

SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

SOME QUESTIONS OF NOMENCLATURE.*

INTRODUCTION.

I HAD originally selected for the address which it is my duty and privilege to give to-day a very different subject† from that which I am now to discuss; but the renewed and lively interest which is being manifested at present in the ever-troublesome subject of nomenclature has led me to take it as my theme. I have been especially influenced, too, by the consideration that a committee was appointed at the last Zoological Congress, held at Leyden, to consider the subject, and suggestions have been asked for.‡ Of the multitudinous

* Address by Vice-President of Section F.—Zoology.

I avail myself of the opportunity to correct the proof of my address for SCIENCE, to add a few typographical corrections (not made in the proofs for the *Proceedings* of the Association) as well as some additional notes.

† Animals as Chronometers for Geology.

‡ The Third International Zoological Congress, (Leyden Sept., 1895), appointed an International Commission of five members to study the various codes of nomenclature in use in different countries. This commission is composed of Dr. Raphael Blanchard (France), Prof. Carus (Germany), Prof. Jentink (Holland), Dr. Sclater, (England), and Dr. Stiles (United States). Dr. Stiles requested the appointment of an American Advisory Committee. This Advisory Committee has now been completed and is made up as follows:

"Dr. Gill, representing the National Academy of

questions that offer for review time will only permit us to examine a few.

Nomenclature, in the modern sense of the word, did not trouble naturalists till near the middle of the last century. The animals and plants of the Ancient world were mostly treated of under the names which the Greeks or Romans had used, or were supposed to have used. The forms that became first known after the discovery of America were introduced into the literature under names more or less like those which they bore among the aboriginal inhabitants of the countries from which those forms had been obtained. Only a few names were coined from the Latin or Greek, and used for forms not mentioned by classical authors. Examples of such are *Ammodytes* and *Anarrhichas*, invented by Gesner. But none of those names were employed as true generic designations. Genera, in fact, in the strictest sense of the word, were not used, by zoologists at least,* till the time of Linnæus.

There were certainly very close approximations to the idea manifest in some of the older authors, such, for example, as Belon and Lang; but their analogous groups were not strictly defined and limited, as the genera of Linnæus and his followers were. The system has been one of slow growth, and has developed in accordance with our knowledge of Nature, and in response to the need for expressing the various degrees of complication of the organisms. The species known to the naturalists of early times were few in number—at least, comparatively—and the old students had no

Sciences; Dr. Dall, representing the Smithsonian Institution; Prof. Cope, representing the Society of American Naturalists; Prof. Wright, representing the Royal Society of Canada; Prof. Packard, representing the American Association for the Advancement of Science." (New note.)

*The genera of plants in Tournefort's work are perfectly regular, as well as defined and illustrated, but the nomenclature is certainly not binomial.

idea of the excessive diversity of form and structure familiar to us.

A census of animals and plants was taken by Ray, shortly before Linnæus commenced his career, and enumerated less than 4,000 animals, exclusive of insects; and of those it was estimated that there were about '20,000 in the whole world.' He evidently believed that the entire number living would not be found greatly to exceed this. But let Ray speak for himself.

According to the author's classification, animals were divided into four orders—'beasts, birds, fishes and insects.' The number of *beasts*, including also *serpents*, that had been accurately described, he estimated at not above 150, adding that, according to his belief, 'not many that are of any considerable bigness, in the known regions of the world, have escaped the cognizance of the curious.' (At the present day, more than 7,000 species of 'beasts,' reptiles, and amphibians have been described.*) The number of *birds* 'may be near 500; and the number of *fishes*, including shell-fish, as many; but, if the *shell-fish* be taken in, more than six times the number.' As to the species remaining undiscovered, he supposed 'the whole sum of beasts and birds to exceed by a third part, and fishes by one-half, those known.' The number of *insects*—that is, of animals not included in the above classes—he estimated at 2,000 in Britain alone, and 20,000 in the whole world. The number of *plants* described in Bauhin's 'Pinax' was 6,000; and our author supposed that "there are in the world more than triple that number; there being in the vast continent of America as great a variety of species as with us, and yet but few common to Europe, or perhaps Africk

*In a recent estimate of described species, 2,500 species of mammals are enumerated and 4,400 species of reptiles and amphibians—the several classes thus aggregating 6,900; this is probably an underestimate. P. Z. S., 1896, 306. (New note.)

and Asia. And if, on the other side the equator, there be much land still remaining undiscovered, as probably there may, we must suppose the number of plants to be far greater. What," he continues, "can we infer from all this? If the number of creatures be so exceeding great, how great, nay, immense, must needs be the power and wisdom of Him who formed them all!"

About 375,000* species of animals are now known, and of insects we still know the smaller portion.†

As knowledge of species of animals and plants increased, the necessity of system in registering them became apparent. Linnæus and Artedi especially appreciated this necessity, and early applied themselves to the correction of existing evils and the reformation of the classification and nomenclature of all the kingdoms of Nature. The Latin language had been long the means of intercourse among the learned, and was naturally selected as the basis of nomenclature. Instead of Latin words used as equivalents or translations of vernacular, by Linnæus and Artedi they were taken especially and primarily for scientific use. The various *kinds* of animals became the more exact *genera* of naturalists. A new language, or rather vocabulary of proper names, was developed with the Latin as the basis. As no adequate idea was at first had of the magnitude of the subject, rigorous codes of laws were formulated on the assumption that philological questions were involved rather than the means for the expression of facts. But soon the bonds that had been framed for the restriction of the

new vocabulary were broken. The idea dawned upon men that they had to do with natural objects rather than philological niceties, and that which was most conducive to facile expressions or exhibitions of facts was more to the purpose than Priscianic refinements. Linnæus himself eventually refused to be bound by the laws which he had originally framed. The early companion of Linnæus—Artedi—who had co-operated with him, and also framed a similar code for Ichthyology especially, was prematurely lost to science. The fact that Artedi devised the first code of laws affecting zoology has been generally overlooked, and a few of his 'canons' may be noticed here. The extent to which each one of the two—Linnæus and Artedi—influenced the other cannot now be learned, nor will it be necessary to consider here who of the two was the abler naturalist. It must suffice that there was almost perfect agreement between Artedi and Linnæus in the spirit of the laws they respectively framed.

COMMENCEMENT OF BINOMIAL NOMENCLATURE.

The question that has been most agitated of late is, what time shall we recognize as the starting-point for the binomial nomenclature? Even now not all will be bound by any such limit for generic nomenclature; but those who will are divided into two main camps—those who start from the tenth edition of the Linnæan '*Systema Naturæ*,' published in 1758, in which the binomial nomenclature was first universally applied, and those who advocate the twelfth edition of the '*Systema*,' published in 1766, the last which appeared during the life of Linnæus.

But it may be premised here that even the fact that Linnæus was the first to devise the system of binomial nomenclature is not conceded by all. It has been claimed that about two centuries before Linnæus published his '*Philosophia Botanica*,' Belon

* A census of animals recently taken under the superintendence of Dr. Selater gave 386,000 species. P. Z. S., 1896, 307. (New note.)

† The late Dr. C. V. Riley even went so far as to say "that there are 10,000,000 species of insects in the world would be, in (his) judgment, a moderate estimate." The largest previous estimate, by Sharp and Walsingham, 2,000,000, was termed by Riley 'extremely low.'

had uniformly and consistently applied the binomial nomenclature to plants as well as animals, fishes and birds.* It has been also urged that C. N. Lang (Langius),† in 1722, used the binomial nomenclature for shells. I have not been able to confirm either statement, and therefore have to side with the great majority who accord to Linnæus the credit of that achievement.

Almost all the naturalists of the United States accept 1758 as the starting-time for nomenclature, and now most of the naturalists of Europe take the same view. But the English generally accept 1766 for the commencement of their orismology. It was 'after much deliberation' that the Committee of the British Association for the Advancement of Science determined on the edition of 1766. It was only because that edition was 'the last and most complete edition of Linné's works, and containing many species that the tenth did not,' that it was so selected—surely an insufficient reason. A principle was subordinated to an individual.

Logically, the actual period for the commencement of the binomial nomenclature should be when the rules for that nomenclature were distinctly formulated; and that was 1751, when the '*Philosophia Botanica*' was first published. Practically, however, it makes little difference for most classes,‡ whether we take that date or 1758, when the next succeeding edition of the '*Systema*' was published. But it does make much difference whether we take the tenth

* Crié (Louis) *Pierre Belon et la nomenclature binaire*. Rev. Sc., xxx., 737-740, 9 Dec., 1892.

† My efforts to see a copy of Lang's '*Methodus nova Testacea marina in suas Classes, Genera, et Species distribuendi*' (Lucern., 1722) have not been successful. Maton and Rackett say that 'he is the first whose generic characters are founded on commodious distinctions,' but expressly state that 'there are no trivial names.' (See Trans. Linn. Soc., vii., 156, 157.) He may have properly appreciated genera.

‡ Arachnology would be most affected, for Clerck's work was published in 1757.

or twelfth edition. There is really no good reason for keeping Linnæus on that lofty pedestal on which he was enthroned by his disciples of a past century. His work does not justify such an elevation. In every department of zoology contemporaries excelled him in knowledge and in judgment. May we not hope that, ultimately, this truth will be recognized, and the tenth edition universally accepted for the first work of the new era?

TRIVIAL NAMES.

The binomial system has come into prominence through a sort of developmental process. Although now generally regarded as the chief benefaction conferred by Linnæus* on biology, it was evidently considered by him to be of quite secondary importance.

The first extensive use of it occurs in the '*Pan Suecicus*,' published in 1749, where the author mentions that to facilitate the recording of his observations he had used an 'epithet' in place of the differential character.† It was thus a mere economical device for the time being.

In the '*Philosophia Botanica*' he also treats it as a matter of trivial importance. He distinguishes between the specific name and the trivial.

His *specific* name corresponds to what we

* Linnæus himself did not claim this as an improvement in his account of the advancement he had effected in science.

† "Possumus nunc ultra duo millia experimenta certissima exhibere, quæ sæpe decies, immo sæpe his decies sunt iterata. Si autem sumamus FLORAM SUECICAM *Holmiæ*, 1745, & ad quamlibet herbam, ut chartæ parcat, nomen adponimus genericum, numerum Floræ Suecicæ & epitheton quoddam loco differentiæ, negotium in compendium facile mittitur." *Pan Suecicus*, pp. 228, 229.

This thesis is attributed to Nicolaus L. Hesselgren in some bibliographies, and naturally so, as it bears his name in the title; but Linnæus probably did not claim more than his own in claiming the authorship, although Hesselgren apparently wrote part of it himself. It is sometimes difficult exactly to fix the authorship in the case of some of the old theses:

would call a *diagnosis* (Nomen specificum est itaque Differentia essentialis); his *trivial* name is what would now be called the *specific*.* It is merely suggested that trivial names may be used as in his 'Pan Suecicus,' and should consist of a single word taken from any source.†

This system was fully carried out in the succeeding editions of the 'Systema Naturæ.' Both names were then given—the *nomen specificum* after the number of the species, under each genus, and the *nomen triviale* before the number, in the margin.

Linnæus placed little store on the trivial names, and accredited such to old botanists; but he took special credit for specific names (or diagnoses), claiming that none worthy of the title had been given before him.‡

DRACONIAN LAWS.

For generic nomenclature a Draconian code was provided by Linnæus and Artedi. It is now a maxim of good legislation that excessive severity of law is apt to defeat the object sought for, and the tendency of civilization is to temper justice with mercy. So has the tendency of scientific advancement been towards a mitigation of the Linnæan

* "217. Nomen specificum *legitimum* plantam ab omnibus congeneribus (159) distinguat; *Triviale* autem nomen legibus etiamnum caret." Phil. Bot., p. 202.

† "NOMINA TRIVIALIA forte admitti possunt modo, quo in *Pane suecico* usus sum; constarent hæc

Vocabula unico;

Vocabula libere undequaque desumpto.

Ratione hac præcipue evicti, quod differentia sæpe longa evadit, ut non ubique commode usurpetur, et dein mutatione obnoxia, novis detectis speciebus, est, e. gr.

Pyrola [5 sp.]

Sed nomina Trivialia in hoc opere seponimus, de differentiis unice solliciti." Ph. Bot., pp. 202, 203.

‡ "Trivialia erant antecessorum et maxime Trivialia erant antiquissimorum Botanicorum nomina.

Character Naturalis speciei est *Descriptio*; *Character vero Essentialis* speciei est *Differentia*.

Primus incepti Nomina specifica Essentialis condere, ante me nulla differentia digna exstitit." Ph. Bot., p. 203.

code. Nevertheless, its severity is more or less reflected in later codes—even the latest—and therefore a review of some of those old canons will not be entirely a resurrection of the dead, and may contain a warning for the future.

In exclusiveness for generic names Linnæus and Artedi went far ahead of any of the moderns. They provided that no names were available for genera in zoology or botany which were used in any other class of animals or plants, or even which were used for minerals, tools, weapons, or other instruments, or even places.*

Under this rule such names as *Acus*, *Belone*, *Citharus*, *Hippoglossus*, *Lingula*, *Novacula*, *Orbis*, *Orca*, *Remora*, *Solea*, and *Umbra*—all now, or some time, in common use—were specified.

This rule was soon relaxed, and any name not previously used in zoology, or, at most, biology, was considered admissible.

Another rule sends to Coventry all names composed of two names of different animals, because it might be uncertain to which genus an animal really belongs.† The ancient name 'Rhino-Batus' is even mentioned as one of the delicts.

This rule is also without any justification, and the reason given for it baseless. Compound words of the kind exiled are in entire harmony with the genius of the classic languages. As an illustration of their use among the Greeks, we need refer to one group only—that is, compounds with hippos, as *Hippalectryon*, *Hippanthropos*, *Hippardion*, *Hippelaphos*, *Hippocampus*, *Hippotigris* and *Hippotragelaphos*. (*Hippokantharos*, *Hippomurmes*, *Hippopareos* and *Hipposelinon* are

* "Nomina piscium generica, quæ quadrupedibus pilosis, avibus, amphibiiis, insectis, plantis, mineralibus, instrumentis opificum etc. communia sunt, omnino deleantur. Linn. Fund. 230." Art. Ph. Ich., § 193.

† "Nomina generica, ex uno nomine generico fracto, et altero integro composita, exulent. Linn. Fund. 224." Art. Ph. Ich., § 196.

other classic Greek words, but do not belong to the same category as the others, inasmuch as they were used in a sense analogous to horse-chestnut, horse-mackerel and horse-radish with us, the word 'horse' in this connection conveying the idea of strength, coarseness or bigness.)

In another rule, all words are proscribed as generic names which are not of Latin or Greek origin;* and among the proscribed are such names as *Albula*, *Blicca*, *Carassius* and many others, which were later used by Linnæus himself as specific names, and which are now used as generic denominations.

Words with diminutive terminations were barely tolerated, if admitted at all,† and the reason alleged for such treatment was that the cardinal name might belong to another class. Among the examples named were *Anguilla*, *Asellus*, *Leuciscus*, *Lingula*, *Oniscus*, and *Ophidion*, now familiar in connection with some of our best-known genera. One of these—*Ophidion*—was subsequently used by Linnæus himself as a generic name.

All are now tolerated without demur even, and probably by most naturalists never supposed to have been tainted with offense of any kind. For all such words we have also classical examples; and four have already been named—the *Oniscus* and *Ophidion* of the Greeks, adopted by the Romans, and the *Anguilla* and *Asellus* of the Latins.

Generic names, derived from Latin adjectives, were also declared to be unworthy of adoption. *Aculeatus*, *Centrine* and *Coracinus* were cited as examples of words that should be rejected under this rule. Later writers have repeated the denunciations uttered by Linnæus and Artedi, and re-

fused to adopt such words. But hear what Plutarch says of names of men derived from adjectives.

In his life of Coriolanus, Plutarch, in recounting the events subsequent to the capture of Corioli, and the refusal of Marcius to accept more than his share of the booty, comes to the proposition of Cominius:†

"Let us, then, give him what it is not in his power to decline, let us pass a vote that he be called *Coriolanus*, if his gallant behavior at Corioli has not already bestowed that name upon him." Hence came his third name of Coriolanus, by which it appears that Caius was the proper name; that the second name, Marcius, was that of the family; and that the third Roman appellative was a peculiar note of distinction, given afterwards on account of some particular act of fortune, or signature, or virtue of him that bore it. Thus among the Greeks additional names were given to some on account of their achievements, as *Soter*, the preserver, and *Callinicus*, the victorious; to others, for something remarkable in their persons, as *Physon*, the gore-bellied, and *Gripus*, the Eagle-nosed; or for their good qualities, as *Euergetes*, the benefactor, and *Philadelphus*, the kind brother; or their good fortune, as *Eudæmon*, the prosperous, a name given to the second prince of the family of the Batti. Several princes also have had satirical names bestowed upon them: Antigonus (for instance) was called *Doson*, the man that will give to-morrow; and Ptolemy was styled *Lamyras*, the buffoon. But appellations of this last sort were used with greater latitude among the Romans. One of the Metelli was distinguished by the name of *Diadematus*, because he went a long time with a bandage, which covered an ulcer he had in his forehead; and another they called *Celer*, because with surprising celerity he entertained them with a funeral show of gladiators a few days after his father's death. In our times, too, some of the Romans receive their names from the circumstances of their birth; as that of *Proculus*, if born when their fathers are in a distant country; and that of *Posthumus*, if born after their father's death; and when twins come into the world, and one of them dies at the birth, the survivor is called *Vopiscus*. Names are also appropriated on account of bodily imperfections; for amongst them we find not only *Sylla*, the red, and *Niger*, the black, but even *Cacus*, the blind, and *Claudius*, the lame; such

* "Nomina generica, quæ non sunt originis Latine vel Græcæ, proscribantur. Linn. Fund. 229." Art. Ph. Ich. § 198.

† "Nomina generica diminutiva vix toleranda sunt. Lind. Fund. 227." Art. Ph. Ich., §202.

† "Nomina generica imprimis Latina pure adjectiva, sed substantivè usurpata, criticorum more improbanda sunt. Linn. Fund. 235." Art. Ph. Ich., §204.

persons, by this custom, being wisely taught not to consider blindness or any other bodily misfortune as a reproach or disgrace, but to answer to appellations of that kind as their proper names."

What was good enough for the ancient Romans to bestow on the most admired of their heroes is good enough for the nomenclature of our genera of animals. We have also examples of names of adjective form used substantively for animals among classic writers. Such, for example, are the *Aculeatus* (pipe-fish), and *Oculata* (lamprey or nine-eyes), mentioned by Pliny.

Linnæus himself, later, coined many names having an adjective form; and three of his genera of plants of one small family, so designated, occur in this region—*Saponaria*, *Arenaria* and *Stellaria*. Yet even at the present day we have evidences of the lingering of the old idea embodied in the canon in question.

We have also had drawn up for us certain rules for the conversion of Greek words into Latin, which are tinctured with more than Roman severity. Thus, we are told that Greek names ending in *-os* should always be turned into *-us*; that the final *-on* is inadmissible in the new Latin, and should invariably be rendered by *-um*.

In accordance with such rules, *Rhinoceros* has been turned into *Rhinocerus*, and *Rhinocerotidae* into *Rhinoceridæ*. But *Rhinoceros* was admitted into classical Latinity, and with it the corresponding oblique cases, *Rhinocerotis*, etc.; in fact, the word was current in the language of description, satire, and proverb—as when used by Juvenal for a vessel made of the horn, or by Lucilius for a long-nosed man, or by Martial in the proverbial expression, '*Nasum rhinocerotis habere*'; i. e., to turn the nose up, as we would say. These authorities are good enough for me.

The termination *-on* was also familiar to the Romans of classic times, and numerous words with that ending may be found in the

books of Pliny. But our modern purists will have none of them; the Greek *-on* in the new Latin must always become *-um*. For example, *Ophidion* was the name given to a small conger-like eel, according to Pliny, and was (without reason) supposed to have been applied to the genus now called *Ophidium*; and this last form was given by Linnæus, who eventually* refused to follow Pliny in such barbaric use of Latin. But Pliny is good enough for me—at least as a Latinist.

Another rule prohibits the use of such words as *Ægir*, *Göndul*, *Moho*, *Mitu*, *Pudu* and the like, and provides that they should have other terminations in accordance with classical usage. But why should those words be changed and surcharged with new endings? As they are, they are all uniform with classical words. *Ægir* has its justification in *Vir*, *Göndul* in *consul*, *Moho* in *homo* (of which it is an accidental anagram) and *Mitu* and *Pudu* are no more cacophonous or irregular than *cornu*. I therefore see no reason why we should not accept the words criticised and corrected by some naturalists in their original form, even if we consider the question involved as grammatical rather than one of scientific convenience.

I have thus defended some of the names of our old nomenclators, and really think the rules laid down for name-making were too severe. But those rules were on the whole judicious, and should not be deviated from by future nomenclators without good and substantial reason; even if too severe, they 'lean to virtue's side.' On the other hand, let old names be respected in the interests of stability, even if slightly misformed.

MISAPPLIED NAMES.

While Linnæus was so exacting in his rules of nomenclature in the cases cited, in

* At first (in the tenth edition) Linnæus allowed *Ophidion*.

others he was extremely lax. It is due to him (directly or indirectly) that our lists of genera of vertebrate animals especially are encumbered with so many ancient names that we know were applied to very different animals by the Greeks and Romans. It is Linnæus that was directly responsible for the misuse of such generic names of mammals as *Lemur*, *Manis*, *Dasypus*; such bird-names as *Trochilus*, *Coracias*, *Phæton*, *Diomedea*, *Meleagris* and (partly with Artedi) such fish-names as *Chimæra*, *Centriscus*, *Pegasus*, *Callionymus*, *Trigla*, *Amia*, *Teuthis*, *Esox*, *Elops*, *Mormyrus* and *Exocoetus*. These all were applied by the ancients, to forms most of which are now well ascertained, and the animals to which they have been transferred have nothing in common with the original possessors of the names.

The misuse of these ancient names is in contravention of the rule adopted by the International Zoological Congress held in Moscow (1892), that "every foreign word employed as a generic or specific name should retain the meaning it has in the language from which it is taken," and of like rules of other associations. The false application by Linnæus and his followers (and he had many) was due partly to the belief that the ancient names were unidentifiable, but now there are few whose original pertinence is not known. It may be thought by some, however, that we are unduly criticising the doings of the past from the vantage-ground of the present. But such is not the case, for at the commencement of his career Linnæus was taken to task for the fault indicated. Some of those criticisms were so apt that they may be advantageously repeated here.

Dillenius, of Oxford, wrote to Linnæus in August, 1737, in these terms :

"We all know the nomenclature of Botany to be an Augean stable, which C. Hoffmann, and even Gesner, were not able to cleanse. The task requires much reading, and extensive as well as various erudi-

tion; nor is it to be given up to hasty or careless hands. You rush upon it, and overturn everything. I do not object to Greek words, especially in compound names; but I think the names of the antients ought not rashly and promiscuously to be transferred to our new genera, or those of the New World. The day may possibly come when the plants of Theophrastus and Dioscorides may be ascertained; and, till this happens, we had better leave their names as we find them. That desirable end might even now be attained if any one would visit the countries of these old botanists, and make a sufficient stay there; for the inhabitants of those regions are very retentive of names and customs, and know plants at this moment by their ancient appellations, very little altered, as any person who reads Bellonius may perceive. I remember your being told, by the late Mr. G. Gherard, that the modern Greeks give the name of *Amanita* (*ἀμανίτα*) to the eatable Field Mushroom; and yet, in *Critica Botanica*, p. 50, you suppose that word to be French. Who will ever believe the *Thya* of Theophrastus to be our *Arbor Vitæ*? Why do you give the name of Cactus to the *Tuna*? Do you believe the *Tuna*, or *Melocactus* (pardon the word), and the *Arbor Vitæ*, were known to Theophrastus? An attentive reader of the description Theophrastus gives of his *Sida*, will probably agree with me that it belongs to our *Nymphæa*, and indeed to the white-flowered kind. You, without any reason, give that name to the *Malvinda*; and so in various other instances concerning ancient names, in which I do not, like Burmann, blame you for introducing new names, but for the bad application of old ones. If there were, in these cases, any resemblance between your plants and those of the antients, you might be excused, but there is not. Why do you, p. 68, derive the word *Medica* from the virtues of the plant, when Pliny, book xviii., chap. 16, declares it to have been brought from Media? Why do you call the *Molucca*, *Molucella*? It does not, nor ought it, to owe that name, as is commonly thought, to the Molucca islands; for, as Lobel informs us, the name and the plant are of Asiatic origin. Why then do you adopt a barbarous name, and make it more barbarous? *Biscutella* is not, as you declare, p. 118, a new name, having already been used by Lobel. I am surprised that you do not give the etymology of the new names which you or others have introduced. I wish you would help me to the derivation of some that I cannot trace; as *Ipomæa*, for instance. Why are you so offended with some words, which you denominate barbarous, though many of them are more harmonious than others of Greek or Latin origin?"

A year later (August 28, 1738) he again wrote :

"It would surely have been worth your while to visit Greece, or Asia, that you might become acquainted with, and point out to us, the plants of the antients, whose appellations you have so materially, and worse than any other person, misapplied. You ought to be very cautious in changing names and appropriating them to particular genera."

How entirely the previsions of the wise old botanist have been realized, I need not explain. We now know what almost all of the names misapplied by Linnæus and his school were meant for of old; and when some more good naturalists collect names and specimens together in various parts of Greece, probably very few of the ancient names will remain unidentifiable.

The only reply that Linnæus could make to the censures of Dillenius appears in the following minutes:

"With regard to unoccupied names in antient writers, which I have adopted for other well-defined genera, I learned this of you. You, moreover, long ago, pointed out to me that your own *Draba*, *Nova Pl. Genera* 122, is different from the plant so called by Dioscorides."

The retort of one sinner that his antagonist is another is no real answer.

The comments of the British Committee of 1865, on this subject, are very judicious and pertinent.

The use of mythological names for animals and plants is far less culpable. The use of such is no worse than that of any meaningless name. Sometimes, even, there may be conveyed an association of ideas which appeals to the imagination in a not disagreeable manner. For example, Linnæus gave the name *Andromeda*, after the Ethiopian maid whose mother's overgreat boasts of the daughter's beauty made her the victim of Poseidon's wrath. Linnæus justified his procedure by a remarkable play of fancy:

"This most choice and beautiful virgin gracefully erects her long and shining neck (the peduncle), her face with its rosy lips (the corolla) far excelling the best pigment. She kneels on the ground with her feet bound (the lower part of the stem incumbent),

surrounded with water, and fixed to a rock (a projecting clod), exposed to frightful dragons (frogs and newts). She bends her sorrowful face (the flower) towards the earth, stretches up her innocent arms (the branches) toward heaven, worthy of a better place and happier fate, until the welcome Perseus (summer), after conquering the monster, draws her out of the water and renders her a fruitful mother, when she raises her head (the fruit) erect."

The relation of the old myth to the plant may be far fetched, and no other would ever be likely to notice the analogy without suggestion; but at least the conceit is harmless, if not agreeable.

The analogy that gave rise to this fanciful description, contained in the '*Flora Lapponica*,' suggested itself to Linnæus on his Lapland journey:

"The *Chamædaphne* of Buxbaum was at this time in its highest beauty, decorating the marshy grounds in a most agreeable manner. The flowers are quite blood-red before they expand, but when full grown the corolla is of flesh-color. Scarcely any painter's art can so happily imitate the beauty of a fine female complexion; still less could any artificial color upon the face itself bear comparison with this lovely blossom. As I contemplated it, I could not help thinking of *Andromeda* as described by the poets; and the more I meditated upon their descriptions, the more applicable they seemed to the little plant before me; so that, if these writers had had it in view, they could scarcely have contrived a more apposite fable. *Andromeda* is represented by them as a virgin of most exquisite and unrivalled charms; but these charms remain in perfection only so long as she retains her virgin purity, which is also applicable to the plant, now preparing to celebrate its nuptials. This plant is always fixed on some little turfy hillock in the midst of the swamps, as *Andromeda* herself was chained to a rock in the sea, which bathed her feet, as the fresh water does the roots of the plant. Dragons and venomous serpents surrounded her, as toads and other reptiles frequent the abode of her vegetable prototype, and, when they pair in the spring, throw mud and water over its leaves and branches. As the distressed virgin cast down her blushing face through excessive affliction, so does the rosy-colored flower hang its head, growing paler and paler till it withers away. Hence, as this plant forms a new genus, I have chosen for it the name of *Andromeda*."

DOUBLE NAMES.

It was long the custom, when a specific

name was taken for a genus, to substitute a new specific for the one so diverted. There was some reason for this, for sometimes the specific name covered several forms, or at least was equally applicable to several; of late, however, the acceptance of both the generic and specific names, that is, the duplication of a name, has been quite general, and various precedents have been adduced in favor of the procedure. "In the solemn anthem musicians have been known to favor such repetitions, the orator uses them, in poetry they occur without offence, and even our English aristocracy, sometimes bears them as an added grace."*

It is also a frequent custom in many barbarous and half-civilized races, as well as the young of our own, to double the name for a given subject; and this analogy may be regarded by some of you as a perfect one. But in the last cases some regard is had for euphony, and it is a short word that is repeated, as in the case of the Kiwi-Kiwi and Roa-Roa of the Maoris of New Zealand, the Pega-Pega of the indigenes of Cuba, the Willie-Willie (water spout) of the Australians, and our own familiar Pa-pa and Ma-ma. Many scientific names repeated are long—some very long—but even for such I would now yield the point. Stability of nomenclature is a greater desideratum than euphony or elegance. But here let me add that there is a history behind the *Scomber Scomber*, which has been frequently cited as an example of the duplication of a name by Linnæus. It was *Scomber scombrus* that was used at first by the early nomenclator, and that occurs in the tenth edition of the 'Systema Naturæ' (p. 297), as well as in the 'Fauna Suecica' (2d ed., p. 119). Linnæus thus combined the old Latin and Greek names of the mackerel, which were formally different, although of course traceable to one and the same root. The name is therefore not

* Stebbing in Nat. Science, viii. 255.

repulsive, but interesting as a historical reminiscence of past usage by two great peoples. It was only in the twelfth edition of the 'Systema' (p. 492) that Linnæus exactly duplicated the name as *Scomber scomber*, and thus vitiated the last edition in this as he did in other cases. But it is at least possible that the exact duplication of names in the twelfth edition is the off-spring of typographical inaccuracy or clerical inadvertence.* At any rate, those who recognize the tenth edition of the 'Systema' as the *initium* of nomenclature will adopt the more elegant form.

VARIANTS AND SIMILARITY OF NAMES.

The case of *Scomber* and *Scombrus* naturally suggest consideration of another rule adopted by various societies. By the German Zoological Society it is provided that "names of the same origin, and only differing from each other in the way they are written, are to be considered identical."† Words considered identical are *Fischeria* and *Fisheria*, as well as *Astracanthus* and *Astera-*

*In the last part of the Proceedings of the Zoological Society of London (1896, II.) received, September 5th, the suggestion that *Scomber scomber* was a lapsus is confirmed. According to Dr. Selater, "on referring to the two copies of the twelfth edition, formerly belonging to Linnæus himself, and now in the library of the Linnæan Society, it will be found that the second *Scomber* is altered, apparently in Linnæus' own handwriting, into *Scombrus* (See note on this subject, 'Ibis,' 1895, p. 168)." P. Z. S. 1896, 310, 311. (New note.)

† "Etymologisch gleich abgeleitete und nur in der Schreibweise von einander abweichende Namen gelten als gleich."

Beispiele: *silvestris* = *sylvestris*; *cæruleus* = *cæruleus*; *linnæi* = *linnei*; *Fischeria* = *Fisheria*; *Astracanthus* = *Asteracanthus*.

a. Dagegen können neben einander verwendet werden *Picus* und *Pica*; *Polyodon*, *Polyodonta*, und *Polyodontes*; *fluvialis*, *fluviatilis*, *fluviaticus*, *fluviorum*; *molluccensis* und *molluccanus*.

b. Bei Neubildung von Namen möge man solche vermeiden, welche leicht mit schon vorhandenen verwechselt werden können." Regeln * * * von der Deutsch. Zool. Ges., § 4.

canthus; and among words sufficiently different are *Polyodon*, *Polyodonta*, and *Polyodontes*.

When rules are once relaxed in this indefinite manner, the way is at once open to differences of opinion as to what are to be considered identical or too much alike. *Fischeria* and *Fisheria* appear to me to be sufficiently distinct, and would be so considered by some who think that *Polyodon*, *Polyodonta*, and *Polyodontes* are too nearly alike. While the last three are conceded to be sufficiently distinct by the German Zoological Society, analogous forms, as *Heterodon* and *Heterodontus*, are claimed by some zoologists to be too similar, and consequently the latter prior and distinctive name of the 'Port Jackson shark' is sacrificed in favor of the later and inapt *Cestracion*—a name originally coined and appropriate for the hammer-headed sharks, but misapplied to the Australian shark.

I agree with those who think that even a difference of a single letter in most cases is sufficient to entitle two or more generic names so differing to stand. The chemist has found such a difference not only ample but most convenient to designate the valency of different compounds, as ferricyanogen and ferrocyanogen. I am prepared now to go back on myself in this respect. In 1831 Prince Max of Nieuwied named a bird *Scaphorhynchus*, and in 1835 Heckel gave the name *Scaphirhynchus* to a fish genus.* In 1863 I used a new name (*Scaphirhynchops*) for the acipenseroid genus, and that name was adopted by other naturalists. Jordan

*In lieu of explanations of the etymology it may be assumed that *Scaphirhynchus* was derived from *σκάφειά*, a digging or hoeing, and that *Scaphorhynchus* is from *σκάφος*, anything hallowed, as a boat. (Oct., 1896.) Both *Scaphorhynchus* and *Scaphirhynchus* were derived from 'σκάφη, scapha; ῥυγχος, rostrum' by Agassiz in his *Nomenclator Zoologicus*, but the characters of the respective genera would be better expressed by the etymologies here suggested, the bird genus having a bill like an inverted boat and the fish genus a snout like a spade as the popular name—shovel-illed sturgeon—implies.

later considered the literal differences between the avine and piscine generic names to be sufficient for both. I yield the point, and abandon my name *Scaphirhynchops*. But those who hold to the rule in question will retain it.

Another set of cases exhibiting diversity of opinion may be exemplified.

In 1832 Reinhardt gave the name *Triglops* to one cottoid genus, and in 1851 Girard named another *Triglopsis*, Girard apparently not knowing of Reinhardt's genus. In 1860 the later name was replaced by *Ptyonotus*. All American naturalists have repudiated the last name.

In 1854 Girard named a genus of Atherinids *Atherinopsis*, and in 1876 Steindachner, knowing well the name of Girard, deliberately called a related genus *Atherinops*. No one, as yet, has questioned the availability of the later name, but one who refuses to adopt *Triglopsis* because of the earlier *Triglops* must substitute another name for *Atherinops*.

Who shall decide in such cases, and what shall be the standard?

MAKING OF NAMES.

It was long ago recognized, even by Linnaeus, that the rigor of the rules originally formulated by him would have to be relaxed. Naturalists early began to complain that the Greek and Latin languages were almost or quite exhausted as sources for new names, and many resorted to other languages, framed anagrams of existent ones, or even played for a jingle of letters.

Forty years ago one of the most liberal of the American contributors to such names* defiantly avowed that "most of the genera [proposed by him] have been designated by words taken from the North American Indians, as being more euphonic than any one [he] might have framed from the Greek. The classic literature has already furnished so many names that there are but few in-

*Girard in *Proc. Acad. Nat. Sc. Phila.*, viii., 209, 1856.

stances in which a name might yet be coined, and express what it is intended to represent. [He offered] this remark as a mere statement, not as an apology." He gave such names as *Minomus*, *Acomus*, *Dionda*, *Algoma*, *Algansea*, *Agosia*, *Nocomis*, *Meda*, *Oliola*, *Codoma*, *Moniana*, *Tiaroga*, *Tigoma*, *Cheonda* and *Siboma*.

The names have caused some trouble, and have been supposed to be original offspring of the ichthyologist; but those familiar with Longfellow's *Hiawatha* will recognize in *Nocomis* the name of the daughter of the Moon* and mother of *Wenonah*† (*Nokomis*), corrected by classical standard! and in *Meda* the title of a 'medicine man' (not 'a classical feminine name'). Other names are geographical or individual.

In the excellent report to the International Zoological Congress, by Dr. Raphael Blanchard (1889), it was remarked that it would be generally conceded that naturalists have almost completely exhausted the Greek and Latin words, simple and compound, possible to attribute to animals.‡

But the classic languages are even yet, although about one hundred thousand names§ grace or cumber the nomenclators, far from being completely exploited. To some of us, indeed, the difficulty in determining upon a new name is rather that of selection of several that are conjured up by the imagination rather than the coining of a single one.

Besides the methods of name-making generally resorted to, there are others that

* "From the full moon fell *Nokomis*,
Fell the beautiful *Nokomis*."

The song of *Hiawatha*, III., lines 4, 5.

† Ophiologists will recognize in *Wenonah* the source of a synonym (*Wenona*) given to the genus *Charina* by Baird and Girard. Oct., 1896.

‡ "On conviendra que les naturalistes ont dû épuiser à peu près complètement la liste des mots grecs ou latins, simple ou composés, qu'il était possible d'attribuer aux animaux." *Bul. Soc. Zool. France*, XIV., 223.

§ The number one hundred thousand includes duplicates and variants.

have been little employed. Among the few who have resorted to other than the regular conventional ways is the illustrious actual President of the American Association for the Advancement of Science. His long list of generic names proposed in the various departments of zoology embraces many of unusual origin, and almost always well formed, elegant and euphonious. I can only adduce a few of the ways of naming illustrated by classical examples.

In ancient Greek there are numerous words ending in *-ias*, and many substantives with that termination are names of animals given in allusion to some special characteristic.

Acanthias is the designation of a shark, especially distinguished by the development of a spine at the front of each dorsal fin; the name is derived from *ἄκανθα*, spine, and the terminal element.

Acontias is the name of 'a quick-darting serpent,' and the main component is *ἄκων*, a dart or javelin.

Anthias is the name of a fish found in the Mediterranean and distinguished by the brilliancy of its color; evidently it was based on *ἄθος*, a flower. The color of the fish may remind one of a showy flower.

Xiphias is the ancient as well as zoological designation of the sword-fish; it was plainly coined from *ξίφος*, a sword.

These four names give some idea of the range of utility of the particle in question; they involve the ideas of defensive armature, offensive armature, ornamentation, and action.

A number of names have been framed by modern zoologists in conformity with such models. Such are *Stomias* (named by the Greek scholar and naturalist, Schneider) and *Ceratias*—types of the families *Stomiidae* (generally written *Stomiatidae*) and *Ceratiidae*. *Tamias* is another name, well known in connection with the chipmunk.

But there is room for many more of like

structure. For example, peculiarities of various parts might be hinted at by such words as *Carias* or *Cephalias* or *Cotidias* or *Cottias* (for animals having some distinctive character in the head), *Chirias* (hand or hand-like organ), *Gnathias* (jaw), *Podias* (feet), *Thoracias* (thorax), and many others of analogous import.

Another termination which might be used advantageously instead of the too often used *-oides* is the patronymic suffix *-ides*. This would be specially useful where genetic relationship is desired to be indicated. We have many such models in classical literature, as Alcides, the son of Alcæus; Atrides, the son of Atreus; Pelides, the son of Peleus, Æacides; the grandson of Æacus, and the like.

Another source for help in name-making is in the several intensive Greek particles occurring as prefixes of various names. The chief of these prefixes are *agi-*, *ari-*, *da-*, *eri-*, *eu-*, and *za-*. *Eu-* has been so very often drafted into use that relief and variety may be found by resorting to the others.

Ari- (*Ἀρι-*) occurs often in classical words, as *ἀριδάκρυς*, very tearful, *ἀριδηλός*, very plain, and *ἀριπρεπής*, very showy.

Da- (*Δα*) is illustrated by such names as *δάσκιος* (*daskios*, shaded) and *δαφνοῖος* (*daphnoios*, deep red) — convert them, if you will, into *Dascius* and *Daphænus*. Numerous names may be made on the model, although in classical Greek there are few.

Eri- (*Ἐρι-*) is used in the same way as *Ari-*, and is familiar in ancient Greek as a particle of such words as *ἐριαυγής* (very brilliant) and *ἐριαύχην* (with a high arched neck). The common large seal of northern Europe (*Erignanthus barbatus*) has received its generic name, based on the same model, on account of the depth of the jaws. Very few naturalists, however, have availed themselves of this particle for name-making, most of the words in the zoological nomenclature commencing with *Eri-* having other origins.

Za- (*Ζα-*) is met with in such words as *ζάης* (strong blowing), *ζᾶθερής* (very hot), *ζᾶχαλλής* (very beautiful), *ζάπλουτος* (very rich), *ζᾶπότης* (a hard drinker). The particle has been utilized in the composition of the generic name (*Zalophus*) of the common sea-lion, distinguished by its high sagittal crest (*ζά-* and *λόφος*, crest), familiar to menagerie visitors, and the residents and travellers in San Francisco. Professor Cope has also made use of it for several of his names.

We have been told by ancient writers that Cicero was a name derived from *cicer*, a vetch. According to Pliny, the name (like *Fabius* and *Lentulus*) was obtained on account of ancestral skill in cultivation of the plant; but, according to Plutarch, the original of the name was so called because he had a vetch-like wen on his nose.* Which one (if either) was the fact is of no material consequence. The etymological propriety of both is sanctioned by the suppositions of classical writers. There can then be no valid objection to other names formed on the model.

There is one rule which has been put in such a form (and without proper exceptions) that a number of names, improper according to classical standards, have been introduced. The rule is that the aspirate of Greek should be rendered by *h*. While this is true for the commencement of a name, it is not for the body, where it generally is suppressed, being sonant only after *p*, *t* or *k*. The Greeks, accordingly, wrote *Philippus* (*Φίλιππος*) and *Ephippus* (*Ἐφιππος*). In accordance with such models *Mesohippus* and *Orohippus* should have been called *Mesippus* and *Orippus*. *Protohippus* should have been *Prothippus*. *Epithippus* might by some be considered to be preoccupied by *Ephippus*, a genus of fishes. But, in my opinion, all the names should be

* Those familiar with the 'Spectator' may recall Addison's allusion to this (No. 59). See also Middleton's Life of Cicero.

retained as they are (if there is no other objection), on the assumption that more confusion would result from sacrifice of priority than of classical excellence.

From names as names, I proceed to the consideration of fitting them to groups.

TYPONYMS.

The question what is necessary to insure reception of a generic name is one of those concerning which there is difference of opinion. By some a definition is considered to be requisite, while by others the specification of a type is only required. But the demand in such case is simply that the definition shall be made. It may be inaccurate or not to the point; it may be given up at once, and never adopted by the author himself afterwards, or by any one else. Nevertheless, the condition is fulfilled by the attempt to give the definition. In short, the attempt is required in order that the competency (or its want) of the namer may be known, and if incompetency is shown thereby—no matter! The attempt has been made. The indication by a type is not sufficient.

Any one who has had occasion to investigate the history of some large group must have been often perplexed in determining on what special subdivision of a disintegrated genus the original name should be settled. The old genus may have been a very comprehensive one, covering many genera, and even families, of modern zoology, and of course the investigator has to ignore the original diagnosis. He must often acknowledge how much better it would have been if the genus had been originally indicated by a type rather than a diagnosis. Many naturalists, therefore, now recognize a typonym to be eligible as a generic name. Among such are those guided by the code formulated by the American Ornithologists' Union, to which reference may be made, and in which will be found some judicious

remarks on the subject under 'Canon XLII.' Certainly it is more rational to accept a typonym than to require a definition for show rather than use. Nevertheless, I fully recognize the obligation of the genus-maker to indicate by diagnosis, as well as type, his conception of generic characters.

FIRST SPECIES OF A GENUS NOT ITS TYPE.

On account of the difficulty of determining the applicability of a generic name when a large genus is to be subdivided, it has been the practice of some zoologists to take the first species of a genus as its type. This, it has been claimed, is in pursuance of the law of priority. It is, however, an extreme, if not illegitimate, extension of the law, and has generally been discarded in recent years. But in the past it had eminent advocates, such as George Robert Gray in Ornithology, and Pieter Van Bleeker in Ichthyology. A few still adhere to the practice, and within a few months two excellent zoologists have defended their application of names by statements that the first species of the old genera justified their procedure. The contention of one involves the names which shall be given to the cray-fishes and lobsters.

It is evident that the fathers of zoological nomenclature never contemplated such a treatment of their names, and the application of the rule to their genera would result in some curious and unexpected conditions. Let us see how some genera of Linnaeus would fare. The first species of *Phoca* was the fur seal, the first species of *Mustela* the sea-otter, the first of *Mus* the guinea pig, and the first of *Cervus* was the giraffe. These are sufficient to show what incongruities would flow from the adoption of the rule.

CHOICE OF NAMES SIMULTANEOUSLY PUBLISHED.

There is another issue of nomenclature involving many genera. In the same work

different names have been given to representatives or stages of what are now considered the same genus. For example, Lacépède, in the third volume of his 'Histoire Naturelle des Poissons,' published two names, *Cephalacanthus* and *Dactylopterus*, the former given to the young and the latter to the adult stage of the flying gurnard. *Cephalacanthus* appeared on page 323, and *Dactylopterus* on page 325. *Dactylopterus* is the name that has been generally adopted for the genus, but some excellent naturalists now insist on the resurrection and retention of *Cephalacanthus*, for the reason that the latter was the first given name.

In connection with an analogous case, it was urged that 'the law of primogeniture applies to twins.' There is a fallacy involved in such a comparison, which becomes obvious enough on consideration. In the case of twins, the birth of one precedes that of the other by a very appreciable interval of time. But in the case of names appearing in the same volume (issued as a whole) the publication is necessarily simultaneous. It is therefore, it appears to me, perfectly logical to take the most appropriate name, or to follow the zoologist who first selected one of the names. In the case of *Dactylopterus*, there would be the further advantage that the current nomenclature would not be disturbed.

It is interesting to note that those who have acted on the principle just condemned do not feel called upon to accept the first species of a genus as its type.

MAJOR GROUPS AND THEIR NOMENCLATURE.

Another subject to which I would invite your attention is the amount of subdivision of the animal kingdom which is expedient, and the nomenclature of such subdivisions.

Linnaeus only admitted four categories—class, order, genus and species. These sufficed for most naturalists during the entire past century. Only one naturalist—Gott-

lieb Conrad Christian Storr—went into much greater detail; he admitted as many as eleven categories, which may be roughly compared with modern groups as follows:

Agmen	Rubrisanguia	Subkingdom
	[=Vertebrata]	
Acies	{ Warm-blooded	} Superclass
	{ Cold-blooded	
Class	Mammalia	Class
Phalanx	{ Pedata	} Subclass
	{ Pinnepedia	
	{ Pinnata	
Cohors	{ Unguiculata	} Superorder
	{ Ungulata	
Ordo		Order
Missus		Suborder
Sectio		Family
Coetus		Subfamily
Genus		Genus
Species		Species

These groups are really not exactly comparable with any of recent systematists, inasmuch as Storr proceeded from a physiological instead of a morphological base in his classification. The only work in which this classification was exhibited was in his 'Prodromus Methodi Mammalium,' published in 1780.

With this exception, the naturalists of the last century *practically* recognized only four categories—species, genera, orders and classes. Families were introduced into the system by Latreille. The word 'family,' it is true, was not unknown previously, but it had been used only as a synonym for order. In botany such usage even prevails, to some extent, at the present day, and persists as a heritage of the past. The French botanists used 'famille' as the equivalent of 'ordo.' Our English and American botanists followed and used 'order' as the more scientific designation, and 'family' as a popular one; Gray, for example, calling the family represented by the buttercups the 'Order Ranunculaceæ,' or 'Crowfoot Family.' But in zoology the two names became early differentiated and, while order was continued in use with the approximate limits assigned to it by Linnaeus, family was interposed as a new category, intermediate between the order and

genus. At first this category generally was given a descriptive designation; but soon the tendency to employ, as a part of the designation, the stem of the principal generic name became marked, and the use of the patronymic suffix *-idæ* in connection with a generic name was adopted and, as time has advanced, has become more and more general. But the assent to this method is not universal. There are still some excellent zoologists who refuse to be bound by the rule, and who adopt the oldest family name, whether it be denominative or patronymic and whatever may be the termination.

The five categories thus recognized were very generally admitted, and for a long time were the only ones recognized by many naturalists. But gradually suborders, subfamilies and subgenera were taken up. Further, the word 'tribe' was often used, but with different applications. Still other divisions were occasionally introduced, but the most elaborate of all the schemes for gradation of the groups of the animal kingdom were those proposed by Bleeker* and Haeckel.† They are reproduced in the following parallel columns, in which their applications to fishes and mammals are likewise shown:

<i>Vertebrata</i>	Phylum		
<i>Pachycardia</i>	Subphylum		
<i>Allantoidia</i>	Cladus		
	Subcladus		
<i>Mammalia</i>	CLASSIS	CLASSIS	<i>Pisces</i>
<i>Monodelphia</i>	Subclassis	Subclassis	<i>Monopnoi</i>
		Divisio	<i>Dirhinichthyes</i>
<i>Deciduata</i>	Legio	Legio	<i>Eleuthero gnathi</i>
<i>Discopla-</i> <i>centalia</i>	Sublegio	Sublegio	<i>Ctneobranchii</i>
		Series	<i>Isopleuri</i>
		Subseries	<i>Kanonikodermi</i>
		Phalanx	<i>Alethinichthyes</i>
		Subphalanx	<i>Neopoesichthyes</i>
		Caterva	<i>Katapteseocephali</i>
<i>Rodentia</i>	ORDO	ORDO	<i>Perceæ</i>
	Subordo	Subordo	<i>Pereichthyini</i> [sic!]
<i>Myomorpha</i>	Sectio	Sectio	<i>Paristemipteri</i>
	Subsectio		
		Tribus	<i>Pereichthyini</i> [sic!]

*Enumeratio specierum Piscium hucusque in Archipelago Indico observatorum, p. xi et seq.

†Generelle Morphologie der Organismen, II., 400.

<i>Murina</i>	FAMILIA	FAMILIA	<i>Percoidei</i>
	Subfamilia	Subfamilia	<i>Perceæformes</i>
<i>Arvicolida</i>	Tribus	Cohors	
<i>Hypudæi</i>	Subtribus	Stirps	
<i>Arvicola</i>	GENUS	GENUS	<i>Perca</i>
	Subgenus		
<i>Paludicola</i>	Cohors		
	Subcohors		
<i>Arvicola</i>	SPECIES	SPECIES	<i>Perca fluviatilis</i>
<i>amphibius</i>			
	Subspecies		
<i>Arvicola</i>	Varietas		
(<i>amphibius</i>) <i>ter-</i> <i>restris</i>			
<i>Arvicola</i>	Subvarietas		
(<i>amphibius</i> <i>ter-</i> <i>restris</i>) <i>ar-</i> <i>gentora-</i> <i>tensis</i>			

Here we have a total of 31 categories intermediate between the kingdom and the individual of an animal form. The tools have become too numerous, and some were rarely used by the authors themselves. Thus the cohors and stirps were not called into requisition by Bleeker for the Percoidei (though they were for the subdivision of the Cyprinoidei), and in the recent classification of the Radiolarians, Professor Haeckel did not find it necessary to draw upon the tribus or subtribus for the arrangement of any family. None others have adopted in detail either of the elaborate schemes proposed by their distinguished authors, and even those authors themselves have not, in their later works, gone into the details they provided for in their schemes. The only divisional name that has been used to any great extent is tribe. That has been frequently employed, but in different ways—sometimes for the division of an order, sometimes within a suborder, sometimes for a section of a family, again for a part of a subfamily, and even for a fragment of a genus.* In two of these widely differ-

*The words Phalanx, Cohors and Series (if not others) have been used recently in another manner by Dr. F. A. Smith in the 'History of Scandinavian Fishes.' The sequence in that work is Classis, Ordo, Subordo, Phalanx, Cohors, Series, Familia, Subfamilia, Genus, Subgenus, Species.

ing ways it has been used in the systems of Bleeker and Haeckel. It is evident, however, that more groups than the old conventional ones, which alone Agassiz admitted, would be useful at present. A happy mean seems to be realized in the following list:

Branch	Superfamily
Subbranch	Family
Superclass	Subfamily
Class	Supergenous
Subclass	Genus
Superorder	Subgenus
Order	Species
Suborder	Subspecies

There are only two (or three for trinomialists) of these which are 'sonant,' all the others being 'mute' (to use the expression of Linnæus); but a question of termination affects several of them.

All the supergeneric groups, like families, were originally chiefly designated by descriptive names, but the trend in all the years has been towards names which are based on the stems of existing genera.

FAMILY.

In 1796-7 ('an 5 de la R.'), Latreille, in his 'Précis des Caractères génériques des Insectes,' for the first time employed the term 'family' as a subdivision of an order, but only gave the families numbers ('Famille première,' 'Fam. 2,' etc.).* He remarked that it might be desirable to have the families named, but deferred doing so till he could review the subject with greater care.†

In 1798 ('an 6'), Cuvier, in his 'Tableau Élémentaire de l'Histoire naturelle des Animaux,' in the introduction, when treating of graded characters ('*caractères gradués*'), named only the genus, order,

* "Les rapports anatomique, ceux de l'*Habitus*, des métamorphoses, ont été mes guides dans la formation des familles. Elles sont précédées d'un chiffre arabe." p. ix.

† "On eut désiré que j'eusse donné des noms aux familles; mais prévoyant que je serois contraint d'y faire plusieurs changemens, j'eusse ainsi exposé la nomenclature à une vicissitude très contraire à l'avancement de la science." p. ix.

class, and the kingdom. In the body of the work, sometimes he used the word family instead of order (as for the Birds), but for two orders of the Insects he formally adopted a division into families which were regularly named. The first (unnamed) order ('ordre'), with jaws and without wings ('Des insectes pourvus de mâchoires, et sans ailes'), was divided into several families ('plusieurs familles naturelles')—'les Crustacés,' 'les Millepieds,' 'les Aracnéides,' and 'les Phtyréides.' The order Névroptères was disintegrated into three families ('trois familles naturelles')—'les Libelles,' 'les Perles,' and 'les Agnathes.' The representatives of the other (six) orders were distributed directly into genera.

This, so far as I have been able to discover, was the first time in which an order of the animal kingdom was regularly divided into named families, designated as such.

In 1806 Latreille, in his 'Genera Crustaceorum et Insectorum,' gave names to families, but on no uniform plan, providing descriptive names for some, as '*Oxyrhinci*' for the Maioidan crabs—names based on typical genera, with a patronymic termination, as *Palinurini* and *Astacini*, and, in other cases, names also based on a typical genus but with a quasi plural form, as *Pagurii*. (In the same work, it may be well to add, Latreille also admitted more categories than usual, using ten for the animal kingdom—Sectio, Classis, Legio, Centuria, Cohors, Ordo, Familia, Tribus, Genus and Species.)

In 1806 A. M. Constant Duméril, who had previously contributed tables of classification to Cuvier's 'Leçons d'Anatomie Comparée,' and published his own 'Elemens d'Histoire Naturelle,' brought out his 'Zoologie Analytique.' In this volume he gave analytical tables for the entire animal kingdom and admitted families for all the classes. The families were generally sub-

ordinated to orders; but when the structural diversity within a class did not appear sufficient to require more than one 'mute' category the order was sacrificed in favor of the family. His families were generally very comprehensive, often very unnatural, and mostly endowed with descriptive names. (He admitted no more than five named categories in the animal kingdom—class, order, family, genus and species.)

As we have seen, Cuvier, Latreille, Rafinesque and others, to some extent, used names ending in *-ides* and *-ini*; but the first to fully recognize the advisability of using patronymic family names universally was William Kirby, who has not often received the credit for so doing, and is probably unknown to most in such connection. Nevertheless, in a note to his memoir on 'Strepsiptera, a new Order of Insects proposed,'* he explicitly introduced this important feature in systematic terminology. He complained that Latreille's names 'have not that harmony and uniformity of termination which is necessary to make them easily retained by the memory.' Continuing, he added, 'If we adopted a patronymic appellation for these sections, for instance, Coleoptera *Scarabæidae*, Coleoptera *Staphylinidae*, Coleoptera *Sphæridiade*, Orthoptera *Grylledæ*, etc., it would be liable to no objection of this kind.'

The suggestion thus made was heeded. The English naturalists (especially William Elford Leach and John Edward Gray) soon applied the method inculcated, and from them it has spread to the naturalists of every land; but the original impulse has been forgotten. For this reason I have recalled the memory of Kirby's work.

* The suggestion of Kirby is to be found in a footnote (p. 88) to the seventh memoir published in 'the Transactions of the Linnæan Society of London' (XI., 86-122, pl. 8, 9). The memoir was 'read March 19, 1811;' the date of the whole volume is 1815.

But it was long before the expediency of this procedure was universally recognized, and even yet there are dissentients. One objection was that the termination *-idæ* was not consistent with Latin words. Prof. Agassiz was never reconciled to such names, and gave names of Greek origin the termination *-oidæ*, and those of Latin the ending *-inæ*. In his system, too, there was no distinction between families and subfamilies, both having terminations in consonance with the origin of the stems, and not the taxonomic value of the groups.

The endings *-idæ* and *-oidæ* have been often supposed to be identical, and even in highly esteemed dictionaries (as 'The Imperial Dictionary of the English Language') the terminal element of family names ending in *-idæ* is derived from *εἶδος*, 'resemblance.' As already indicated, however, words so terminated should be considered as patronymics. But those ending in *-oidæ*, *-oidæi*, and *-oidea* may be assumed to be direct components with *εἶδος*.

In answer to the objection (by Burmeister for example) that patronymic names are foreign to the genius of the Latin language, or at least of Latin prose, the fact that such a poet as Vergil has a large number shows that there is no pervading antagonism.

SUBFAMILY.

Next to the family, the term 'subfamily' was the earliest, and has been the one most generally accepted of the groups now adopted. But the name itself was not used till long after 'family' had come into general vogue. The chief subdivision of the family had been named tribe ('*tribu*'), by Latreille, in 1806, and he continued to use that term. C. S. Rafinesque, in 1815, used the word subfamily ('*sous-famille*') for groups of the same relative rank as the 'tribu' of Latreille, but gave generally descriptive names, with modified nominative plural endings (e. g., *Monodactylia*), although

sometimes he named the group after the principal genus (*e. g.*, *Percidia*). The subfamily is now generally recognized, and its ending rendered by *-inæ*, or more seldom *-ini* or *-ina*. This is rather a termination for Latin adjectives involving the idea of relation or pertinence.

But, as been already urged, the language of nomenclature should not be bound by rules of strict philology. One of the most useful devices of scientific terminology is the establishment of terminations which indicate the nature or value of a group or relation to the group to which some entity belongs.

The chemist has his terminations in *-ates*, *-ides* and *-gens*, and does not deem it incumbent to defend his usage or to abandon his system, because some one might object to the want of classical models. Nay, classical scholars themselves have recognized the legitimacy and usefulness of such a method.

The ending *-idæ* has been shown to have classical sanction for both Greek and Latin; *-inæ* has only classical sanction for Latin words, and there is one—*-oidea* for which no models are to be found in either language. But the convenience of all those endings as indicative at once of the taxonomic value of each group far outweighs any objection to them from the philological side. We are now confronted with the groups having the *-oidea* ending.

SUPERFAMILY.

Experience has shown that for the exhibition of difference in value of various groups and characters, more than the generally accepted groups—families and subfamilies—are desirable. Groups above the family, in the generality of their characters, had been frequently adopted. A quarter century ago I searched for an available name and notation for such a group, and found that the groups which I wished to

recognize were most like those that Dana had recognized in the Crustaceans, under the name of subtribe, and given the ending *-oidea*. But the term 'tribe' had first been given and most generally used for a subdivision of the family, and consequently was ineligible for a group including the family. Other names had been given to such groups, but there were objections against them. In a communication to the American Association for the Advancement of Science (Volume XX.) I used a new name—superfamily—and the termination *-oidea*. The great advantage of the name was that it relieved the memory, and suggested at once what was meant by relation to a familiar standard—family. The term has been quite generally adopted, but there has been diversity of usage in the form of the names, *-oideæ* being frequently suffixed to the stem, and sometimes a descriptive name has been given. The only reason for the ending *-oidea* is that it was first used in such connection; *-oideæ* has the advantage (or disadvantage?) that it is in consonance with *-idæ* and *-inæ*. No provision has been made by the German Zoological Society for this category, their attention having been confined to family and subfamily nomenclature.*

OTHER GROUPS

Time does not permit of the consideration of the other groups—order, suborder, class, subclass, superclass, branch, etc. Nevertheless, a caveat is in order that there appears to be no reason why the principle of priority now so generally recognized for the subordinate groups should not prevail

* "Die Namen von Familien und Unterfamilien werden fortan von dem gültigen Namen einer zu diesen Gruppen gehörigen Gattung Gebildet, und zwar die der Familien durch Anhängen der Endung *idæ* (Plural von *ides* [gr. *εἶδος*] masc. gen.), die der Unterfamilien durch Anhängen der Endung *inæ* (fem. gen.) an den Stamm des betreffenden Gattungsnamens." Regeln . . . von der Deutsch. Zool. Ges., § 28.

for the higher. Why should the name *Amphibia* disappear and *Batrachia* and *Reptilia* usurp its place? *Amphibia* is a far better name for the *Batrachia*, and in every way defensible for it. The name had especial relation to it originally, and it was first restricted to it as a class. Why should the names *Sauria* and *Serpentes* give place to *Lacertilia* and *Ophidia*? The first are names familiar to all and correctly formed; the last are, at least, strangely framed. Why should not *Meantia* be adopted as an ordinal name, by those who regard the *Sirenids* as representatives of a distinct order, as did *Linnaeus*? Why should not the ordinal names *Bruta*, *Feræ*, *Glires* and *Cete* prevail over *Edentata*, *Carnivora*, *Rodentia* and *Cetacea*? If the rules formulated by the various societies are applied to those groups, the earliest names must be revived.

COMPLAINTS OF INSTABILITY OF NOMENCLATURE.

Frequent are the laments over the instability of our systematic nomenclature; bitter the complaints against those who change names. But surely such complaints are unjust when urged against those who range themselves under laws. We are forcibly reminded by such complaints of the ancient apologue of the wolf and the lamb. The stream of nomenclature has indeed been much muddied, but it is due to the acts of those who refuse to be bound by laws or reason. The only way to purify the stream is to clear out all the disturbing elements. In doing so, mud that has settled for a time may be disturbed, but this is at worst anticipating what would have inevitably happened sooner or later. We are suffering from the ignorance or misdeeds of the past. In opposing the necessary rectifications and the enforcement of the laws, extremes may meet; conservatives and anarchists agree. But the major-

ity may be depended upon in time to subscribe to the laws, and the perturbed condition will then cease to be.

It is unfortunate that our nomenclature should have been so wedded to systematic zoology, and devised to express the different phases of our knowledge or understanding of morphological facts. Even under the binomial system the disturbing element might have been made much less than it is. The genera of *Linnaeus* recognized for the animal kingdom were generally very comprehensive; sometimes, as in the case of *Petromyzon*, *Asterias* and *Echinus*, answering to a modern class; sometimes, like *Testudo*, *Rana*, *Cancer*, *Scorpio*, *Aranea*, *Scolopendra* and *Julus*, to a modern order, or even more comprehensive group, and rarely, among *Vertebrates*, to a group of less than family value. The usage of *Linnaeus* for the animal kingdom was very different from that for the vegetable kingdom. If the successors of *Linnaeus* had been content to take genera of like high rank (equivalent to families, for example), and give other names to the subdivisions (or subgenera) of such genera, which, to use the language of *Linnaeus*, should be mute, less change would have subsequently resulted. But (*Linnaeus* himself leading) his successors successively divided a genus, gradually accepting a lower and lower standard of value, till now a genus is little more than a multiform or very distinct isolated species. Yet the change has been very gradual. It began by taking a comprehensive group, recognizing that the differences between its representatives were greater than those existing between certain genera already established, and therefore the old genus was split up; or it was perceived that the characters used to define a genus were of less systematic importance than others found within the limits of the old genus, and, to bring into prominence such a truth, the genus was disintegrated. The

process often repeated, and from successively contracted bases, has led to the present condition.

The existing system of restricted genera, however, is too firmly fixed to revert back to a method that might have been, and which indeed Cuvier attempted to introduce by his revised Linnæan genera and their subgenera. The best thing to do now is to accept the current system, purified as much as possible by judicious and inexorably applied laws. Doubtless in the distant future a less cumbrous and changeable system of notation will be devised, but in the meantime we had best put up with the present, inconvenient though it be.

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SECTION F.—ZOOLOGY.

THE results of the late meeting at Buffalo of Section F, of the A. A. A. S., may be regarded as satisfactory. The average attendance at the sessions, which continued without interruption from Tuesday morning to Thursday evening, was thirty-five. Twelve of the one hundred and ten members elected at Buffalo chose this section. Twenty-five papers besides the address of Vice-President Gill were offered; two, however, were withdrawn—one to be given by the President of the Association as a public lecture and one to be read in Section E. The remaining twenty-three were read by their authors, with the exception of that of Mr. Miles, read by C. C. Nutting.

1. The first paper was by U. S. Entomologist L. O. Howard 'On the Entomological Results of the Exploration of the British West India Islands by the British Association for the Advancement of Science,' detailing the steps by which this important investigation had been brought about, and summarizing the results of the different papers which have been published since the beginning of the investigation. He eulogized

the British Committee for its conception of the work and the liberality with which it has been carried on, showed the importance of the results so far achieved, and made a plea for the association of entomologists with scientific expeditions in this country, and for the close collecting of insects, which has apparently been heretofore considered as of less importance than the collection of higher animals and plants.

2. The second paper was by Mr. F. M. Webster, who discussed cases among insects where a species unarmed and in no way capable of protecting itself was, to a certain extent, protected by its resemblance to armed species, or such as are known to be distasteful. Others, by their actions, mimicked the movements of certain other species, and were thereby mistaken for such as are inedible. The ground was taken that birds, after learning that certain insects were not fit for food, would shun any other insects appearing like these, wherever they might come in contact with them, even though at a different season of the year. There may be cases where one species mimics another, when the enemy has become exterminated and no protection is needed. Caution was enjoined against hasty and immature conclusions, as there is much to be learned in the matter, but no facts should be cast aside as mere coincidences, when more facts would enable us to push the problem to a point nearer a solution. That insects, especially, gain protection from their coloration and movements is assured, but much caution is necessary before conclusions are reached. The paper was illustrated by specimens.

3. Prof. A. D. Hopkins, of Morgantown, W. Va., under the title 'On Life Zones in West Virginia,' gave in detail the work he had done in mapping these zones in his State as indicated by the insect fauna.

4. 'The Variations of certain Species of North American Odonata' was a paper