important implications of this passage. In the first place, not every character is of equal value for zoological classification. Temminck listed in the *Manuel d'ornithologie* which characters should be used to define new genera and to arrange them in his classification system. Any other character was accessory and ineffective in

[65] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xxiv-xxv.
[66] Temminck, *Observations sur la classification*, 12.
[67] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, x.

distinguishing genera of birds. The second, more incisive implication points to the authority of a naturalist to designate these key generic characters. Only those who had enough empirical knowledge and practical experience were able to determine which characters were to be used in classification. Naturalists who worked on the theory of nature, by contemplation or speculation, were not capable to distinguish variations from genuine diagnostic characters. Apparently, Temminck's pride in his extensive studies exasperated Vigors: "With considerable, and perhaps justifiable, self-complacency, he adds, that it is this knowledge which draws the line of distinction between the true expounder of nature, and the pseudo-naturalist of the cabinet and the library"[68]

What exactly a "defining character" was became a very important point of dispute, as it carried with it the possibility to create boundaries between taxa. In his criticism of Vieillot's system, Temminck pointed out his inconsistent choice of characters: "Mr. Vieillot does not follow a uniform method for the essential characters of his genera; he makes use of distinctive features with a certain indifference, taking them from here and there; this approach is highly defective, as it makes it impossible to find equivalent traits suitable for comparison between genera."[69] The characters with which to define a separate group, be it a species, a genus or a higher taxonomic level, were crucial not only for nomenclature, but also for the true method of classification. To understand how the natural groups of birds relate to each other and thus to understand nature's patterns, it was necessary first to properly define these groups. For this, Temminck turned to Cuvier's principles.

Cuvier's works on fossils and comparative anatomy had led him to postulate a starting point for the classification of living beings. From there, he defined the higher taxa based on his principles of the correlation of parts and the subordination of characters. Very simply put, he attached more value in classification to those organs that were essential for an animal to live, such as the respiratory and digestive organs, and then proceeded to group animals according to the degree of similarity of these vital organs first, arranging the smaller groups using the less important anatomical features. Temminck chose the characters to delimit his genera *à la* Cuvier. But it was just a starting point, and the weighting of the characters to establish the smaller groups remained to be done:

> It is certain that comparative anatomy and the study of the osteology of animals must be considered as basic sciences and as the point of departure for the zoologist who wishes to build the methodical edifice; but it is not exclusively

[68] Vigors, "Observations on the Nomenclature," 193.
[69] Temminck, *Observations sur la classification*, 41.

with the insights provided by these two studies that he must establish the second order groups.[70]

For example, the main features he used to establish the families of pigeons and fowl were the beak and the feet (important for feeding and locomotion), as well as the shape of the trachea (essential for reproduction, as the males use vocalization to attract the females). Genera were delimited by a combination of characters taken from their skeleton, the shape of the tail and wings, their size, their habitat and nesting behavior. Coloration patterns, a particular geographical distribution or peculiar features distinguished one species from another.[71] After the dreadful affair with Pauline Knip, the only illustrations in Temminck's book on pigeons and fowl were a few anatomical plates showing these essential diagnostic characters.

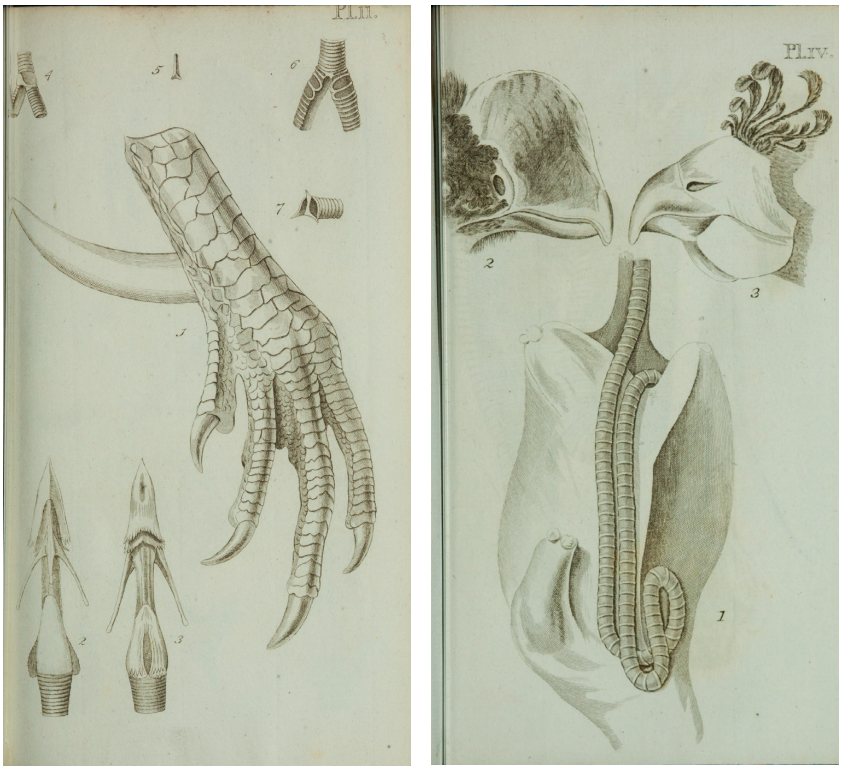


FIGURE 5.4. *Planches Anatomiques* from Temminck's *Histoire naturelle générale des pigeons et des gallinacés*, vol 2. pl. II, and vol. 3, pl. IV (1813–1815).

[70] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xv.

[71] Temminck, "Discours sur l'Ordre des Pigeons," *Pigeons et gallinacés*, vol. 1, 32-39; Temminck, "Introduction troisième partie," *Manuel d'ornithologie*," 2 ed., vol. 3.

Identifying diagnostic characters for defining taxa was in no way Temminck's exclusive practice; in fact, it had become the standard procedure since Cuvier. Karl Illiger, for example, explained it as follows:

> No one is apt to doubt that in organisms the more important parts are more constant and that unimportant parts are subject to great variability. From this follows as a second rule for the determination of generic characters that they must be based preferentially on the more important parts. The importance of a part can be recognized partly from its greater or lesser relation to the foremost vital functions (*Lebensverrichtungen*) such as nutrition and reproduction, partly from its close connection with the nervous system, as with the sense organs, partly from the connection of a part with a very special purpose of the animal or the plant, and partly from the wide occurrence (Allgemeinheit) of a part which lets us infer its indispensability.[72]

The difficulty was to get naturalists to agree on which characters were to be used for a genus, or a species. As we have seen, the species concept seems to be quite similar to that of a genus: it is represented by an ideal type, but with variations, and only by observation and comparison can one successfully delimit a species. However, as Mayr notes with a hint of disappointment, naturalists "fail to provide a thorough discussion of the species problem. Rather, they refer to it in a sentence here and in another sentence there. One has to piece their ideas painfully together from such little fragments."[73] This is certainly the case with Temminck. For him, a species description should not be an endless enumeration of characters, but naturalists should be able to select a few characters that capture the identity of the species:.

> As long as one knows most of species that have been described and recalls them from memory, then when the description of a new species has to be undertaken, one immediately finds the main affinities or the characteristic differences. What matters is to have a perfectly satisfactory description of the type species; then those of the other species of the same genus are sketched with broad strokes: often, a single well-defined character is enough to ensure that the species cannot be confused, not even with those it resembles most at first glance.[74]

Apparently, it all came down to experience and knowledge, and there were no tangible rules or guidelines that could help. In fact, most naturalists occupied with

---

[72] Johann Karl Wilhelm Illiger, "Einige Gedanken über die Begriffe: Art und Gattung in der Naturgeschichte," in *Versuch einer Systematischen vollständigen Terminologie fur das Thierreich und Pflanzenreich* (Helmstadt: C. G. Fleckeisen, 1800); translated by Ernst Mayr, "Illiger and the Biological Species Concept," *Journal of the History of Biology* 1, no. 2 (1968): 177.

[73] Mayr, "Illiger and the Biological Species Concept," 167.

[74] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xxv.

classification at the time were concerned with finding the right characters and giving them hierarchical values to use them in their classifications. Naming species and delimiting genera was a more complicated and deeper question than merely listing and cataloguing animals: it was the key to understand the organization of nature. The way naturalists delimited species involved comparing series of specimens and descriptions in the literature and then selecting those characters that, for them, had diagnostic value for that species. Therefore, comparison and experience, however subjective, played a decisive role.[75] In 1844, Strickland confessed with some dismay that ornithology still had not figured out how to weight zoological characters, and "must therefore be estimated by moral rather than by demonstrative evidence."[76] It seems that despite the type concept, the general approach to defining genera was an intuitive one, at least for the time being. Strickland admitted as much when he wrote: "The precise rank in the scale of successive generalizations which shall be occupied by those groups we term *genera* is then a matter of *convenience*, and consequently of *opinion*."[77] But he remained optimistic: "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."[78]

The search for a natural classification system

Temminck's refutation of Vigors' method indicates that they held different ideas about what the type of a genus ought to be, how to characterize it and how to use it in systematics. Evidently, they also disagreed on who had the authority to settle the matter. The debate between Vigors and Temminck may seem one of methodology and technicalities, but it was a reflection of much deeper questions. They were also arguing about the truth of their classification systems.

In this period the major goal of ornithology was the search for a natural system of classification. By *natural* was meant a system that reflected the true organization of all

[75] The concept of species in biology has been extensively studied and discussed. See for example Scott Atran, Richard W. Burkhardt, Pietro Corsi et al., eds., *Histoire du concept d'espèce dans les sciences de la vie: colloque international (mai 1985) organisé par la Fondation Singer-Polignac, Paris* (Paris: Fondation Singer-Polignac, [1987]); Jürgen Haffer, "The History of Species Concepts and Species Limits in Ornithology," *Bulletin of the British Ornithologists' Club* 112A [Centenary] (1992); Stevens, *Development of Biological Systematics*; John S. Wilkins, *Species: a History of the Idea*, Species and Systematics, vol. 1 (Berkeley: University of California Press, 2009); Frank E. Zachos, *Species Concepts in Biology: Historical Development, Theoretical Foundations and Practical Relevance* (Switzerland: Springer, 2016).

[76] Hugh Edwin Strickland, "Report on the Progress and the Present State of Ornithology," *Report of the British Association for the Advancement of Science* 14 (1845): 217.

[77] Strickland, "Report on the Progress," 218.

[78] Strickland, "Report on the Progress," 218.

living forms and the laws of the natural world.[79] There was, however, a lack of consensus on how to reach that goal, on what approach to classification would eventually lead to a natural classification system. Naturalists working on classification were very aware of the differences between three sorts of systems: artificial ones (meant to help catalogue diversity with no theoretical implications); classification systems constructed based on partial knowledge (too incomplete to reflect natural laws); and systems reflecting the true divine order in the natural world (*the* natural system). In 1826, James Ebenezer Bicheno, a colonial official with a keen interest in botany, published an article about the contrasts between artificial and natural systems and their functions. He wrote:

> The artificial and the natural systems aim at two very distinct objects, which are in some measure incompatible with each other. The one is to make us acquainted with individuals; and the other, founded upon acquaintance with individuals, to combine them according to their characters, so as to abridge the labour of reasoning, and to enable us to ascend from particular to general truths.[80]

If the goal was to analyze, Bicheno explained, divisions and subdivisions might be very convenient. But when the intention was to understand the truths of nature, these subdivisions and the characters used to define them were in fact an obstacle. He pointed out the "confusion of analysis and synthesis" that was taking place in many classification systems, "a defect which may be attributed chiefly, I apprehend, to the attempt which both we and our continental neighbours have made to combine the natural with the artificial system. We have aimed at analysis and synthesis at the same time."[81] The main question was not whether or not there was an underlying order in nature, but rather: how could zoologists turn those artificial systems into natural ones? By empirical, inductive study of nature? Or should naturalists rely on their insights and construct classification systems in a deductive way?

Temminck's method was definitely based on the Cuvierian tradition: by careful study of the main characters of birds, including every variation, their behavior and geographical distribution, he would discover the true laws of organization. He insistently stated this in every work he published. He relied on Cuvier's methods of comparative anatomy to delineate the main groups in zoology, and on the careful study of collections and nature to refine Cuvier's system. The accumulation of knowledge through the patient study of nature, building on the work of previous naturalists, like

[79] Farber, *Emergence of Ornithology*, 80-91.
[80] James Ebenezer Bicheno, "On Systems and Methods in Natural History," *Transactions of the Linnean Society of London* 15, no. 2 (1827): 481.
[81] Bicheno, "Systems and Methods," 492.

Latham's *Index ornithologicus* (1790) and Illiger's *Prodromus Systematis Mammalium et Avium* (1811), was the path to transform the artificial systems into natural ones, slowly closing the gap between them. Temminck's confidence in reaching a natural classification may have been enhanced by the fact that he was mainly interested in birds and mammals, groups well-studied since the time of Linnaeus and relatively small when compared with the insects or plants. Although new species were being discovered and the relations between groups remained a matter of discussion, Temminck believed that ornithologists had reached a point where the rough outline of the organization of the class of birds had been drawn:

> We hope that we will succeed, with time, in creating a better method of classification. The only way to achieve this goal is by a meticulous examination of nature; no genus, no subdivision, not even the acceptance of a new species can have a place in such a method, before a conscientious study of the living animals, or their undamaged remains, has been made by trustworthy naturalists; we should not admit anymore the multitude of animals described from observations of travelers and vague information, which collectors seem to have introduced in books only to enlarge the catalogue of nomenclature.[82]

For Temminck, induction was the only way to understand the true organization of nature, the foundation towards a natural classification system. Too many changes in the foundation and the whole building would come crumbling down "as a house of cards."[83] Temminck rejected Vieillot's classification system of 1816 because by changing the work of his predecessors, Vieillot discarded the advances made by other ornithologists until then. He could not accept that Vieillot had chosen to create a complete new system of classification: "Mr. Vieillot […] has shattered all the systems that have been published previously as well as the modern ones."[84] By creating endless divisions and subdivisions naturalists were also constructing a system so complicated that it could never lead to an understanding of the true nature of the relations between groups. The artificial system should not be anything else than an auxiliary tool, a rough version of the final system whereby the organization of nature becomes visible, and it should therefore be simple and neat, without unnecessary segmentation, to serve as a universal central point of reference to build upon.[85] For Temminck, knowledge emanated from the very act of classifying.

[82] Temminck, "Avant-propos," *Manuel d'ornithologie*, 1 ed., xv.
[83] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xii.
[84] Temminck, *Observations sur la classification*, 6.
[85] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xi.

Vigors, on the other hand, saw classification systems not as a foundation on which to build a natural system, but as a practical tool to help order the natural forms. For him, understanding nature did not depend upon classification: it was the classification system that emanated from knowledge. As knowledge evolved, so did the classification systems, as they were secondary to science. So when he came to embrace Quinarianism, he employed his quinarian approach to overhaul the classification of birds. His groups of birds reflected the quinariam dictum that all groups were linked to the number five.

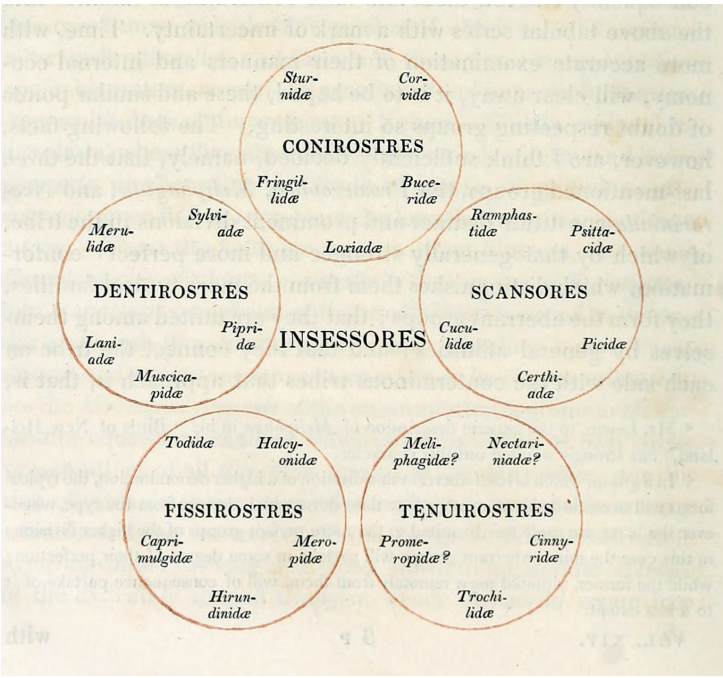


FIGURE 5.5. A diagram for the orders and families of birds, organized in circles of five according to the quinarian principles, from Vigors' "Observations on the Natural Affinities that Connect the Orders and Families of Birds" (1825).

Vigors relied on a natural philosophy *a priori* to guide the construction of his classification system, like William Sharp MacLeay (who had defined the quinarian principles for the first time in his *Horae Entomologica* in 1819) and William Swainson. But in fact, as quinarian systems proposed that all taxa are divisible into five groups, each group into five subgroups and so on, if a group consisted of four or fewer taxa it followed that a missing species or genus remained to be discovered. This led occasionally to the creation of new taxa that would fill in the gap or to the merging of groups to ensure groups were arranged in multiples of five. Vigors claim that his system

was based on the careful study of nature and that it was, therefore, a natural classification system, was met with understandable skepticism.[86]

Swainson, in his *Preliminary discourse on the study of natural history* of 1836, explained that there were two methods to study natural history, the "analytical method," based on empirical research and, therefore, inductive, and the "synthetic method," based on principles that were assumed correct before investigating. Only the first method would lead to the true classification system, the quinarian system. That Quinarianism had not been discovered earlier was, according to Swainson in 1834, because naturalists had been focusing on minute details, instead of searching for universal principles.[87] Like Vigors, he was convinced that "the circular principle of variation" had been discovered as a result of empirical research, that it emerged naturally from the knowledge zoologists had acquired until then and that, consequently, his system of classification was natural. Swainson considered Temminck's system as described in his *Manuel d'ornithologie* to be artificial, as it did not reflect the quinary circles, but excellent nonetheless:

> Of all those which have been framed *without* a reference to the general laws of the natural system, it is decidedly the best. This may appear unmerited praise, when we perceive that the very foundation, or, in other words, the primary divisions, are forced and unnatural. […] These [Temminck's divisions], however, when viewed in reference to artificial arrangement – and the author is evidently unacquainted with any other, are very clear, and, consequently, excellent. The genera, it is true, are few, but they are defined with great care, and evidence of acquaintance with this class of zoology far superior to that possessed by any of the moderns.[88]

Swainson accepted Temminck's divisions for their clarity. Vigors clearly could not. He even accused Temminck of working on an artificial system—with large, unnatural genera—to suit his own ideas: "When we see […] nature thus made to bend to the views of man, it becomes every one to enter his protest, however feeble, against doctrines so pregnant with danger to the views of the student, and so subversive to the sound principles that regulate the science."[89]

---

[86] Vigors and Swainson adopted Sharpe's ideas and applied them to ornithology. Vigors published his bird classification in a series of papers in the 1820s, including his "Observations on the Natural Affinities that Connect the Orders and Families of Birds," *Transactions of the Linnean Society of London* 14, no. 3 (1825). Swainson discussed the quinarian classification extensively in *Natural History and Classification of Birds*.

[87] William Swainson, *A Preliminary Discourse on the Study of Natural History* (London: Longman, Rees, Orme, Brown, Green & Longman, 1834), 109.

[88] Swainson, *Treatise on the Geography*, 184.

[89] Vigors, "Observations on the Nomenclature," 183.

Not without irony, quinarians received exactly the same criticism for their systems of classification: creating groups to suit their own geometrical system. Getting back at Vigors, Temminck rejected Quinarianism and any other form of geometric symmetry in zoological classification without reservation. He wrote in 1835: "One gets lost in circular affinities, in the most bizarre analogies; the trinary and quinary systems divide opinions and one arrives in the arena of hypotheses and philosophical ideas, which lead to endless and pointless debates; all this to explain this beautiful nature and the wonderful and grandiose order that governs it."[90]

The search for a natural system was so vital for zoology that to label a classification system as artificial automatically implied that the system was inadequate or defective. Strickland noted: "the natural system is an accumulation of facts which are to be arrived at only by a slow inductive process, similar to that by which a country is geographically surveyed."[91] Therefore, he concluded, all systems based on an *a priori* theory, which attempt to classify forms in conformity with a philosophy, were erroneous. He proposed the study of affinities, or the similarities between species in those vital characters relevant for their existence (the equivalent of the modern concept of homology in biology), in order to construct the natural classification system. By measuring the morphological distance between species, Strickland built a system that could be drawn as a "map," much like a geographical map, placing species in a two-dimensional space.[92]

In 1856, Alfred Russel Wallace published an article cautiously entitled "Attempts to a Natural Arrangement of Birds" in which he rejected Quinarianism and adopted Strickland's map-making method as the right approach to the natural system: "When this has been done for all [families of birds], we may be able to arrange the whole group so as to present to the eye a view of the relations of the several parts, and then, and then only, shall we be able to determine whether any and what subdivisions can be established."[93] Temminck made no mention of Strickland's method nor of his concept of affinity—which was popular mainly in Britain—although his systems of classification were built upon very similar premises and also relied on morphological similarity of vital characters.

---

[90] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xv.

[91] Hugh Edwin Strickland, "On the True Method of Discovering the Natural System in Zoology and Botany," *Annals and Magazine of Natural History* 6, no. 36 (1840): 186.

[92] See for instance, Mario A. Di Gregorio, "Hugh Edwin Strickland (1811–1853) on Affinities and Analogies: or, the Case of the Missing Key," *Ideas and Production* 7 (1987); O'Hara, "Representations of the Natural System in the Nineteenth Century."

[93] Alfred Russel Wallace, "Attempts at a Natural Classification of Birds," *Annals and Magazine of Natural History; Zoology, Botany, and Geology* 18 (1856): 216.

In Germany, the *Naturphilosophen* had an entirely different approach. For the *Naturphilosophen*, classification systems reflected their philosophical views of nature, much as the Quinarian system did, but they had a more holistic and philosophical approach. *Naturphilosophie* looked for relations between the natural objects and for forces driving natural processes, applying *a priori* principles to their systems of classification.[94] *Naturphilosophen* like Lorenz Oken or Johann Jakob Kaup were searching for the ultimate natural system to organize the diversity of living beings, just as the quinarians, Temminck, Strickland and Wallace did. Their departing point was the idea that knowledge derived not from experience, but from reason and divine inspiration. The naturalist was, to borrow a phrase from Breidbach and Ghiselin, "a kind of divine mind reader," whose classifications reflected his insight into God's plan, as manifested in nature.[95] This led to seemingly illogical and even laughable classifications, which, however, appear more comprehensible when viewed in the context of their conception.

Lorenz Oken, for example, devised a classification system for animals based upon the five senses: touch, taste, sight, smell, and hearing. The underlying principle was that animal groups were the physical representation of the five senses. The resulting groups were named accordingly as Dermatozoa (invertebrates), Glossozoa (fish), Ophthalmozoa (mammals), Rhinozoa (amphibians) and Otozoa (birds).[96] Oken kept on developing his system by including the sequence of development of the brain and other vital organs in animals, until he published in 1833 his *Allgemeine Naturgeschichte für alle Stände*, where he explained in detail his theories. The final arrangement is summarized by Breidbach and Ghiselin as follows:

A. Viscera animals
    I. Gut animals (infusorians, coelenterates etc.)
    II. Vessel animals (mollusks)
    III. Skin animals (worms and insects)
B. Flesh animals
    IV. Bone animals (fish)
    V. Muscle animals (amphibians including reptiles)
    VI. Nerve animals (birds)
C. Sense animals
    VII. Sense animals (mammals)[97]

[94] Stresemann, *Ornithology from Aristotle to the Present*; Farber, *Emergence of Ornithology*.
[95] Olaf Breidbach and Michael T. Ghiselin, "Lorenz Oken and "Naturphilosophie" in Jena, Paris and London," *History and Philosophy of the Life Sciences* 24, no. 2 (2002): 220.
[96] Lorenz Oken, *Grundriss der Naturphilosophie der Theorie der Sinne und der darauf gegründeten Classification der Thiere. Frankfurt, a. M. 1804.* (Frankfurt-am-Main: printed by the author, 1804); and *Allgemeine Naturgeschichte für alle Stände*, 8 vols. (Stuttgart: Hoffmann'sche Verlags-Buchhandlung, 1833–1843).
[97] Breidbach and Ghiselin, "Oken and "Naturphilosophie", 228.

Clearly, even when all naturalists were pursuing the goal of uncovering the basic laws governing zoology, approaches and philosophies varied to such an extent that conflicts were unavoidable. Their goal was the same, namely, to discover the true laws of nature; their methods, however, were not. An understanding between these naturalists, holding such disparate ideas on the validity of a classification system was extremely difficult to achieve, not least because there was no central authority to arbitrate the disputes. Even more, each of them considered himself to be the authority on the matter.

The lack of agreement on a philosophy of natural history had brought to light the fact there was not enough knowledge to fully comprehend the true relations between taxa. In 1840, Strickland wrote: "We must first prove the existence of a real *natural system*, a subject which involves an enquiry into the designs of creative power, one of the most awful themes which the human intellect can attempt."[98] For most naturalists, the only reasonable thing to do was to keep on studying nature, accumulating facts and data, improving their systems. Or as Illiger put it: "We must try to enlarge our experience as greatly as possible; the greater the wealth of our observations the closer we will come to our goal."[99] The search for universal principles as promoted by Swainson in 1835 was abandoned and most publications focused on the description of new material and its arrangement within the most well-known classification systems, building on those of Latham, Illiger and Temminck.

According to Paul Farber, the empirical nature of most writings during the first half of the nineteenth century was a consequence of both the empiricist tradition and the process of specialization that was taking place at the time. If naturalists had restricted their fields to a minor part of the whole natural world, Farber notes, then "who, then, was qualified to comment on the larger issues in natural history? If naturalists increasingly restricted their domain of expertise, who could judge the validity of a claimed discovery of a general law?"[100] After the failures of the classification systems based on natural philosophies like Quinarianism and *Naturphilosophie*, it is also conceivable that a general feeling of disappointment and a good dose of prudence prevented naturalists from developing a philosophical foundation for classification. In the Netherlands, the empiricist tradition was particularly important in the nineteenth century; Temminck's dismissal of theories was not unique in his country. During his

[98] Hugh Edwin Strickland, "Observations upon the Affinities and Analogies of Organized Beings," *Magazine of Natural History* 4 (1840): 220.
[99] Illiger, "Einige Gedanken über die Begriffe"; translated by Mayr, "Illiger and the Biological Species Concept," 171.
[100] Farber, *Emergence of Ornithology*, 140.

time, Dutch scientists, including natural historians, were committed to applied and practical sciences and few of them pursued the philosophical questions of their particular fields.[101] There was, however, a general feeling of hope in zoology that the laws of nature could indeed be discovered. Temminck, pragmatically, advocated patience and hard work:

> In the present state of science, and surrounded as we are by this great wealth of newly discovered objects, it seems preferable to limit our research, for the time being, to the exact knowledge of the species, and to identify them carefully, in so far as this is possible. We leave to the methodists with their bias in favor of their complicated structure full of technical terms, the care of arranging in a methodical system all those subtle details that they want to characterize rigorously by generic demarcations.[102]

The role of philosophy in zoological classification is discussed more in depth in the following chapters, and this will lead us to a better understanding of how natural philosophy played a central role in determining the status of systematics within natural history.

[101] Klaas van Berkel, Albert van Helden, and Lodewijk C. Palm, *The History of Science in the Netherlands: Survey, Themes and Reference* (Leiden: Brill, 1999); Theunissen, *Nut en nog eens nut.*
[102] Temminck, "Introduction troisième partie," *Manuel d'ornithologie*, 2 ed., vol. 3, xviii.