life to be preserved in the fossil state, representing, as Saporta and Marion show, and as Mr. Tyler's researches fully bear out, the primitive form of leaf development, which consists simply in setting apart a portion of the growing plant to serve the purposes of leaves, consisting of more or less broad and elongated blades, usually embracing the stem and tapering gradually to a point, with the leaf bundles continued in straight lines parallel to each other throughout their entire length. They are, therefore, broadest at the base and least adapted to securing the ultimate purpose of leaves already mentioned, viz., the maximum amount of light and air. The process of leaf development began with this condition, and many of the forms in which the cotyledon is still single have acquired a blade, as, for example, many species of *Potamogeton*, *Smilax*, *Dioscorea*, etc. In *Smilax* and some other genera true stipules have been developed, along with the tendency towards their differentiation into tendrils and other useful organs.

An important obstacle to the preservation of monocotyledonous leaves in the fossil state is the absence in them of any definite joint or natural point of separation of the leaf from the stem, which is one of the earliest results in the process of leaf evolution, also involving the principle of the renewal of leaves at annual or other fixed periods, which has practically resulted in the indefinite multiplication of the leaves produced, increasing the chances of their preservation by the whole number of such renewals. The only chance for an ordinary monocotyledonous plant to become entombed and preserved in the fossil state is that the locality in which it grows shall become somewhat rapidly covered up, burying the entire plant so quickly that it cannot decay during the process. This, as anyone can see, must be an exceedingly rare occurrence. Still, there is no doubt that a large amount of monocotyledonous vegetation growing in bogs and marshes in estuarine regions that are slowly subsiding under the weight of materials brought down the streams, and which also aid in covering them up, has been, in fact, preserved in a very imperfect way, and many vague and puzzling objects occur in all collections made from such localities. They are found throughout the Mesozoic, in the form of short culm-like segments and imperfect bits of leaves so badly macerated that they are neglected by those who determine such collections. It is rarely possible to say what form of plant they really represent, and yet it is often clear that these remains belong to certain glumaceous forms, grasses, sedges, rushes, etc. Saporta, in his work on the Mesozoic of Portugal, described and figured, under the name of Poactites, quite a number of these forms from the Neo-Jurassic to the Albian, or through the Upper Jurassic and entire Lower Cretaceous. Others have been called Cyperites, Zosterites, Bambusium, etc. Numerous small seeds are also constantly occurring, which are for the most part unnamed or given such names as do not indicate their botanical affinities. Many of these probably belong to monocotyledonous plants.

Mr. Tyler's paper, with all its excellencies, conveys the impression of an unfinished production. One would say that in his hurry to use it as a thesis he had been obliged to close it up abruptly. Its most serious defect is the want of careful descriptions of the plates and figures explained in their numerical order for the convenient use of the reader. This condition of the paper suggests the probability that the writer has much additional material, and inspires the hope that he may have entered upon a much more extended and exhaustive series of observations along these suggestive lines.

LESTER F. WARD.

On the Genera of Rodents: An Attempt to bring up to Date the current Arrangement of the Order. By OLDFIELD THOMAS, F.Z.S. Proc. Zool. Soc., London, 1896, pp. 1012–1028. Issued April, 1897.

The order Rodentia offers peculiar difficulties to the student, both on account of the number of its species and the great variety of forms which it includes. The satisfactory arrangement of the thousand or more species now known is no easy matter, as shown by the attempts of several authors, notably Waterhouse in 1839–48, Gervais in 1848–53, Brandt in 1855, Lilljeborg in 1866, Gill in 1872, and Alston in 1876. During the last ten years more progress has been made in the study of mammals than

in any previous quarter of a century. New methods of collecting, and more thorough exploration of regions previously little known, have brought to light a host of new forms and furnished material for studies which have thrown new light on the relationship of many groups. More careful examination of the literature has likewise necessitated many changes in nomenclature. Thus it is not surprising that Alston's classification, which has been generally adopted during the last 20 years, should have become somewhat antiquated.

In many respects Mr. Thomas is peculiarly fitted for the task of 'bringing the arrangement of the order up to date.' As curator of mammals in the British Museum he has constant access to a collection of rodents, which includes representatives of all but 15 of the existing genera and is unrivalled in the possession of a large number of types. Perhaps no other zoologist is personally familiar with more species or has a better general knowledge of the Rodentia than Mr. Thomas. He has also done much towards placing the nomenclature on a sound basis and has kept fully abreast of recent morphological work.

Although his paper comprises only 16 pages, it is an unusually important contribution to the literature of mammals and its value is not to be measured merely by its length. Unlike Alston's paper, it contains no diagnoses, and is therefore merely a list of genera arranged by families and subfamilies. It is intended mainly as a convenient reference list for museum curators and writers who have neither the time nor the inclination to work out the relationships of genera. Its object is threefold, since it gives: (1) the position and sequence of the genera in their respective subfamilies; (2) the earliest available name for each genus, and (3) a reference to the original description. The results of the investigation here presented necessitated not only a study of the genera and families, but the selection of the proper name from a host of synonyms for each of the 160 groups which are considered worthy of generic rank.

It would have been very desirable if the list had included extinct as well as living forms and had been extended to subgenera, thus forming a complete conspectus of the order. In limiting it to living mammals the author restricted himself to forms with which he is personally familiar, and by omitting subgenera avoided a vast amount of work which would have inevitably delayed the appearance of the list.

The changes which have been made in the classification of Rodents during the last 25 years can be most clearly brought out by comparing the lists of Gill, Alston and Thomas, but in so doing it should be remembered that Thomas follows Alston as closely as possible in the arrangement of the higher groups. Gill in 1872 recognized 9 superfamilies, 20 families, 16 subfamilies, but mentioned no genera; Alston in 1876 gave 3 superfamilies, 18 families, 23 subfamilies and 100 genera; Thomas now admits 5 superfamilies, 21 families, 27 subfamilies and 161 genera.* The increase in the present list is due to elevating the Bathyergidæ, Heteromyidæ, Erethizontidæ and Pedetidæ to the rank of families, and reducing the Lophiomyidæ to a subfamily of Muridæ. About one half the additional genera are 'new discoveries' and the remainder are due to the breaking-up of old genera.

Recent writers divide the Rodentia into two suborders: Simplicidentata and Duplicidentata; and most of them have followed Alston's tripartite division of the Simplicidentata into Sciuromorpha, Myomorpha and Hystricomorpha. This simple arrangement has not proved satisfactory, since some of the outlying genera will not fit into either group. To meet this difficulty Thomas has added two groups: Anomaluri and Aplodontiæ, making 5 subdivisions of superfamily value, thus to some extent following Gill. But in the attempt to retain Alston's higher groups with the termination *morpha* and at the same time to distinguish others of lower rank he has introduced two subdivisions between family and suborder. The names adopted are unfortunate, since the terminations are not distinctive, having been used by different authors for divisions varying in rank from superfamilies to subgenera. It would be simpler to

*Only 159 are mentioned, but *Fiber* is inadvertently omitted, and *Chilomys* has been proposed since this paper was printed. Beside these *Sigmodontomys* and *Zygodontomys* have recently been described by Dr. J. A. Allen.

adopt Gill's termination *oidea* for all these groups, although such a course would reduce the Sciuromorpha to the same rank as the Anomaluridæ. The relation of Thomas' superfamilies to those of Gill and Alston is as follows:

Anomaluri=Alston's Anomaluridæ=Gill's Anomaluroidea.

Sciuromorpha=Alston's Sciuromorphia (minus the Anomaluridæ and Aplodontiæ=Gill's Sciuroidea+Castoroidea.

Aplodontiæ=Alston's Haplodontidæ=Gill's Haploodontoidea.

Myomorpha=Alston's Myomorpha=Gill's Lophiomyoidea + Myoidea + Myoxoidea+Saccomyoidea.

Hystricomorpha=Alston's Hystricomorpha =Gill's Hystricoidea.

Two of Thomas' subfamily names, Loncherinæ and Sigmodontinæ are open to question on grounds of priority. The Loncherinæ were separated as a distinct group by Burmeister in 1854, but Gray had previously recognized the subfamily Echimyna in 1825, and Gill adopted the name in the form Echimyinæ in 1872. *Echimys* and *Loncheres* both belong to the same subfamily, and Echimyinæ besides being more generally used than Loncherinæ has several years' priority. Sigmodontinæ must give way to the well-known term Cricetinæ, the change having been made through a misapprehension as to the validity of the generic name *Cricetus*. As will be shown further on, there is no reason for rejecting *Cricetus* or the subfamily of which it is the type.

The instability of generic names is strikingly exemplified by this list. No less than one-eighth of the genera have been 'changed' during recent years, and in the attempt to find names which have unquestioned priority and are not preoccupied, the author has introduced unfamiliar terms for about 10 per cent. of the genera. In all such cases, however, the commonly accepted designations are added in brackets. But it may be questioned whether he has really carried this work far enough, for several of the names left undisturbed are open to objection.

Arctomys, which is usually credited to Schreber, 1792, can be traced back to 1780, but even with this early date it will probably have to give way to *Marmota* Blumenbach, 1779. The latter appeared in the first edition of the Handbuch d. Naturgeschichte—a rare volume, which is not accessible at present, and hence it is impossible to ascertain what species were originally placed in the genus.*

Hamster Lacépède appeared in 1801, whereas *Cricetus* was described by Cuvier in 1798, although not named until 1800. It was, however, defined by Kerr in 1792, and therefore antedates *Hamster* by not less than nine years. This is an excellent illustration of the importance of ascertaining the first publication of a name. Quoting *Cricetus* from Cuvier, Thomas assumes it to date from 1817 and rejects it in favor of *Hamster*, 1801. Had he found Cuvier's first use of the *Cricetus* in 1800 he would have avoided changing a name which must now be restored.

Cœlogenus Cuvier, 1807, appeared six years later than Lacépède's *Agouti*, the latter having been published in the Mem. de l'Institut, Paris, III., p. 494, 1801. As both of these genera were based on the same animal, *Agouti paca* (Linn.) is the proper name for the common paca.

Lagostomus Brookes, 1829, is antedated by *Vizcacia* Schinz, 1824,† and should be replaced by it.

Ellobius Fischer, 1814, may be considered untenable by some zoologists because of the prior use of *Ellobium* by Bolten in 1798 for a genus of mollusks,‡ but those who reject *Ellobius* must find a substitute for it, probably in *Chthonoergus* Nordmann, 1839.

The references to the original description of each genus in the list will be found very useful, but in a number of cases the names were actually published from one to twelve years

* In the 7th edition of the same work, published in 1803, Blumenbach included *Marmota alpina*, *M. cricetus*, *M. lemmus*, *M. typhlus* and *M. capensis*.

† See SCIENCE, New Ser., VI., July 2, 1897, pp. 21–22.

‡ Museum Boltenianum, 1798. See Adams, Gen. Recent Moll., II., 1858, p. 237. Both names are derived from the same Greek word, the neuter noun ἐλλόβιον, an ear ring. Should it be desirable to place the mammal genus in a separate subfamily, as Gill has already done, the designation Ellobiinæ becomes identical with that in use for a subfamily of mollusks.

earlier than here indicated. The author could hardly be expected to verify all his references and had he done so the result might not have justified the labor. Nevertheless, the failure to find the original description may result in an error which will necessitate a change in the type of a group or may even lead to the rejection of a valid current name as in the case of *Cricetus*. As Mr. Thomas has evidently given merely the references usually quoted by authors, the remarks on this part of the paper should be regarded as supplementary notes rather than criticisms. For the benefit of those who may use the list, the earliest references are given below for genera which were published before the dates assigned by Thomas :*

9. *Arctomys* Schreber, Säugthiere, plates CCVII.–CCIX., 1780, text IV., pp. 721–743, 1782 (not '1792').

16. [*Myoxus* Schreber, Säugthiere, IV., plates CCXXV. A–B, CCXXVII., 1782, text IV., pp. 824–831, 1787] (not '1792').

19. *Graphiurus* F. Cuvier, Proc. Zool. Soc. London, p. 5, July, 1838 (not '1845').

31. *Rhombomys* Wagner, Gelehrte Anzeige K. Bay. Akad. Wiss. München, XII., pp. 421, 429, 433, March, 1841 (not '1843').

35. *Dendromus* A. Smith, Zool. Journ., IV., pp. 438–439, Jan.–May, 1829 (not '1834').

61. *Cricetus* Kerr, Anim. Kingd., I, Mamm., pp. 42, 242–246, 1792 (not Cuvier, '1817').

72. *Rhipidomys* (Wagner), Tschudi in Wiegm. Archiv. 1844, I., p. 252 (not '1845').

96. [*Cuniculus* Wagler, Nat. Syst. Amphibien, p. 21, 1830] (not '1832').

— *Fiber* G. Cuvier (Tableau Elem. d'Hist. Nat. Anim., p. 141, 1798), Lecons d'Anat. Comp., I., Tabl. 1, 1800.

100. *Tachyoryctes* Rüppell, Neue Wirbelthiere z. Fauna von Abyssinien, Säugth., pp. 35–37, Taf. 12, 1835.

108. *Heteromys* Desmarest, Nouv. Dict. d' Hist. Nat., 2d ed., XIV., pp. 180–181, 1817 (not '1822').

115. *Dipus* Schreber, Säugthiere, pls. CCXXVIII.–CCXXXII., 1782, text IV., pp. 842–861, 1788–89 (not 'Gmelin, 1788').†

137. *Echimys* Cuvier, Nouv. Bull. Soc. Philom., p. 394, Sept., 1809 (not '*Echinomys* Desmarest, 1817').

155. *Dolichotis* Desmarest, Journ. de Phys., LXXXVIII., p. 211, March, 1819 (not '1822').

But however desirable it may be to obtain the earliest reference, a generic name can not date farther back than 1758 (the year when the 10th edition of Linnæus' Systema Naturæ was published) or before the time when it was used as a scientific and not a vernacular name. Brisson's genera of 1756 must date from 1762, and French names should not take precedence over others published later, but before the former appeared as Latin names. The following genera should therefore be quoted as indicated below :

Spermophilus Cuvier, Dents des Mamm., 1825, pp. 160–161, 255, pl. LV. (not 1822), *Glis* Brisson, Regn. Animale, ed. 2, 1762, pp. 13, 113–118 (not 1756); *Atherurus* F. Cuvier, Dict. Sci. Nat., LIX., 1829, p. 483 (not G. Cuvier, Règne Animal, 1829); *Cercolabes*, Brandt, 1835, Mem. Acad. Imp. Sci. St. Petersburg, 3d ser., III., pp. 55–58 (not F. Cuvier, 1822); *Hydrochœrus* Brisson, Reg. Animale, 1762, pp. 12, 80–81 (not 1756).

Neither should the *apparent* date of publication be accepted when there is evidence to show that the name actually appeared earlier or later than indicated by the title page of the volume in which it was printed. For this reason *Anomalurus* should date from January, 1843, not 1842; *Psammomys* 1828, not 1826; *Oreinomys* 1881, not 1880; *Saccostomus* 1846, not 1847; *Acomys* 1838, not 1840; *Chiropodomys* 1868, not 1869; *Zapus* 1875, not 1873; *Pectinator* 1856, not 1855; *Schizodon* March, 1842, not 1841; *Chætomys* 1843, not 1848; *Lagostomus* 1829, not 1828. This question of exact dates may seem a very trivial matter, but when a difference of only a year or two in publication has necessitated the rejection of such well known names as *Arvicola*, *Isomys* and *Ochetodon*, it can readily be seen that, unless the date of publication is fixed with precision, generic names will never be stable.

*To these may be added *Fiber*, omitted from the list, and *Tachyoryctes*, which has no reference.

† Those who agree with Sherborn in not recognizing names on plates must quote *Dipus* from Boddaert's Elenchus Animalium, 1785, p. 47. In either case the authority is not Gmelin, as given by Thomas.

In two minor points the list is fairly open to criticism, namely, in the abbreviation of authorities and references, and in the emendation of names. Even those familiar with the literature will find difficulty in recognizing Ogilby in 'Og.,' Brants in 'Bts.,' Hemprich and Ehrenberg in 'H. & E.,' or in telling whether 'Sm.' stands for Smith or Smuts. In most cases Mr. Thomas has followed the original spelling of a name, but apparently with some hesitation, for he finds it necessary to apologize for *Aplodontia*, stating that he looks 'with loathing on these h-less names.' He has, however, adopted the emended forms *Echinomys* for *Echimys*, *Cannabateomys* for *Kannabateomys*, *Pithecochirus* for *Pithecheir*, and *Acodon* for *Akodon*, although in a paper subsequently published he has reverted to the original spelling, *Akodon*.

There is opportunity for much divergence of opinion as to the sequence and relative rank of the groups, for example, as to the wisdom of reducing the Lophiomyidæ to a subfamily of the Muridæ, while giving *Pedetes* and the American Porcupines full family rank. Some may question the removal of the Batherginæ from the Spalacidæ to form a separate family placed after the Geomyidæ and Heteromyidæ, so that the Old World genera *Spalax* and *Bathyergus*, which were formerly arranged side by side, are now separated by two families of New World pouched gophers and pocket mice: Possibly, it may seem that the author has recognized a relatively large number of genera of Muridæ, in view of the statement that all the recently proposed genera of Geomyidæ "may be most conveniently treated as of subgeneric rather than generic rank, sound as their basis as natural groups no doubt is."

But whatever difference there may be in regard to minor points, the fact remains that this paper admirably fulfills its purpose as a check list of genera of Rodents. We may venture to hope that the field having now been cleared to a certain extent of nomenclatural difficulties, Mr. Thomas will soon undertake the work which has so long been needed, namely, a complete catalogue of the Rodentia.

T. S. PALMER.

WASHINGTON, D. C.

SOCIETIES AND ACADEMIES.

NEW YORK ACADEMY OF SCIENCES—BIOLOGICAL SECTION, APRIL 5.

PROFESSOR OSBORN moved that a committee be appointed to consider and take action on the question of postage on natural history specimens. The chair appointed Doctors Dyar and Dean and Professor Stratford. Professor Bristol offered his resignation as Secretary. It was accepted, and the election of his successor was laid over until the next meeting.

Professor Osborn reported upon the phylogeny of the early Eocene Titanotheres, showing that they are divided into two distinct series, included under the genera *Telmatotherium* and *Palæosyops*, both of which independently acquired horns. The Telmatothere line begins with *T. boreale*, a form which Cope referred to as Palæosyops. It is distinguished by animals with long narrow skulls and high stilted feet, and undoubtedly represented the upland types of the family. The Palæosyops line, as suggested by Earle and Hatcher, passes through *P. laticeps* and *P. manteoceras*, and leads up to Diplacodon, the larger species of which surpass in size the smaller Titanotheres of the Oligocene. The main line gives off several collaterals, such as *P. paludosus*. Lambdotherium does not belong in the Titanothere phylum at all.

A second note related to a division of the two groups of placental mammals, the Meseutheria and Ceneutheria. The former, since Wortman's demonstration that the Ganodonta are ancestral Edentates, must now embrace this division, besides the Creodonta, Lemuroidea, Tillodontia, Insectivora, Amblypoda and Condylarthra.

The third note related to the origin of the typical mammalian types of teeth among the Theriodonta, Cynodontia and Gomphodontia of the Triassic. It is especially noteworthy that the Gomphodontia afford a demonstration of the origin of multituberculate teeth from a tritubercular ground plan, as hypothetically assumed by the speaker some years ago.

Mr. Bradney B. Griffin reported that in Thalassema (one of the Echiurids) the spireme occurs in minute ova (3 micra in diameter) floating in clusters in the body cavity. The spireme segments into one-half the somatic