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BIOLOGY.

A Century's Progress in Zoological Knowledge. Address in the Department of Zoology and Botany, by William Henry Flower, *F.R.S., President of the Section.*

On the 10th of January, 1778, died the great Swedish naturalist, Charles Linné, more commonly known as Linnæus, a name which will ever be mentioned with respect and regard in an assembly devoted to the cultivation of the sciences of Zoology and Botany, as whatever may be the future progress of those sciences, the numerous writings of Linnæus, and especially the publication of the *Systema Naturæ*, can never cease to be looked upon as marking an era in their development. That work contained a systematic exposition of all that was known on these subjects expressed in language the most terse and precise. The accumulated knowledge of all the workers at Zoology, Botany, and Mineralogy since the world began, was here collected together by patient industry, and welded into a complete and harmonious whole by penetrating genius.

Exactly a century has passed since Linnæus died. What of the progress of the subjects to which he devoted his long and laborious life? This one century is a brief space compared with the ages which have passed since man began to dwell upon the earth, surrounded by living objects, which have, more and more as time rolled on, awakened his curiosity, stimulated his faculties to observe, and impelled him to record the knowledge so gained for the benefit of those to come. How does it stand in comparison which those which preceded it, in the contributions it has thus acquired and recorded?

It may be not without interest in commencing our work at this meeting to cast our eyes back and take stock, as it were, of the knowledge of a hundred years ago, and of that of the present time, and see what advances have been made; to look at the living world as it was known to Linnæus and as it is known to ourselves. The *Systema Naturæ*, the last edition of which, revised by the author, was published in 1766, will be a convenient basis for the comparison; but as the subject is one which, even in a most superficial outline, might reach such lengths as would well tire out the most patient of audiences, and absorb time which will be more profitably occupied by the valuable contributions which are forthcoming from other members of the Association, I will merely take a small section of the work, about 100 pages out of the first of the four volumes, those devoted to the first class Mammalia. The comparison of this part is perhaps the easiest, as the contrast is the least striking, and the progress has been comparatively the slowest. The knowledge of large, accessible, and attractive-looking animals had naturally preceded that of minute and obscure organisms, and hence, while in many other departments the advance has altogether revolutionized the knowledge of Linnæus, in the Vertebrated Classes, especially the one of which I shall now speak, it has only extended and reformed it.

In taking the *Systema Naturæ* of Linnæus, the comparison is certainly carried back somewhat beyond the hundred years which have elapsed since his death, and the brilliant contributions to the knowledge of the Mammalia of Buffon and Daubenton just then beginning to be known, and the systematic compilation of Erxleben (published in 1777), are ignored; but for the present purpose, especially considering the limited time at my disposal, it will be best not to go beyond the actual text of the work in question.

Before considering systematically the different groups into which Linnæus divides the class, I must remark in passing upon what is the greatest, and indeed most marvellous difference between the knowledge of Zoology of our time and that of Linnæus. Now we know that the animals at present existing upon the earth are merely the survivors of an immensity of others, different in form, characters, and mode of life, which have peopled the earth through vast ages of time, and to which numerically our existing forms are but infinitesimally small, and that the

knowle lge we possess of an immense number of them, fully justifies the expecta tion of an enormous further advance in this direction. In the time of Linnæu the existence in any past time of a species having no longer living representatives o the earth, though perhaps the speculation of a few philosophical minds, had no been received among the certainties of science, and at all events found no place i the great work we are now considering.

In the twelfth edition of the *Systema Naturæ* we find the class MAMMALI divided into seven orders: I. *Primates*, II. *Bruta*, III. *Feræ*, IV. *Glires*, V. *Pecor* VI. *Belluæ*, VII. *Cete*. These orders contain forty genera without any intermediat subdivisions. The genera are again divided into species, of which the total num ber is 220.

The first order, PRIMATES, contains four genera: *Homo*, *Simia*, *Lemur*, an *Vespertilio*.

The vexed question of man's place in the zoological system was thus settled b Linnæus. He belongs to the class *Mammalia*, and the order *Primates*, the sam order which includes all known monkeys, lemurs, and bats: he differs only ge nerically from these animals. But then we must remember that the Linnæan gener were not our genera, they correspond usually to what we call families, sometimes to entire orders. So that practically man's position is much the same as that t which, after several vicissitudes, as his separation as an order by Blumenbach an Cuvier, or as a subclass by Owen, he has returned in the systems of nearly al the zoologists of the present day who treat of him as a subject for classifica tion upon zoological and not metaphysical grounds.

Yet since the time of Linnæus the whole science of Anthropology has bee created. There is certainly an attempt at the division of the species *Homo sapien* into six varieties in the *Systema Naturæ*, but it has scarcely any scientific basis Zoological Anthropology may be said to have commenced with Blumenbach, who it is interesting to recall as an evidence of the rapid growth of the science, was contemporary with most of us in this room, for he died as lately as 1840, although his first work on the subject, '*De generis humani varietate nativa*,' was publishe three years before the death of Linnæus, too late, however, to influence the work we are now speaking of. The scientific study of the natural history of man i therefore, we may say, but one century old. To what it has grown during tha time you are probably aware. Scarcely an important centre of civilisation in the world but has a special Society devoted to its cultivation. It forms by itself a special department of the Biological Section of our Association—a department o such importance, that on this occasion no less distinguished a person than a forme most eminent President of the whole Association was thought fit to take charge o it. From him you will doubtless hear what is its present scope, aim, and compass I need only remind you that except the one cardinal point of the zoological relatio of man to other forms of life, which Linnæus appears to have appreciated with in tuitive perception, all else that you will now hear in that department was no dreamt of in his philosophy.

As might naturally be supposed, apes and monkeys have, for various reasons attracted the attention of observers of nature from very early times, and conse quently Linnæus was able to give rather a goodly list of species of these animals amounting to thirty-three; but of their mutual affinities, and of the importan structural differences which exist between many of them, he seems to have had no idea, his three divisions being simply regulated by the condition of the tail, whether absent, short, or long.

We now know that the so-called Anthropoid or man-like apes, the gorilla chimpanzee, orang, and gibbons, form a group apart from all the others of such im portance, that everything related to their history, structure, and habits has been most assiduously studied, and there is now an immense literature devoted to this group alone. Nothing could better illustrate the advances we have made in a hundred years, than the contrast of our present knowledge of these forms with that of Linnæus. It is true that, as shown in the most interesting story of the gradual de velopment of our knowledge relating to them in the first chapter of Huxley's 'Man's Place in Nature,' the animal now called gorilla was, without doubt, the pongo, well known to, and clearly described by our countryman, Andrew Battle, a contemporary

of Shakespeare; and that a really accurate and scientific account of the anatomy of the chimpanzee had been published as far back as 1699 by Dr. Edward Tyson, who, as the first English comparative anatomist, I am proud to claim as in some sort a predecessor in the chair I have the honour to hold in London, as he is described on the title-page of his work as 'Reader of Anatomy at Chirurgeons' Hall.'

Linnæus was, however, not acquainted with these, and his second species of the genus *Homo*, *H. troglodytes*, and his first of the genus *Simia*, *S. satyrus*, were both made up of vague and semi-fabulous accounts of the animals now known as chimpanzees and orangs, but hopelessly confounded together. Of the gorilla, and what is stranger still, of any of the large genus of gibbons, or long-armed apes of South-eastern Asia, he had at the time he revised the *Systema* no idea.

The remaining monkeys, we now know, fall into three very distinct sections: the *Cercopithecidæ* of the Old World, and the *Cebidæ* and *Hapalidæ* of the New, or by whatever other names we may like to designate them. Although members of all three groups appear in the list in the *Systema*, they are all confusedly mixed together. Even that the American monkeys belong to a totally different stock from those of the Old World, does not seem to have been suspected.

The genus *Lemur* of Linnæus comprehends five species, of which the first four were all the then known forms of a most interesting section of the Mammalia. These animals, mostly inhabitants of the great island of Madagascar, though some are found in the African continent, and others in some of the Southern and Eastern parts of Asia, constitute a well-defined group, but one of which the relations are very uncertain. At one time, as in the system of Linnæus, they were closely associated with the monkeys. As more complete knowledge of their organization has been gradually attained, the interval which separates them structurally from those animals has become continually more evident, and since they cannot be placed within the limits of any of the previously constituted orders, it has been considered advisible by some naturalists to increase the ordinal divisions in their behalf and to allow them to take rank as a distinct group, related to the *Primates* on the one hand, and to the *Carnivora* and *Insectivora* on the other. The knowledge of their relations, however, bids fair to be greatly increased by the discoveries of fossil forms lately made both in France and America, some of which seem to carry their affinities even to the *Ungulata*.

Existing upon the earth at present, besides the more ordinary Lemurs to which the species known to Linnæus belong, there are two aberrant forms, each represented by a single species. These are the little *Tarsius* of Borneo and Celebes, and the singular *Chiromys*, or Aye-aye, which, though an inhabitant of the head-quarters of the group, Madagascar, and living in the same forests and under the same conditions as the most typical Lemurs, exhibits a most remarkable degree of specialization in the structure both of limbs and teeth, the latter being modified so as to resemble, at least superficially, those of the Rodents, a group with which in fact it was once placed. It was discovered by Sonnerat in Madagascar in 1780, two years after the death of Linnæus. The specimen brought to Paris by this traveller was the only one known until 1860. Since that date, however, its native land has been more freely open than before to explorers, and many specimens have been obtained, one having lived for several years in the Gardens of the London Zoological Society.

The history of a name is often not a little curious. Linnæus applied the term *Lemures*, i.e. the departed spirits of men, to these animals on account of their nocturnal habits and ghost-like aspect. The hypothetical continent in the Indian Ocean, supposed to have connected Madagascar with the Malayan Archipelago is called by Mr. Sclater, *Lemuria*, as the presumed original home of the Lemur-like animals. Although the steps are not numerous, it might puzzle a classical scholar, ignorant of Zoology, to explain the connection between this continent and the Roman festival of the same name.

The fifth animal which Linnæus places in his genus *Lemur*, under the name of *L. volans*, is the very singular creature to which the generic term *Galeopithecus* has since been applied. It is one of those completely aberrant forms, which having no near existing relations, and none yet discovered among extinct forms, are perfect puzzles to systematic zoologists. It is certainly not a lemur, and not a bat, as has

been supposed by some. We shrink from multiplying the orders for the sake of single genera containing only two closely allied species; so we have generally allowed it to take refuge among the *Insectivora*, though without being able to show to which of that somewhat heterogeneous group it has any near affinities.

The fourth genus of the PRIMATES is *Vespertilio*, comprising six species of bats. This genus has now by universal consent expanded into an order, and one of the best characterized and distinctly circumscribed of any in the class: indeed, those who have worked most at the details of the structure of bats find so much diversity in the characters of the skull, teeth, digestive organs, &c., associated with the modification of the forelimbs for flight common to all, as almost to entitle them to be regarded rather as a sub-class. Anatomical, as well as palæontological evidence, show that they must have diverged from the ordinary mammalian type at a very far distant date, as the earliest known forms, from the Eocene strata, are quite as specialized as any now existing, and no trace has hitherto been discovered of forms linking them to any of the non-volant orders. By the publication within the last few weeks of a valuable monograph on the existing species of the group, entitled "A Catalogue of the Chiroptera in the Collection of the British Museum," by G. E. Dobson, we are enabled to contrast our present knowledge with that of the time of Linnæus. Although the author has suppressed a large number of nominal species which formerly encumbered our catalogues, and wisely abstained from the tendency of most monographists to multiply genera, he describes four hundred species, arranged in eighty genera: nearly double the number of species, and exactly double the number of genera, of the whole class MAMMALIA in the *Systema Naturæ*, and these Dr. Günther remarks in his Preface are probably only a portion of those existing. The small size, nocturnal habits, and difficulty of capture of these animals, are sufficient reasons for the supposition that there are still large numbers unknown to science. In the list of Linnæus, the first primary group of Dobson, the *Megachiroptera*, now containing seventy species, is represented by a single one, *V. Vampyrus*, obviously a *Pteropus*, to which the blood-thirsty habits of the fabulous Vampyre are attributed, but which is not absolutely identified with any one of the known species. The other species described by Linnæus can almost all be identified with bats at present well known.

A curious example of the results of basing classification upon a few, and those somewhat artificial characters, is afforded by one of the true bats, now called *Noctilio leporinus*, though admitted by Linnæus to be '*similimus vespertilionibus, similiter pedibus alatus*,' being separated from the others, not only generically, but even placed in another order, that of the GLIRES or Rodents, because it did not, or was supposed not, to fall under the definition of the order PRIMATES, which begins '*Dentes primores incisores superiores IV. paralleli.*' In reality this bat has four upper incisors, but the outer ones are so small as to have been overlooked when first examined. But even, if this were not so, no one would now dream of basing an animal's position upon such a trivial character when opposed to the totality of its organization and habits.

The characters of the incisor teeth are placed in the first rank in the definitions of all the orders in the *Systema Naturæ*, and hence the next order called BRUTA, characterized by '*dentes primores nulli superius aut inferius*,' contains a curious mixture of heterogeneous animals, as the names of the genera *Elephas*, *Trichechus*, *Bradypus*, *Myrmecophaga*, *Manis*, and *Dasypus* will indicate. It contains, in fact, all the animals then known comprised in the modern orders of *Proboscidea*, *Sirenia*, and *Edentata*, together with the walrus, one of the *Carnivora*. The name BRUTA has been revived for one of these orders, that more generally called *Edentata*, but I think very inappropriately, for it was certainly not equivalent, and if retained at all, should rather belong to the *Proboscidea*, as *Elephas* stands first in the list of genera, and was probably in the mind of Linnæus when he assigned the name to the group.

It is curious to find that the striking differences between the African and the Indian elephants, now so well understood by every beginner in Zoology, and all the facts which have already been accumulated relating to the numerous extinct forms of Proboscideans, whether Mammoths, Mastodons, or Dinotheria, were quite unknown to Linnæus. One species only, *Elephas maximus*, represented in the

zoology of a hundred years ago, was all that was known of the elephants or elephant-like animals.

The genus *Trichechus* of this edition exhibits a very curious phase of zoological knowledge: It contains two species. 1. *T. rosmarus*, the Walrus, now known to be a modified seal, and therefore a member of the Linnæan order FERÆ, and 2. *T. manatus*, a name under which were included all the known forms of Manatees and Dugongs, in fact the whole of the modern order *Sirenia*; animals widely removed in all essential points of their organization from the walrus, with which they are here generically united. Their position, however, between the elephant on the one hand and the sloths on the other, is far better than their association with the *Cetacea*, as in Cuvier's system, an association from which it has been most difficult to disengage them, notwithstanding their total dissimilarity, except in a few external characters. Although the discovery of many fossil forms has done much to link together the few existing species and to show the essential unity of the group, it has thrown no light upon their origin, or their affinities to other mammals. They still stand, both by their structure and their habits, a strangely isolated group, and it baffles conjecture to say whence they have been derived, or how they have attained their present singular organization.

The remaining genera of the Linnæan order BRUTA constitute the group out of which Cuvier, following Blumenbach, formed his order *Edentata*, a name certainly not happily chosen for a division which includes species like the great Armadillo, having a larger number of teeth than any other land mammal, but which, nevertheless, has been so generally adopted, and is so well understood, that to attempt to change it would only introduce an element of confusion. Four out of five of the principal modifications of form in the group at present known, are indicated by the four Linnæan genera, *Bradypus* or Sloth, *Myrmecophaga* or Anteater, *Manis* or Pangolin, and *Dasypus* or Armadillo. The advances during the century have consisted in the accumulation of a great mass of details respecting these groups; the addition of a fifth and very distinct existing form, the *Orycteropus* or Cape Anteater; and the discovery of numerous and very remarkable extinct forms, such as the Megatheriums and Glyptodons of South America, so fully known by their well-preserved osseous remains. There is, however, still much to be done in working out the real relationship of the somewhat isolated members of the order, if it be a natural order, both to each other, and to the rest of the Mammalia, from which they stand widely removed in many points of organization.

The third order of Linnæus, FERÆ, contained all the then known animals, which, with whatever diversities of general structure, agreed in their predatory habits, and possessed certain general characters of teeth and claws to correspond, though the terse definition of "*Dentes primores superiores sex, acutiusculi, canini solitarii,*" is by no means universally applicable to them. This order was broken up by Cuvier into the orders *Carnivora* and *Insectivora*, and the genus *Didelphys*, included in it by Linnæus, has been since by universal assent removed to another group.

The first six genera belong to the very well-defined and probably natural group now called *Carnivora*. The one placed at the head of the list, *Phoca*, is equivalent to the large and important modern sub-order *Pinnipedia*, the walrus, however, though essentially a seal, having been, as before mentioned, relegated by Linnæus to another order, on account of its aberrant dentition. But three species are recorded in the genus: *P. ursina*, the sea-bear of the North Pacific (now *Otaria ursina*); *P. leonina*, founded on Anson's sea-lion, now commonly called the elephant seal, or sea-elephant (*Macrorhinus proboscideus*, or more properly *leoninus*); and *P. vitulina*, the common seal of our coasts.

The terrestrial sub-order of *Carnivora* is represented by five genera: 1. *Canis*, including the dog, wolf, hyæna, fox, arctic fox, jackal, &c. 2. *Felis*, with only six species, but still one of the few Linnæan genera, which covers exactly the same ground as at present in the opinion of the majority of zoologists, although it may be mentioned as an example of the tendency towards excessive and unnecessary multiplication of generic names which exists in some quarters, that it has been divided into as many as fourteen. 3. *Viverra*, a heterogeneous group, containing ichneumons, coatis, and skunks, animals belonging to three very distinct families,

according to modern ideas. 4. *Mustela*, a far more natural group, being nearly equivalent to the modern family *Mustelidæ*; and, lastly, a very comprehensive genus *Ursus*, consisting of *U. meles*, the badger, *U. lotor*, the raccoon, *U. luscus*, the wolverene, and all the true bears known, comprised in the single species *U. arctos*. Many interesting forms of *Carnivora*, as *Cryptopræta*, *Proteles*, *Eupleres*, *Ailurus*, and *Ailuropus*, have no place in the Linnæan system, being comparatively modern discoveries. The very recent date (1869) at which the last-named remarkable animal was made known to science by the enterprising researches of the Abbé David into the Fauna of Eastern Thibet, gives hope that we may not yet be at the end of the discovery of even large and hitherto unsuspected forms of existing mammals.

Next in the Linnæan system comes the genus *Didelphys*, constituted for the reception of five species of American opossums. This is a very interesting landmark in the history of the progress of the knowledge of the animal life of the world, as these five opossums, forming a genus in the midst of the order FERÆ, were all that was then known of the great sub-class *Marsupialia*, now constituting a group entirely apart from the ordinary members of the class. It is difficult now to imagine an animal world without kangaroos, without wombats, without phalangers, without thylacines, without dasyures, and so many other familiar forms, and yet such was the animal world known to Linnæus. It is true that a species of kangaroo from one of the islands of the Austro-Malayan Archipelago was described as long ago as 1714 by De Bruyn, who saw it alive at the house of the Dutch governor of Batavia, and that Captain Cook and Sir Joseph Banks saw and killed kangaroos on the east coast of Australia in 1770, and had published figures and descriptions of them in 1773, or five years before the death of Linnæus, but the work we are now considering contains no traces of knowledge of the existence of such a remarkable and now so well-known animal.

The three remaining genera of FERÆ, *Talpa*, *Sorex*, and *Erinaceus*, contained all the known species of the present order INSECTIVORA, which now embraces many and very varied forms, quite unsuspected a century ago, and to which it is probable that others will be added by the time the exploration of the animal products of the world is completed.

The fourth order, GLIRES, has remained practically unchanged to our day, although the name *Rodentia* has generally superseded that bestowed upon it by Linnæus. The five genera of the *Systema Naturæ*, *Hystrix*, *Lepus*, *Castor*, *Mus*, and *Sciurus*, have been vastly increased, partly by subdivision and partly by the discovery of new forms. *Noctilio* is, as before mentioned, removed to the Chiroptera, but its loss is well compensated for by *Hydrochærus*, the well-known Capybara, the largest existing member of the group, which in the Linnæan system is placed among the Belluæ, in the same genus with the pigs.

The fifth Linnæan order, PECORA, is a fairly natural group, equivalent to Cuvier's *Ruminantia*; but it is no longer considered of the value of an order, since the animals composing it have now been shown to be as closely related to certain of those belonging to the next order as they are to each other. The first genus, *Camelus*, contains both the American Lamas and the Old World camels, the demonstration of the common origin and close affinities of which has been one of the important results of the recent discoveries in the palæontology of the Western continent. In the next genus, *Moschus*, were placed the well-known musk deer of the highlands of Central Asia, and two small African antelopes, which have no special affinity with it. The subsequent inclusion in the same genus of the small chevrotains (*Tragulinæ*), which was very natural at the time, as they agree perfectly with the musk in the absence of horns and the presence of large canine tusks, by which artificial characters the genus was defined by Linnæus, was one of those unfortunate associations which has greatly retarded the progress of knowledge of the true affinities of the group. Judging by the popular works on Zoology, it is still as difficult to apprehend that a chevrotain is not a musk deer, as it is that a manatee is not a cetacean; both errors of the same kind, if not quite so gross, as that of regarding a whale as a fish, or a bat as a bird. The genus *Cervus* contains six species of true deer, including the moose, reindeer, red deer, fallow and roe, associated with the giraffe.

The twenty-one species at that time recognized of the great group of hollow-horned Ruminants are distributed quite artificially in three genera, *Capra*, *Ovis*, and *Bos*. Though subsequent investigations have greatly increased the number of species known, we are still in much uncertainty about their mutual affinities and generic distinctions. Being a group of comparatively modern origin, and only just attaining its complete development, variation has chiefly affected the less essential and superficial organs, and the process of extinction of intermediate forms has not operated sufficiently long to break it up into distinctly separated natural minor groups, as is the case with many of the older families, which yield, therefore, far more readily to the needs of systematic classification, especially as long as the extinct forms are unknown or ignored.

The sixth order of land mammals, BELLUÆ, corresponding to the *Pachydermata* of Cuvier, contains what is now known to be a heterogeneous collection, viz. the horses, the hippopotamus, the pigs, rhinoceros, and the rodent capybara. The abolition of these two last orders and the entire re-arrangement of the ungulate mammals, into two different natural groups, now called *Artiodactyla* and *Perissodactyla*, first indicated by Cuvier in the 'Ossemens fossiles,' from the structure of the limbs alone, and afterwards confirmed by Owen from comparison of every part of the organization, has been one of the most solid advances made in our knowledge of the relations of the Mammalia during the present century.

The past history of this, as of so many other groups of vertebrated animals, has been brought to light in an unexpected manner by the wonderful discoveries of fossil remains made during the last ten years in the Rocky Mountains of America; discoveries, the importance of which will only be fully appreciated when the elaborate and beautifully illustrated work which Professor Marsh has now in progress, is completed.

The last Linnæan order, CETE, is exactly conterminous with the order so named, or rather more generally modified to *Cetacea*, in the best modern systems, for Linnæus did not commit the error of Cuvier and others, of including the *Sirenia* among the whales. His knowledge of the animals composing the group was necessarily very imperfect, indeed it is only within the last few years, especially since the impulse given to their study by Eschricht of Copenhagen, that the great difficulties which surround the investigation of the structure and habits of these denizens of the open sea have been so far surmounted that we have begun to obtain clear views of their organization, affinities, and geographical distribution.

Two most remarkable forms of mammals, so abnormal in their organization as now to be generally considered deserving the rank of a distinct sub-class, the *Echidna* and *Ornithorhynchus*, were first made known to science in 1792 and 1799 respectively, and consequently have no place in the *Systema Naturæ*. The very recent discovery of a third form to this group, or at least a very striking modification of one of the forms, the large New Guinea echidna (*Acanthoglossus Bruynii*), is the last important acquisition to our knowledge of the class.

In this brief review of the progress of one small section of one branch of zoological knowledge it will be seen that it is chiefly of systems of arrangement, of classification, and of names that I have been treating. By many biologists of the present day these are looked upon as the least attractive and least profitable branches of the subject. The interest of classification, though it has lost much in some senses by the modern advances of scientific biology, has, however, gained vastly in others. The idea that has now, chiefly in consequence of the writings of Darwin, taken such strong hold upon all working naturalists—the idea of a gradual growth and progressive evolution, and therefore genetic connection between all living things—breaks down the artificial barriers which zoologists raise around their groups, and shows that such names as *species*, *genera*, *families*, *orders*, &c., are merely more or less clumsy attempts to express various shades of differences among creatures connected by infinite gradations, and in this sense destroys the importance attached to them by our predecessors. On the other hand, it immensely increases the interest contained in the word "relationship," as it implies that the word is used in a real and not, as formerly, in a metaphorical sense. There is a kind of classification, such as we might apply to inanimate substances or manufactured articles. We may say, for instance, that a tumbler, a wine-glass, and a tea-cup are more

closely related to each other than either one is to a chair or a table, and that they might be formed into one group, and the last-named objects be placed in a second. This kind of classification is certainly useful in its way, for methodical arrangement and descriptive purposes. It is the kind of arrangement which Linnæus and his contemporaries applied to animals. It is, however, a very different classification from that which supposes that the members of a group having common essential characters are descended from a common ancestor, and have gradually, by whatever cause or means, become differentiated from other groups. On this view a true classification, if it could be obtained, would be a revelation of the whole secret of the evolution of animal life, and it is no wonder that many are willing to devote so large a share of their energies to endeavour to attain it.

The right application of the principles of nomenclature, first clearly established by Linnæus, to the groups we form is, again, by no means to be despised, as laxity and carelessness in this respect are becoming more and more the greatest hindrances to the study of Zoology. The introduction of any new term, especially a generic name, and indeed the use of an old one by any person whose authority carries weight, has an appreciable effect upon the progress of science, and should never be done without a full sense of the responsibility incurred. All beginners are puzzled and often repelled by the confused state of zoological nomenclature to an extent to which those who have advanced so far as only to care for the things, and to whom the actual names by which they are called are comparatively indifferent, have little idea. Those whose special gift or inclination leads them to the pursuit of other branches of Biology, as Morphology, Physiology, Embryology, &c., must have definite names for the objects they observe, depict, or describe, and are dependent upon the researches of the systematic zoologist for supplying them, and should not neglect to take his counsel, otherwise much of their work will lose its value.

Several times has the British Association thought this a worthy subject for the consideration of its members, and through the instrumentality of a committee of working naturalists drew up in 1842 an excellent code of regulations and suggestions on the subject of zoological nomenclature. These rules were revised and reprinted in 1865; and in accordance with a resolution adopted at the last annual meeting at Plymouth they have been again republished at the cost of the Association during the present year. The mere issue of such rules must have had a beneficial effect, as they have undoubtedly been a guide to many careful and conscientious workers. Unfortunately there are no means of enforcing them upon those of a different class, and there is still something wanting, short of enforcing them, which possibly may be within the power of the Association to effect. In the administration of the judicial affairs of a nation, besides the makers of the laws, we have an equally essential body to interpret or apply the law to particular cases—the judges. However carefully compiled or excellent a code of regulations may be, dubious and difficult cases will arise, to which the application of the law is not always clear, and about which individual opinions will differ. The necessary permission given in the Association rules to change names which are either 'glaringly false,' or 'not clearly defined,' opens the door to considerable latitude of private interpretation. As what we are aiming at is simply convenience and general accord, and not absolute justice or truth, there are also cases in which the rigid law of priority, even if it can be ascertained, requires qualification, and other cases in which it may be advisable to put up with a small error or inconvenience to avoid falling into a larger one. I may name such cases as the propriety of reviving an obsolete or almost unknown name for one which, if not strictly legitimate, has been universally accepted, or the retention of a name when already applied to a different genus, instead of the institution of another in its place. For instance, should the name *Echidna*, by which the well-known Monotrematus Mammal is known in every text-book and catalogue in every language, be susperseded by *Tachyglossus*, because the former name had previously been applied to a genus of snakes? or should the chimpanzee be no longer called *Troglodytes* lest it should be confounded with a wren? Should *Chiromys* be discarded for *Daubentonia*, *Trichechus* for *Odobenus*, and *Tapirus* for *Hydrochærus*? Should the Java slow lemur be called *Loris*, *Stenops*, or *Nycticebus*? Should Sowerby's whale be placed in the genus *Physeter*, *Delphinus*, *Delphinorhynchus*, *Heterodon*, *Diodon*, *Aodon*,

Nodus, *Ziphius*, *Micropterus*, *Micropteron*, *Mesodiodon*, *Dioplodon*, or *Mesoplodon*, in all of which it may be found in various systematic lists? Should one of the largest and best known of the Cetaceans of our seas be called *Balænoptera musculus*, *Physalus antiquorum*, or *Pterobalæna communis*, all names used for it by authors of high authority? Should the smallest British seal be called *Phoca hispida*, *fœtida*, or *anellata*?

I might go on indefinitely multiplying instances which will be answered differently by different naturalists, the arguments for one or the other name being often nicely balanced. What is wanted, therefore, is some kind of judicial authority for deciding which should in future be used. If a committee of eminent naturalists, selected from various nations, and divided into several sections, according to the subjects with which each member is most familiar, could be prevailed upon to take up the task of revising the whole of our existing nomenclature upon the basis of the laws issued by the Association in 1842, occasionally tempering their strictly legal decisions with a little discretion and common sense, and with a view, as much as possible, of avoiding confusion, and promoting general convenience; and if the working zoologists of the world generally would agree to accept the decisions of such a committee as final, we should dispose of many of the difficulties with which we are now troubled. There seems to me no more reason why the nomenclature of such a committee, if it were composed of men in whose judgment their fellow-workers would have confidence, should not be as universally accepted as is the nomenclature of the last edition of the *Systema Naturæ* of Linnæus. We have agreed not to look beyond that work for evidence of priority, and why should we not agree in the same way to accept decisions which would probably be arrived at with even fuller knowledge and greater sense of responsibility?

Whether this suggestion will be received with favour or not, it appeared to me that it was one not inappropriate for the consideration of this Section which has already dealt with the question in a manner so advantageous to science, and also for this year which has witnessed the hundredth anniversary of the death of the great teacher of systematic zoology.

Our knowledge of the living inhabitants of the earth has indeed changed since that time. Our views of their relations to the universe, to each other, and to ourselves, have undergone great revolutions. The knowledge of Linnæus far surpassed that of any of his contemporaries; but yet of what we now know he knew but an infinitesimal amount. Much that he thought he knew we now deem false. Nevertheless, some of the oldest words to be found in all his writings contain sentiments which still claim a response in the hearts of many. Although we are less accustomed to see such words in works of science, that is no proof that their significance has been impaired by the marvellous progress of knowledge. With the words which Linnæus selected to place at the head of his great work I will conclude—

> '*O Jehova,*
> *Quam ampla sunt tua opera!*
> *Quam sapienter ea fecisti!*
> *Quam plena est terra possessione tua!*'

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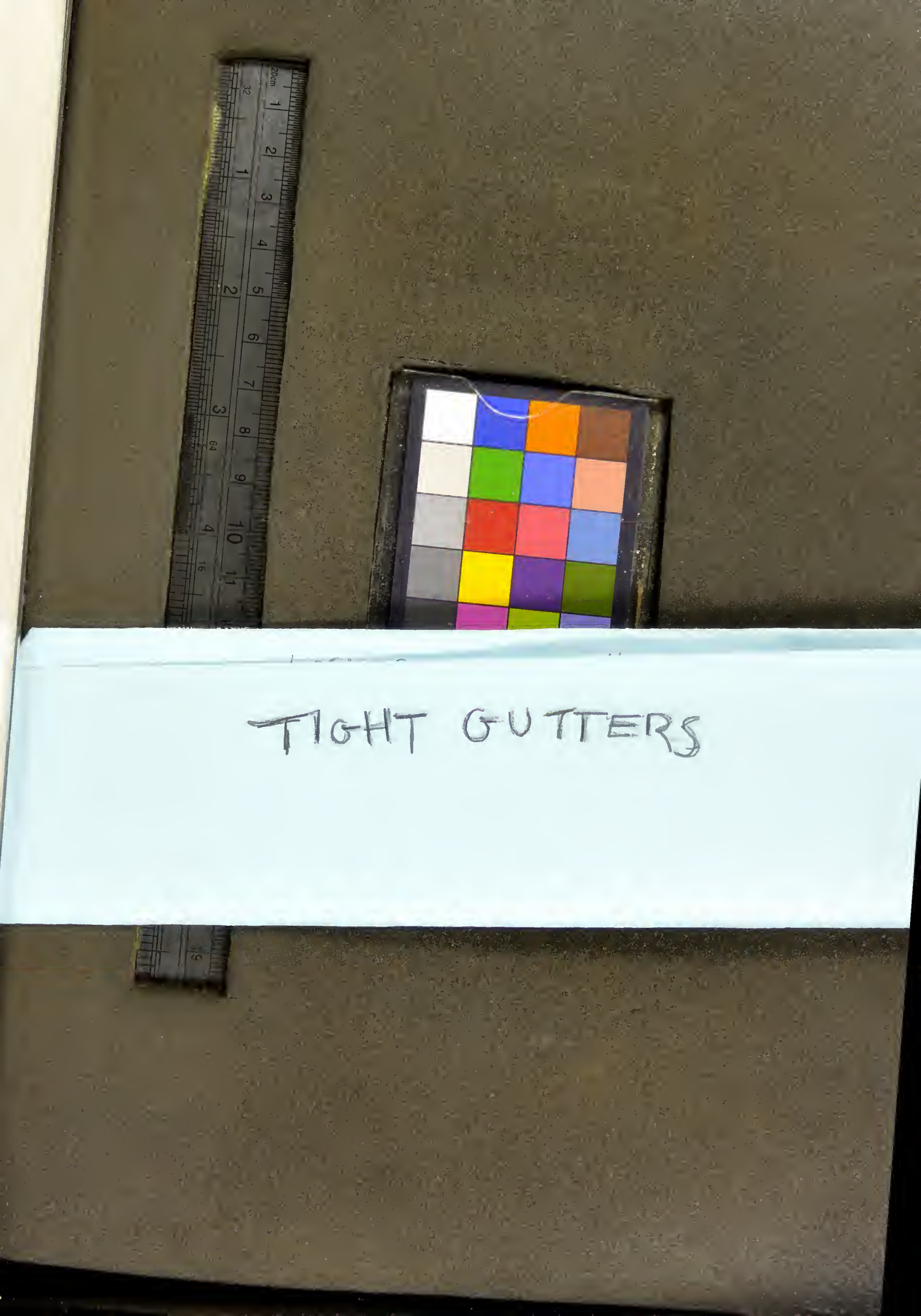
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