

When we take into account the direction of the errors, the results are as follows :—

5 6 7 8 9 10 11 12 13 14 15
+ '06 + '09 + '05 0'0 - '05 - '27 - '46 - '51 - '85 - '93 - 1'27

Thus there is a clear tendency to over-estimate small numbers and to under-estimate large ones. There is an evident inclination towards those medium numbers which most frequently recurred : how far this discredits the experiments I cannot undertake to say, but it is an instance of that inevitable bias in mental experiments against which it is impossible to take complete precautions.

My conclusion that the number five is beyond the limit of perfect discrimination, by some persons at least, is strongly supported by the principles of rhythm. All the kinds of time employed by musicians depend upon a division of the bar into two or three equal parts, or into multiples of these. Music has, indeed, been composed with the bar divided into five equal parts, but no musicians have yet been found capable of performing it (Rees' Cyclopædia, RHYTHM). Short runs, indeed, consisting of five or even seven equal notes, are not unfrequently employed by the best musicians, but it is to be doubted whether the ear can grasp them surely. I presume it is beyond doubt that 6, 8, 9, or more equal notes in a bar are always broken up by the hearer, if not by the performer, into periods of 2, 3, or 4. Quinary music, even if it could be executed, would be ill appreciated by the hearers, and, though all the powers of the human mind may be expected to progress in the course of ages, quinary rhythm belongs to the music of the distant future.

W. STANLEY JEVONS

BURMEISTER'S FAUNA ARGENTINA

FEW districts of the world are so rich in well-preserved remains of an extinct fauna of remarkable and interesting character as the neighbourhood of the city of Buenos Ayres. The immense alluvial plain of the Argentine Republic is the burial-place of the Megatherium, the Mylodon, the Glyptodon, the Macrauchenia, the Toxodon, and many other strange forms of ancient life, whose bones are ever and anon restored to light by the crumbling away of the soft banks of the great rivers which flow into the estuary of the Plata. So abundant, indeed, are they that, as remarked years ago by Darwin, any line whatever drawn across the Pampas would probably cross the skeleton of some extinct animal.

Collections of these fossils have at various times been sent to several European museums, and much information has been published upon the nature of the animals to which they belonged, but these observations have been generally made upon imperfect or fragmentary materials. The fortunate circumstance of the able and energetic German naturalist, Dr. Hermann Burmeister, formerly Professor of Zoology in the University of Halle, having taken up his residence at Buenos Ayres, and having been appointed Director of the Public Museum of that city, has been the occasion of a systematic and elaborate elucidation of the ancient fauna of this important district.

This has been brought about mainly by the publication of a richly illustrated serial quarto work, entitled "Anales del Museo Publico de Buenos Aires," the special object

of which is to describe and figure the new or little-known objects preserved in that establishment. This work, which was commenced in 1864, appears at irregular intervals, but has already reached its sixth number, the first five of which constitute the first volume, the sixth, which is just published, being the commencement of a second volume. Dr. Burmeister is the sole author, and we have no hesitation in saying that it promises to be one of the most important contributions yet made to the knowledge of Mammalian zoology, for to this class is the publication mainly restricted. The parts already before us contain not only far more complete descriptions and detailed figures than have hitherto been given, of many of the extinct forms mentioned above, but it has also several admirable anatomical memoirs on rare or little-known living forms, especially of the Cetacea which occur in the estuary of the great river Plata, and in the adjoining part of the Atlantic Ocean, a field of research hitherto almost unexplored.

As this work, being written in the Spanish language, is not so well known in this country as it deserves to be, we propose to lay before our readers a summary of the contents of the volume already completed, from which they will be able to judge of the richness and variety of the material which has been at the author's disposal, and of the excellent use that has been made of it in his experienced hands.

After a history of the foundation and progress of the public museum of Buenos Ayres, and a general essay on palæontology, a detailed description is given of the skeleton of *Macrauchenia patachonica*. The first discovered remains of this very remarkable animal, which is about the size of a camel, were found by Mr. Darwin in 1834 at Port St. Julian on the Patagonian coast, and presented by him to the Museum of the Royal College of Surgeons of London, where they are now preserved. They were described by Professor Owen in the appendix to the "Voyage of the *Beagle*" (1840). Since that time but little addition was made to our knowledge of the species (although some bones of a smaller animal of the same genus, discovered by Mr. D. Forbes in Bolivian copper mines, have been described by Professor Huxley), until the lamented Bravard commenced the description, in a work to be entitled "*Fauna fósil del Plata*," of a comparatively perfect skeleton, which was contained in the museum of Buenos Ayres; but as he did not recognise its identity with Owen's *Macrauchenia*, he gave it the name of *Opisthorhinus falconeri*. The premature death of Bravard in the earthquake which destroyed the greater part of the town of Mendoza, prevented the publication of this work; but three of the plates, which had already been executed, containing figures of the skull with nearly complete dentition, and many of the vertebræ and limb bones, form the first three plates of the present work. To these, Dr. Burmeister has added another containing views of the pelvis and some more vertebræ, and an elaborate description of the whole of the known bones, finally concluding that the zoological position of the genus is among the imparidigitate or perissodactyle Ungulata, between the Horse and the Tapir.

After some remarks on the humming-birds described by Azara, a preliminary notice is next given on the different species of Glyptodon, or gigantic extinct Armadillo, in the museum. Three species are distinguished as well esta-

blished, viz., *G. spinicaudus*, *G. clavipes*, and *G. tuberculatus*; a fourth, *G. pumilio*, smaller than the other, is founded on a portion of a lower jaw. Some general observations on the osteology of the genus are added.

The next portion of the work is called "Fauna Argentina, Part I., Fossil Mammals." It commences by a geological description of the fossiliferous region, and then follows a list of the fossil mammals of the "diluvian" deposits, with some remarks upon each. This list comprises, of Carnivora, *Machairodus neogaus*, of which the museum possesses a nearly complete skeleton discovered in 1844 near Lujan, about fifty miles west of Buenos Ayres. A short account of the osteological character of this interesting specimen is given, and a full and illustrated description is promised in one of the future numbers of the work. We have also *Felis longifrons*, *Canis protalopex*, *Canisavus*, *Mephitis primeva*, *Ursus bonariensis*. With regard to Marsupialia, it is singular that no remains of this group have hitherto been found in the diluvial deposits of the region in question, although, as is well known, they are not infrequent in the Brazilian caves explored by Lund. The list of fossil rodents includes *Myopotamus bonariensis*, *M. antiquus*, *Ctenomys bonariensis*, *Lagostomus angustidens*, and *Cavia breviflucata*. In the Edentata, the district is of course especially rich. Notices are given of *Megatherium americanum*, *Myodon giganteus*, *M. gracilis*, *M. robustus*, *M. darwini*, and a plate is devoted to the illustration of details of the osteology of these two genera, especially the hitherto little known sternum, sternal ribs, and hyoid bones. Then follow *Scelidotherium leptocephalum*, *S. cuvieri*, *Megalonyx meridionalis*, and *M. jeffersoni*. The genus *Glyptodon*, now divided into several sections, is represented by the following species: *G. (Panochthus) clavicaudatus*, *G. (P.) tuberculatus*, *G. clavipes*, *G. (H. plio-phorus) asper*, *G. (H.) elongatus*, *G. (H.) levis*, with several species but incompletely known. Numerous details are given of the osteology of these animals, with three plates of illustrations, one containing a view of a complete skeleton of *G. asper*. Under the head of *Pachydermata*, the teeth of two extinct species of horse, *E. curvidens* and *E. devillei* are described and figured, further notes are added on *Macrauchenia*, together with a complete view of the skeleton, and a restored outline of the animal with a slender elongated pendant proboscis, and some valuable details are given on the genus *Toxodon*, for the first knowledge of which, as in the case of *Macrauchenia*, we are indebted to Darwin's collection, described by Owen. Three species are now distinguished, viz., *T. burmeisteri*, *T. owenii*, and *T. darwini*, appropriately commemorating the three distinguished naturalists by whose labours the history and affinities of this singular form have been made known. Three plates are devoted to the illustration of this genus. The list concludes with *Mastodon humboldtii*, to the osteology and dentition of which one plate is assigned.

The next and concluding section of the volume is entitled "Fauna Argentina, Part II., Mammifera pinnata." It is devoted to an account of the marine mammalia of the republic. Of the Pinniped Carnivora, *Otaria jubata* and *O. falklandica* are mentioned. The Manati is stated not to occur in the Argentine rivers. The Cetacea are represented by *Pontoporia blainvillii*, *Delphinus micros*, *D. obscurus*, *D. cymodoce*, *Lageno-*

rhynchus ceruleo-albus, *Orca magellanica*, *Phocæna spinipinnis*, *Globiocephalus grayii*, *Epiodon australe*, *Balaenoptera bonariensis*, *E. palachonica*, *Sibbaldius antarcticus*, and *Megaptera burmeisteri*.

A very detailed description is given of the external characters and anatomy of a newly discovered species of *Ziphius*, named by Dr. Burmeister *Epiodon australe*, which is not only valuable as being one of the most complete and fully illustrated accounts we possess of the structure of any Cetacean, but especially as the members of the particular group to which this one belongs are all exceedingly rare, or, at all events, have a remarkable habit of keeping out of the way of naturalists, and, consequently, are less known than almost any other section of the Mammalia. Descriptions, more or less detailed, are also given of the following new species:—*Globiocephalus grayii*, and *Orca magellanica*, both founded on characters of the skulls, which are figured. The former has much larger and thicker teeth than any other members of the genus to which it is referred. *Phocæna spinipinnis* is characterised not only by the numerous and regularly placed horny tubercles on the anterior edge of the dorsal fin (which are also frequently found, though in a more rudimentary condition, in the European porpoise) but also by the peculiar form of that fin, the anterior edge being concave, and by the conformation of the skull.

Not less valuable than the anatomical description of *Epiodon australe* is the article which concludes the work, which is a full and excellently illustrated account of the external characters and anatomy of a very singular and aberrant form of dolphin, hitherto but imperfectly known, called *Pontoporia blainvillii*. This animal is one of the smallest of the Cetacea, being but five or five and a-half feet long when adult. It inhabits the estuary of the river Plata and the adjoining parts of the ocean, but it is not truly fluviatile, like the *Mia* of the Amazon and the *Platanista* of the Ganges, to which two forms it presents some structural affinities.

We trust that the brief outline which we have given of the contents of the first volume of these "Anales" will be sufficient to show that it is a book indispensable to every good scientific library, and, in conclusion, we wish to express our cordial hope that the inhabitants and government of Buenos Ayres will continue zealously to carry on the creditable work they are doing for science in keeping up and augmenting their valuable museum, and that Dr. Burmeister will long continue to be the exponent of its treasures.

W. H. FLOWER

RECENT PETROGRAPHICAL LITERATURE

I.

Lehrbuch der Mineralien und Felsartenkunde. Von Dr. F. Senft. Jena. (London: Williams and Norgate.)

THE future historian of Geology who shall describe the rise and progress of the science in England, will find material for one of his most curious and interesting chapters in tracing out the causes which checked the growth, and finally all but extinguished the very existence of petrographical study in this country. While in all that relates to stratigraphical geology, we have kept well ahead of other nations, and have been quite abreast of them in palæontology, we have allowed petrography, or the study