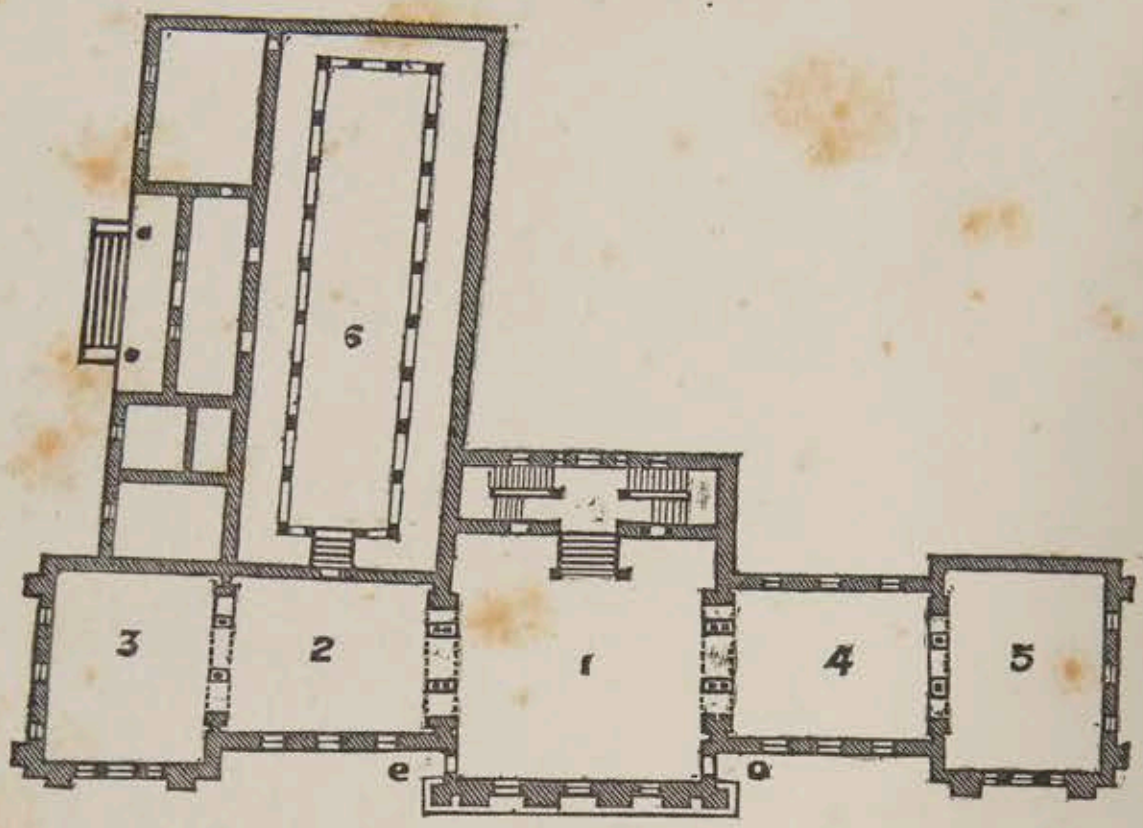
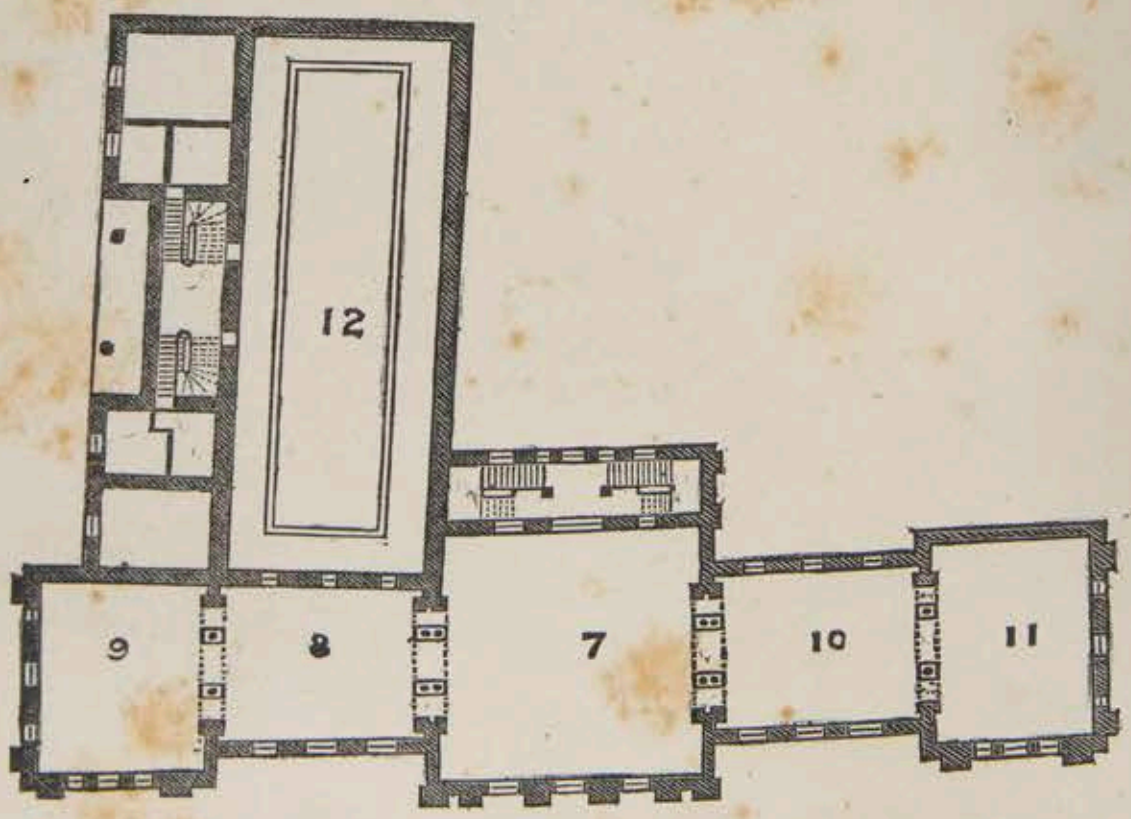
Sydney

PLAN OF THE AUSTRALIAN MUSEUM.



1. Ground Floor Plan.

e *Entrance Door.* o *Exit Door.*



2. First Floor Plan.

GUIDE

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OF THE

AUSTRALIAN MUSEUM

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Prepared by C. A. Ansell, Acting Curator
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PREFACE.

THERE are three classes of visitors whose requirements must be kept in view in the preparation of a Guide like the present one. First there are those who visit the Museum with a view to obtaining information on some definite point, or to study some particular group of objects. For these, what must be aimed at is chiefly a topographical guide or plan to indicate where the several collections are placed and the general scheme of their arrangement, as it would be impossible within the necessarily limited compass of a museum handbook to supply detailed information regarding them, which must be sought for in special works ; various catalogues of special collections which have been issued or are in preparation will to some extent supply this want. Secondly, there is the student of the general subject of natural history and comparative anatomy. Thirdly there is the much larger class whose object is general information. For the benefit of these the Guide requires to be, to some extent explanatory and descriptive.

In writing the present Guide all these classes of visitors have been kept in view, as far as it is possible to do so in a limited compass. The present arrangement of the collections in the Museum is only a temporary one, pending the carrying out of certain very necessary alterations and additions in the buildings, and it presents certain inconveniences both to the general visitor and the student ; but it is hoped that, with the help of the little plan, there will be no difficulty in finding the whereabouts of the several collections. For the benefit of the Natural History student the various groups illustrated by the specimens in the Type Collection are pointed out, and a few other necessary explanatory notes added. For the general visitor some brief explanatory memoranda are added, having reference for the most part to the fauna of Australia.

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GUIDE

TO THE

AUSTRALIAN MUSEUM.

The Australian Mammals, Reptiles, Amphibians, and Fishes are to be found in the rooms marked 2 and 3 in the plan. The Australian Birds are in room No. 8. The foreign Mammals are in No. 6, the foreign Birds in No. 12, the foreign Reptiles in No. 1, and the foreign Fishes in No. 2 and No. 1. The Insects are in No. 6; the Spiders, Scorpions, and Centipedes in No. 7; the Crustacea, Echinoderms, Zoophytes, and Sponges, and the Type Collection in No. 9; the Shells in Nos. 7 and 10. The specimens of collections recently acquired and the larger Aquatic Vertebrates are in No. 7. The Minerals are in Nos. 6 and 11; the Fossils in No. 12; the bones of Moas and extinct Australian Mammalia in No. 5.

I—AUSTRALIAN MAMMALS.

The lower floor of the New Building (2 and 3 in plan) is occupied in great part by the collections of the various groups of Australian Vertebrata (or back-boned animals), the Fishes, Frogs, Snakes, Lizards, Tortoises, and Mammals. Of these, the largest collection is that of the Australian Mammalia at the northern end of the building, including the Kangaroos, Wallabies, Kangaroo-rats, Bandicoots, Phalangers, Native Cats, Pouched Rats, Native Bears, Wombats, and other groups of Marsupials, representing, together with the Aboriginal Black-fellow, the Native Dog, and a few Bats and Rats, the entire indigenous Mammalian Fauna of Australia.

Marsupials are not entirely restricted to the Australian Continent; several kinds of Kangaroos, Wallabies and Phalangers *(Cuscus)* are known to inhabit New Guinea, and species of *Cuscus*

are found in Celebes, Amboyna, Waigiou, Timor, New Ireland, etc., while a distinct family of Marsupialia—the *Didelphidæ* or true Opossums, inhabit the American Continent; but Australia is peculiarly the home of this order of mammals. Here they reach their highest degree of development as regards numbers and variety, and among them are to be found the equivalents or analogues of a great many of the subdivisions of the higher orders of Mammalia. Thus the Antelopes and Deer are represented by the Kangaroos, Wallabies, and Pademelons, the Cats and Weasels by the Dasyures and Phascogales, the Dogs by the Thylacines, the Porcupines by the Echidna, the Ant-Eaters by the Myrmecobius, the Moles by the Bandicoots, the Rodents by the Wombat, the Monkeys by the Koalas and Phalangers, the Flying Squirrels by the Petaurista and Belideus. In other words the Mammals of Australia, though nearly all Marsupials, have become adapted to widely different habits and modes of life, some being herbivorous, some fruit-eating, some insect-eating, others flesh-eating, some fleet runners, others living habitually in trees, and so on. Yet, with all these diversities of habits and the corresponding differences of structure, they are all united in one group by certain common characteristics. In the first place (leaving out of account for the present the Platypus and Echidna, which belong to a lower group than the true Marsupials) they nearly all possess a pouch (*marsupium*, whence the name of the Order) in which the young are carried until they reach an age when they are capable of shifting for themselves. Co-ordinated with the presence of the pouch is that of the so-called *marsupial bones*—a pair of bones which are attached to the front of the pubis (see the skeleton of a kangaroo in the right-hand corner of the first case); these bones are not directly connected with the pouch or marsupium, they are formed by the conversion into bone of a tendon or sinew, and rudiments of similar bones or cartilages are found in exceptional instances in some of the higher Mammals; but, as their presence is constant in the Marsupials, except in the Tasmanian Thylacine, the name of marsupial bones has been given to them. Besides the presence of marsupial bones the

skeleton of the *Marsupialia* is characterised nearly always by the bending inwards of the angle of the lower jaw, by the socket in which the lower jaw works being partly formed by the cheek-bone, and by the sutures or lines of junction of the bones of the skull remaining remarkably open throughout life. The brain also is of low organisation—the cerebrum or great brain being usually smooth or little convoluted, and the *corpus callosum* or cross-band of nerve fibres by which the halves of the great brain are united together being of small size and scarcely distinct. A more noteworthy and distinctive point, however, is the condition in which the young are born. The young of many of the other groups of mammals are born in a more or less blind and helpless condition, but in none are they born at so early a stage of their development as in the Marsupials. Brought forth like the young of other animals they are placed by the mother in the pouch, where they adhere to the teat. The milk, which they are incapable of sucking, is squeezed down their throats by the action of the mother, choking being prevented by a special formation of the throat, by means of which a continuous passage is formed for the air from the nostrils to the windpipe, the milk passing on either side down to the gullet. These young kangaroos or phalangers may be found in the pouch in so rudimentary a state that the belief is very current among bushmen that they grow there like apples on a tree; but that such is not the case is evidenced, not only by the structure of the internal organs, but by the discovery, first by Prof. Owen, and subsequently by others, of young still more rudimentary than those in the pouch in the uterus or womb itself.

The first three wall-cases on the left side of the North Wing (2 and 3 in the plan) are chiefly occupied by mounted specimens of kangaroos and wallabies comprising the family *Macropodidæ*. These are distinguished by the great length of the hind as compared with the fore limbs—the former being alone used in progression—and the powerful tail; the first toe of the hind foot is absent, the second and third toes are bound together by the skin and are very small, the fourth is very large and the fifth is smaller, but fully formed in all except *Hypsiprymnodon*; there are three incisor or front teeth on each side in the upper jaw, and a

single pair in the lower, the latter being chisel-shaped, directed horizontally forwards, and capable of being worked scissors-like against one another by the movement of the two halves of the lower jaw, which are loosely connected together. Among these may be noted the Great Kangaroo (*Macropus major*), the Red Wallaroo or Great Red Kangaroo (*Osphranter rufus*), the Black Wallaroo (*Osphranter robustus*); the Great Kangaroo of Western Australia (*Macropus ocydromus*), Parry's Wallaby (*Halmaturus Parryi*) from the Clarence River and Queensland, the Pademelon Wallaby (*Halmaturus Thetidis*), the Black-striped Wallaby, the Black Wallaby, the Red-necked Wallaby, the Black-gloved Wallaby of Western Australia, and other species. In the third case is a group of the Yellow-footed Rock Wallaby (*Petrogale xanthopus*) of South Australia, and specimens of the New South Wales Rock Wallaby (*Petrogale penicillata*). In the same case are specimens of a New Guinea Wallaby (the *Dorcopsis luctuosa*), which differs from any Australian species in the nature of its dentition; also the Nail-tailed Wallabies (*Onchogalea lunata* and *O. frenata*), and the Tasmanian Wallaby (*Halmaturus Billardieri*). In the fourth case are the Rat-kangaroos and the Bandicoots. Of the former is to be specially noticed the common Rat-kangaroo (*Hypsiprymnus murinus*) and a singular little species from Rockingham Bay named by Mr. E. P. Ramsay *Hypsiprymnodon moschatus* and regarded by Prof. Owen as, perhaps, forming the type of a new family. Of the latter may be mentioned Gunn's Bandicoot (*Perameles Gunnii*), the Saddle-backed Bandicoot (*Perameles myosurus*), the Banded Bandicoot (*Perameles fasciatus*), the large New Guinea Bandicoot (*Perameles Broadbentii*) and the so-called Rabbit-rat (*Peragalea lagotis*). Below, in the same case, will be found specimens of the Banded Hare-kangaroo (*Lagorchestes fasciatus*) of Western Australia, the common Hare-kangaroo, the Jerboa Kangaroo (*Bettongia penicillata*) and other species of Jerboa, and also the singular *Chaeropus castanotis*. At the left-hand end of the first case at the bottom (room No. 2) is a group

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* The skeletons of Marsupials will be found in room No. 5.

of Wombats (*Phascolomys*). These burrowing and root-eating Marsupials are characterised by their thickset bodies and short legs, each foot having five powerful digging claws; they have a single pair of chisel-shaped front teeth above and below, quite like those of a rabbit or rat, no canines, and five grinding teeth on each side above and below.

The next case is occupied by carnivorous or flesh-eating Marsupials of the family *Dasyuridæ*. This family is characterised by having four incisors on each side in the upper jaw and three in the lower, and by the possession of well-developed canines, and by the usual number of grinding teeth being seven on each side above and below; there are four toes in the foot and none of them are united by a web; the great toe or hullux is often rudimentary; the tail is not prehensile. Below is a group of Tasmanian carnivora, including the Tasmanian Devil *(Sarcophilus ursinus)* which differs from the true Dasyures, among other points, in the entire absence of the hullux or great toe, the Tasmanian Wolf (*Thylacinus cynocephalus*) remarkable for its dog-like proportions, and the spotted Dasyure or "Tiger Cat" (*Dasyurus maculatus*). Besides these in the same case are specimens of the common variable Dasyure or "Native Cat" (*Dasyurus viverrinus*), the West Australian Dasyure *(Dasyurus Geoffroyii)*, the South Australian Dasyure (*D. hallucatus)*, and the Brush-tailed Phascogale (*Phascogale penicillata*). In the next case are a series of small rat-like or mouse-like animals which are nearly related to the preceding, and in fact require to be placed in the same family. These are the various species of *Antechinus*, *Antechinomys*, *Podabrus*, and allied genera which in most parts of their organisation are "Native Cats" in miniature. Here must be mentioned the Banded Ant-eater (*Myrmecobius fasciatus*) of which there are specimens in the bottom of the case. This curious little marsupial, which is a native of Western Australia, is likewise referred to the family of the Dasyures or Native Cats, but has no fewer than nine grinding teeth (three premolars and six molars) on each side above and below; the female has no pouch, but has eight nipples arranged in a circle as in the Phascogale; it has a long slender tongue for licking up the ants on which it feeds, and is

said to be in the habit of running rapidly round an ant-hill until it has thoroughly roused the whole colony, when it proceeds to satisfy its appetite.

The greater part of the remainder of this case is taken up by the Carpophaga or fruit-eating Marsupials, including the Phascolarctidæ or Koalas (Native Bears) and the Phalangistidæ or Phalangers or Australian Opossums. The familiar Koala or Native Bear, of which there is but one species (*Phascolarctus cinereus*), found over nearly the whole of Australia south of the tropics, is distinguished by the rudimentary tail, by having the thumb and second finger opposable to the other fingers, and the innermost toe of the foot opposable like a thumb ; all the toes except the innermost toe of the hind feet have strong claws. There are three front teeth on each side above and one below, one canine above and none below, and five grinding teeth on each side above and below. The term *carpophagous* does not well indicate the habits of the native bear, whose ordinary food is not fruits, but the tender shoots of the Eucalypti.

The Phalangers (*Phalangistidæ*) form a tolerably large family. They all, unlike the Koala, have a long prehensile tail, which is scaly or naked underneath at the extremity. As in the Koala the second and third toes are united by a web. Among these attention may be directed to the specimens of the common Phalanger or Opossum (*Phalangista vulpina*), Cook's Phalanger (*Phalangista Cookii*), the Sooty Phalanger (*Phalangista fuliginosa*) of Tasmania, the Viverrine Phalanger (*Phalangista viverrina*), and the little banded Phalanger (*Dactylopsila trivirgata*) from Northern Queensland, the flying Phalangers (*Petaurista taguanoides*, *Belideus breviceps*, and *B. ariel*, and the minute *Acrobata pygmæa.)*

In this case also are the specimens of those two very remarkable and interesting Australian Mammals the *Platypus* and the *Echidna*. Though placed along with the Marsupials, these remarkable animals are really as distinct from them as the Marsupials are from the higher orders of Mammalia. They constitute, in fact, a lower subdivision of the Mammalia distin-

guished from the Marsupials, as from all other Mammals, by certain points in their organisation by which they are linked with the Birds and Reptiles. Such points are, in the skeleton, the presence of a T-shaped bone—the interclavicle in front of the breast-bone, the union of the coracoid bones with the breast-bone, and the fact that the epiphyses of the vertebræ are absent; and in the brain the absence as a distinct structure of the corpus callosum or cross-band of fibres, by means of which the two halves of the cerebrum or great brain are connected together in all other Mammals. The *Platypus* and *Echidna*, however, shew their relationship with the Mammalia in the possession of the mammary glands by which the young are nourished, though these are devoid of teats, there being only a bare space of the skin, often pushed in slightly so as to form a shallow pit, where the ducts or canals of the gland open. On account of their evident relationship with the Birds and the Reptiles, it was formerly supposed that the Monotremata (as the class formed by the *Platypus* and *Echidna* is called) might be oviparous, but all doubts on this head (which indeed might be resolved by a study of the structure of the female generative organs) were removed by the discovery by Prof. Owen of the ova of the *Platypus* and *Echidna in utero*: the *Echidna* and *Platypus* bring forth the young alive like the higher Mammals, but in a very rudimentary state; and as in the Marsupials there is no evidence of the existence of a placenta.

The Monotremata are represented by only two well-marked species in Australia—the Duck-billed Platypus (*Ornithorhynchus anatinus*) and the Spiny Ant-eater (*Echidna hystrix*). The Tasmanian species of Echidna is regarded as distinct and is named *E. setosa*, and a third species has been described from New Guinea. They are found in no other part of the world, and, though analogy leads us to infer that they must have been more abundant at some preceding period of the earth's history, no fossil remains of them have been found save in some post-tertiary deposits in Australia itself.

Though united in one Order, the *Platypus* and *Echidna* differ considerably from one another. The *Platypus* (of which there is

a group at the bottom of the case with an imitation of their natural surroundings), is essentially an aquatic animal, with webbed feet adapted for swimming, broad leathery beak adapted for seeking food such as grubs and worms among mud and water-weeds, horny grinding teeth, and soft fur. The *Echidna* on the other hand has the feet armed with strong claws adapted for digging, a narrow beak with a long slender tongue, and is clothed with a mixture of strong pointed spines and coarse hairs. In the case of both the Platypus and the Echidna the male has the hind feet armed with a strong pointed spur, in connection with which is a gland, but there is no evidence that the secretion of this gland is of a poisonous nature, or that the animal uses the spur as a weapon of offence.

In the next case are specimens of the Australian non-Marsupial Mammals—the rats and mice, the native dog and the bats; also specimens of the common Seal* and the common New South Wales Dolphin. Of the rats the most remarkable are the water-rats (*Hydromys*) and the curious little kangaroo-like *Hapalotis*. The Native Dog or Dingo is apparently a wild variety of the domestic dog, and probably made its advent in Australia along with man, that is, at, geologically speaking, a comparatively recent period; but the evidence on this point is not complete.

II.—AUSTRALIAN BIRDS.

The Australian Birds are contained in the room marked 8 in plan in the upper floor.† Nearly 700 species of Australian birds have been described; and, though specimens of all of those are not contained in the mounted collection, the greater number are represented. As compared with other regions of the earth's surface Australia is characterised by the absence of certain wide-spread families and the presence of several families not found in any other part of the world. There are no true Finches (*Frin-*

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* Other specimens of the Eared Seal are in the Room numbered 7.

† As at the time of writing this Guide the birds were soon to be re-arranged in new wall-cases, it has not been possible to give full particulars as to their mode of arrangement in the present edition.

gillidæ) Woodpeckers (*Picidæ*), Pheasants (*Phasianidæ*), or Vultures (*Vulturidæ*) in Australia; though these families are widely distributed over the rest of the earth's surface. On the other hand no fewer than nine families may be regarded as peculiar to the Australian region—including New Guinea and the neighbouring Islands—namely, the Birds of Paradise (*Paradiseidæ*), the Honey-eaters (*Meliphagidæ*), the Lyre-birds (*Menuridæ*), the Scrub-birds (*Atrichidæ*), the Cockatoos (*Cacatuidæ*), a family of Parrakeets (the *Platycercidæ*) the Brush-tongued Parrakeets (*Trichoglossidæ*), the Mound-birds (*Megapodidæ*), and the Cassowaries (*Casuaridæ*). Among families found in other regions the King Fishers (*Alcedinidæ*) are more largely represented in Australia than in any other region of the earth, and the Pigeons are also very numerous.

The great wealth in temperate Australia of honey-bearing flowers, of the Myrtle family particularly, and the *Proteaceæ*, sustains an immense multitude of honey-eating birds of the family *Meliphagidæ*, which feed as well on the small insects about the flowers as on the honey itself. This family comprises many of the commonest and most familiar birds to be seen among the Banksias, Melaleucas and Eucalypts in the "bush" in New South Wales. Such is the graceful little Spine-bill (*Acanthorhynchus tenuirostris*), the common White-cheeked Honey-eater (*Meliornis sericea*), the very numerous species of *Ptilotis*—such as the familiar Yellow-tufted Honey-eater (*P. auricomis*), the White-eared Honey-eater (*P. leucotis*), and the Yellow-faced Honey-eater (*P. chrysops*), the richly attired Blood-bird (*Myzomela sanguinolenta*), the "Old Soldier" or Garrulous Honey-eater (*Myzantha garrula*), the Gill Bird or Wattle Bird (*Anthochaera carunculata*), the Friar Bird (*Tropidorhynchus corniculatus*) with its curious leather-like hood, and a host of others. The family of the Birds of Paradise (*Paradiseidæ*) is represented in Australia among other forms by the Manucode and Rifle-bird, by the Bower-birds, such as the Satin Bower-bird (*Ptilonorhynchus holosericeus*), the Spotted Bower-bird (*Chlamydodera maculata*), the Regent-bird (*Sericulus melinus*), and the Cat-bird (*Ailuraedus Smithii*). The very peculiar family of the Lyre-birds, with their

magnificent tails, are shewn in groups in special cases—the New South Wales Lyre-bird (*Menura superba*), and the Northern Lyre-bird (*Menura Alberti*); the Victorian Lyre-bird (*Menura Victoriæ*) is in its place in the general collection.

The peculiar and interesting family of the Cockatoos also demand special attention. The best known is the common Sulphur-crested Cockatoo (*Cacatua galerita*); and the handsomest is Leadbeater's Cockatoo (*Cacatua Leadbeateri*). Of the Parrakeets, attention may be directed to the familiar Pennant's Parrakeet or the "Blue Mountain" as it is often termed (*Platycercus Pennantii*), the "Rose Hill" or "Rosella" Parrakeet (*P. eximius*); the "Moreton Bay Rose Hill" (*P. pallidiceps*), and the Grass Parrakeets (*Euphema*). The Brush-tongued Parrakeets are represented by the gorgeous Blue-bellied Lorikeet (*Trichoglossus Novæ-Hollandiæ*), the Scaly-breasted Lorikeet (*T. chlorolepidotus*), the common Musk Lorikeet (*T.* or *Glossopsitta australis*), the little Lorikeet (*T.* or *G. pusilla*) and others.

There are twenty-five species of Pigeons in Australia, and of these particular attention may be called to the beautifully coloured Fruit Pigeons, *Ptilopus Swainsonii*, *P. Ewingii*, *Lamprotreron superbus*, and *Megaloprepia magnifica*, the White Nutmeg Pigeon (*Myristicivora spilorrhoa*), the Top-knot Pigeon (*Lopholaimus antarcticus*), the Wonga Wonga (*Leucosarcia picata*) the common Bronze-Wing (*Phaps chalcoptera*), the Brush Bronze-Wing (*Phaps elegans*), the Crested Bronze-Wing (*Ocyphaps lophotes*) and the Peaceful Dove (*Geopelia tranquilla.*)

The very remarkable family of Birds, which from their habit of depositing their eggs in mounds of decaying vegetable matter, have been named the Mound Birds (*Megapodiidæ*), though not strictly confined to the Australian Continent, are very characteristic of the Australasian region, and find their nearest, though still not very near, allies in the Curassows of South America. Of these one of the best known is the Brush-turkey (*Talegallus Lathami*), an inhabitant of New South Wales and Queensland. This bird, as is well known, lays its eggs in holes in large mounds of decaying vegetable matter, and covers them up—the hatching

of the eggs being brought about by the heat generated by the fermentation of the mass: when they emerge from the egg the young are already able to shift and forage for themselves. The so-called Plain-turkey (*Leipoa ocellata*) has very similar habits, and so has the Australian Megapode (*Megapodius tumulus*). Among the Wading-birds one of the most remarkable is the Tribonyx, which is somewhat nearly related to the Notornis of New Zealand.

The Emu (*Dromæus Novæ-Hollandiæ*) is another of the most interesting and characteristic of the Australian birds. A second kind, the Spotted Emu (*D. irorratus*) occurs in the western portions of the continent. The Australian Cassowary (*Casuarius australis*) is only found in the northern portions of Queensland. Both the Cassowary and the Emu belong to that subdivision of the class of birds to which the African Ostrich and the South American *Rhea* also belong. These birds differ from all others in certain points in the structure of the skeleton—the breast-bone, the pelvis, and the skull—in which they approach nearer the reptiles than other birds. The presence of these gigantic birds in South Africa, in South America, Australia, and formerly in New Zealand (see the skeletons of the Moa), is regarded by some naturalists as evidence (taken in connection with various other similar facts) of the former existence of a land-connection between these countries in the form of a great southern continent.

III.—AUSTRALIAN REPTILES.

The collection of Australian Reptiles is placed in two centre cases in the north room of the ground floor (3 in plan). The case placed on the left contains the Snakes. The Australian Snakes belong chiefly to the families Pythonidæ and Elapidæ; the latter are all venomous, and these comprise about two-thirds of the species. Among the non-venomous snakes are represented the *Typhlopidæ*or Blind Snakes, the Tree-Snakes (*Dendrophidæ*), such as the common Green Tree-Snake (*Dendrophis punctulata*), the Night Tree Snakes (*Dipsadidæ*); among the Python family the Carpet Snake (*Morelia variegata*), the Diamond Snake (*Morelia*

spilotes), the Black-headed Snake (*Aspidiotes melanocephalus*), and others. Of the venomous snakes (family Elapidæ) may be specially noted the Brown Snake (*Diemenia superciliosa*), the deadly Black Snake (*Pseudechis porphyriacus*), the Brown-banded Snake (*Hoplocephalus curtus*), also a very dangerous species, the Clarence River snake (*Tropidechis carinata*), the Ringed Snake (*Vermicella annulata*), and the Death Adder (*Acanthophis antarctica*). The last-named is a dangerous snake, though perhaps not so venomous as the Brown, Black, or Brown-banded; the last scale of the tail becomes hardened in old specimens, and has somewhat the form of the sting of a scorpion, so that it is popularly supposed to act as a weapon of offence: that it is not so may readily be proved by experiment; a similar superstition is prevalent regarding certain species of Indian Snakes. The Sea Snakes (Family *Hydrophidæ*) are all, as far as known, very venomous; but we rarely hear of accidents from their bite, as they are very timid, and will not attack man unless driven to bay in some crevice. As examples of this family may be noticed the Ringed Sea Snake (*Platurus scutatus*) the Brown Sea Snake (*Aipsyurus fuscus*), Stoke's Sea Snake (*Hydrophis Stokesii*), the Eyed Sea Snake (*Hydrophis ocellata*), and the Yellow-bellied Sea Snake (*Pelamis bicolor*).

In the opposite case are contained the Lacertilia or Lizards. The Australian Lizards are very numerous and in many instances very peculiar. Three of the families into which they are arranged, viz., the *Pygopodidæ*, the *Aprasiidæ*, and the *Lialidæ*, and 36 of the genera are found in no other part of the world. The greater number of the species belong to the families of the Scinks and the Geckos.

Among the Scinks may be noticed the numerous species of *Hinulia*, the "Shingle Back" (*Trachydosaurus rugosus*), the "Blue Tongue" (*Cyclodus gigas*), and among the Geckos the Thick-tailed Gecko (*Œdura marmorata*), and the Leaf-tailed Geckos (*Phyllurus platurus*, *P. Myliusii*, and *P. inermis*). The Pygopodidæ are snake-like lizards peculiar to Australia, with rudimentary fore limbs; e.g. *Pygopus lepidopus*; the Lialidæ are likewise snake-like, with no external trace of

limbs; examples in the collection are *Lialis Burtoni* and *Lialis punctulata*. In the families of Lizards found in other parts of the world, may be noticed the common variable Lace-Lizard (*Hydrosaurus varius*), commonly but erroneously called the Iguana—the true Iguanas being found only in South America—the Frilled Lizard (*Chlamydosaurus Kingii*), the Jew Lizard *Grammatophora barbata*), and the curious Horned Lizard (*Moloch horridus*), of which a monster ally has recently been described by Prof. Owen from fossil bones found in the Darling Downs.

The Australian Turtles and Tortoises are placed in the bottom of the same case. Among the Fresh-water Turtles attention may be called to the Oblong Turtle (*Chelodina oblonga*), and the Toothed-backed Turtle (*Elseya dentata*). The genera *Chelodina*, *Elseya*, and *Chelemys* are all peculiar to Australia.

The Australian Crocodiles are in room No. 7, and will be noticed under "Larger Aquatic Vertebrates."

IV.—AUSTRALIAN AMPHIBIA.

The collection of Frogs, almost entirely Australian, are arranged at present in the case containing the specimens of Lizards and Tortoises. The Australian region is marked by the absence of any of the tailed Amphibians, such as the efts or newts and salamanders; but it is very rich in the various families of tailless forms, especially tree-frogs. There is only one true toad (Fam. *Bufonidæ*); but nine other families are represented, and seven genera are peculiar to Australia, viz., *Pseudophryne*, *Pachybatrachus* and *Chelydobatrachus*, *Helioporus*, *Pelodryas*, *Chirodryas* and *Notaden*. Only two of these peculiar genera (*Pelodryas* and *Pseudophryne*) are represented in the Museum collection, so that contributions of frogs are much wanted. The genus *Litoria* and the family *Pelodryadæ* are found in South America as well as in Australia, and present us with one among many points of similarity between the faunæ of these two regions.

V.—AUSTRALIAN FISHES.

In the upright centre cases of the same room that contains the Mammals (2 and 3 in plan) are cases containing specimens in spirits and stuffed of Australian fishes, arranged according to their orders and families. Of the present collection, among the Perch tribe, attention may be called to the common salt-water Perch (*Lates colonorum*), found in the mouths of all the eastern rivers of New South Wales as well as in Victoria, and not uncommon in the Sydney Market; the "Old Wife"* (*Enoplosus armatus*), the so-called "Black Rock Cod" (*Serranus Damelii*) of Port Jackson, the "Wirrah" (*Plectropoma ocellatum* and *P. annulatum*), the very unhappily named "Salmon" or "Salmon Trout" of the Sydney fishermen (*Arripis salar*), the "Murray Cod," or, better, "Murray Perch" (*Oligorus*) of which there are several species; the "Silver Perch" (*Therapon Richardsonii*), the "Trumpeter" (*Therapon Cuvieri*); the "Pearl Perch" (*Glaucosoma scapulare*), a very fine fish caught on snapper-grounds, but unfortunately rarely seen, perhaps owing to its favourite haunts not having yet been discovered; the "Bull's Eye Perch" (*Priacanthus macranthus*), the "Silver Belly" (*Gerres ovatus*). Among the Squamipennes may be noticed the common *Chætodon strigatus*, of Port Jackson, and the "Sweep" (*Scorpis aequipinnis*); in the Mullidæ the "Red Mullet" (*Eupeneoides Vlamingii*). Among the Sparidæ some of the chief species are the common "Black Fish" (*Girella tricuspidata*), the "Snapper" (*Pagrus unicolor*), the "Tarwhine" (*Chrysophrys sarba*) the "Black Bream" (*Chrysophrys australis*), the "Morwong" (*Chilodactylus macropterus*), the "Banded Morwong" (*Chilodactylus vittatus*), the "Carp" (*Chilodactylus fuscus*), the "Bastard Trumpeter" (*Latris ciliaris*); among the Scorpænidæ the "Red Rock Cod" (*Scorpæna cruenta* and *S. cardinalis*), the

* It has to be noted in connection with these English names for the Australian fishes (and the same remark applies to other classes of natural objects) that the same names are applied in different Colonies or even different parts of New South Wales itself to very different species of fishes, and some species may have as many as four or five different English names in different parts of Australia. The English names on the labels are those most in vogue in Sydney.

"Fortescue" (*Pentaroge marmorata*) so much dreaded by fishermen on account of the painful wounds produced by its spines; the "Zebra Fish" (*Pterois volitans*); among the Berycidæ the "Nanegai" (*Beryx affinis*); among the Sciænidæ the "Jew Fish" (*Sciæna artarctica*), and the "Teraglin" (*Otolithus atelodus*); among the Carangidæ the "Yellow Tail" (*Trachurus trachurus*), the "King Fish" (*Seriola Lalandii*), the "Samson Fish" of the Sydney fishermen (*Seriola hippos*), the "Tailor" (*Temnodon saltator*) and the "John Dorey" (*Zeus australis*); in the Scombridæ the "Mackerel" (*Scomber antarcticus*), the "Horse Mackerel" (*Auxis Ramsayi*), the "Pilot Fish" (*Naucrates ductor*) and the remarkable "Sucking Fish" (*Echeneis remora*); in the Trachinidæ the "Whiting" (*Sillago maculata* and *S. bassensis*); in the Cottina the "Flathead" (*Platycephalus fuscus* and *P. cirronasus*) and the "Flying Gurnet" (*Trigla polyommata*); among the Gobies the "Climbing Fish" (*Periophthalmus australis*); in the Sphyraenidæ the "Pike" (*Sphyraena obtusata*); among the Atherinidæ the "Hardy Head" (*Atherina pinguis*); of the Mugilidæ the Mullet (*Mugil dobula* and *Mugil grandis*).

On the top of one of the cases will be seen a large specimen of a Ribbon Fish (family Trachypteridæ) named by Mr. E. P. Ramsay *Regalaecus jacksoniensis*. Among the Labridæ attention may be directed to the "Pig Fish" (*Cossyphus unimaculatus*), the "Blue Groper" (*Cossyphus Gouldii*), and the "Rock Whiting" of the Sydney fishermen (*Odax semifasciatus*); among the Gadidæ or Cod Family to the "Beardy" (*Lotella marginata*), Among the Pleuronectidæ or Flat Fishes are represented the "Flounder" (*Pseudorhombus Russellii*), the "Sole" (*Solea*), the "Lemon Sole" (*Plagusia unicolor*), and others; this family has a good many representatives in Australia, but they are never very common in the Sydney market, the trawl not being yet employed by the Sydney fishermen. Among the Siluridæ may be noted the "Cat Fish" of Port Jackson (*Cnidoglanis anguliformis*); in the Scopelidæ the oddly named "Sergeant Baker" (*Aulopus purpurissatus*); among the Scombresocidæ the "Long Tom" (*Belone ferox*), the "Gar Fish" (*Hemirhamphus intermedius*), and the "River Gar Fish" (*Hemirhamphus regularis*); in the

family Osteoglossidæ the Barramundi (*Osteoglossum Leichardti*), of the Queensland Rivers, a remarkable genus which is found likewise in the tropical rivers of Eastern South America, and the Indo-Malay Islands. The Galaxiadæ comprising the various species of *Galaxias* sometimes called "Mountain Trout," are remarkable as being found only in the rivers of Australia, New Zealand and South America.

The numerous and fine varieties of the herring family, shoals of which visit the Australian coast at certain seasons, are not at present well represented in the collection; but notice may be taken of *Elops saurus*, *Clupea novæ-hollandiæ*, which is the Australian representative of the sprat, *Clupea moluccensis*, various species of anchovy, (*Engraulis*), etc.

Among the Murænidæ the most noteworthy species represented is the Silver Eel (*Murænesox cinereus*), among the Lophobranchii the *Hippocampus*, among the Sclerodermi the "Leather Jackets" (*Monacanthus*) and "File Fishes" (*Balistes*), the "Box Fishes" (*Ostracion*), the "Toad Fishes" (*Tetrodon*), and the "Porcupine Fish" (*Dicotylichthys punctatus*).*

Perhaps the most remarkable of all the Australian Fishes is the *Ceratodus*, or so-called "Burnett Salmon" of the Queensland Rivers, represented in the collection by stuffed specimens; it is intermediate in some respects between the fishes and the amphibia, and its nearest living allies are the "Mud Fishes" of South Africa.

Among the cartilaginous Fishes are spirit specimens of the young of several species of sharks; also stuffed specimens of the "Angel Fish" (*Rhina squatina*), the "Whip-tailed Ray" of Port Jackson (*Myliobatis*), the "Torpedo Ray," or "Numb Fish" of the Sydney fishermen (*Hypnos subnigrum*), the "Saw Fish" (*Pristiophorus cirratus*), the "Wobbegong" (*Crossorhinus barbatus* and *C. dasypogon*). The larger stuffed specimens of sharks and rays will be found in the upper floor, (Room No. 7).

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* Large specimens of the Sun-Fish, which also belongs to this family, will be found in room No. 7.

VI.—LARGER AQUATIC VERTEBRATES.

In a group on the floor in the centre hall of the upper story (7 in plan) and suspended from the gallery are stuffed specimens of the larger aquatic vertebrata. These include representatives of a number of different groups of animals that have their limbs specially constructed for locomotion through the water. Among true *fishes* are representatives of the larger sharks and rays, sun-fishes, etc. Among *reptiles* are the gigantic "Luth" or "Leather-Backed Turtle" and the Crocodile. Among aquatic mammals are represented the Seals (order Carnivora), the Dugong and the Manatee (order Sirenia), and the Whale-bone Whales and Porpoises (order Cetacea). All these animals, though belonging to widely different classes, agree (with the exception of the Crocodiles), in having the limbs specially modified to serve as flippers or paddles, by whose aid progression through the water is effected, and all, with the same exception, are more or less helpless or awkward on land. Special attention may be directed to the Dugong, which is one of the two, or at most three, living species of the class Sirenia, all characterised like the Whales, by the possession of a single pair of flippers, and by the almost total absence of hair. The Dugong is a marine mammal from the Queensland Coast, but ranging westwards through the Indian Ocean to the east coast of Africa, inhabiting shallow waters of bays and inlets and feeding on sea-weed. In its full grown state it may be as much as 20 feet in length; the colour of the smooth, glossy back varies from light brown to slatey black, the under surface being lighter. The full-grown males have a pair of conspicuous tusks in the upper jaw; these are wanting in the female. The flesh is valued as food by the natives; the oil is of excellent quality, and has been used with good results as a substitute for cod-liver oil; but the number of the animals is limited, and the fishery is yearly becoming less productive.

The Manatee, a member of the same order as the Dugong, and an inhabitant mainly of the east coast of South America, though found also on the west coast of Africa, is likewise becoming greatly reduced in numbers, owing to the esteem in which its flesh, oil, and hide are held.

Skeletons of the Dugong and the Manatee will be found in room No. 4. In the same room and in rooms 2 and 3 are skeletons of various kinds of Whales and Porpoises. Among these attention may be directed to those of the great Sperm Whales (*Physeter macrocephalus* or *Catodon australis*) one in room 2, and one room 3. "When fully matured by age," Mr. Walker Scott says, "the male of this gigantic race of beings is said to have reached in length to eighty-four feet, with a girth at the largest part of thirty-six feet."

"The male cachalot of 60 feet long will have a pectoral fin of about 3 feet, and a caudal one, the principal organ of progression, of 19 feet across; in good condition such an animal will yield about 100 barrels of oil and 12 barrels of spermaceti."

"The teeth of aged males commonly weigh from 2 to 4 pounds each; the ivory of which they are composed is hard and capable of taking a high polish; but for commercial purposes it is held in much less estimation than that obtained from the tusks of the elephant."

At the north end, above the case containing the Marsupials, is a specimen of the Killer (*Orca capensis*)—a Dolphin noted for its ferocity and rapaciousness. Nearly over the entrance to the Old Building are skeletons of *Mesoplodon* and *Diplodon*, small Whales, remarkable for their long tapering beak, small narrow but elevated head, small flippers, and the possession of two pairs of teeth in the lower jaw and none in the upper.

The two stuffed specimens of very young Whale-bone Whales in the collection in room 7, already referred to, were both quite recently captured on the coast near Sydney, and were only newly born. When adult the southern Whale-bone Whale reaches a length of about 70 feet, and yields about 8 tons of oil and 7 cwt. of whale bone. Formerly they used to visit the shores of Tasmania in vast numbers and yielded a rich harvest; but of late years with the exception of occasional stragglers, they have completely deserted these shores.

The Seals in the same collection are specimens of the Australian Hair-seal from the Seal Rocks north of Port Stephens. A

skeleton of the same species will be found in the room numbered 5 in the plan.

The Crocodiles belong to the two species found in Australia—the large common Crocodile (*Crocodilus biporcatas*), which never ascends far up the rivers, but usually frequents the mangrove flats and lagoons about their mouths; and the fresh-water Crocodile (*Philas Johnstonei*) which is only found above the reach of tidal influence in perfectly fresh water. The Australian Crocodile is very commonly known as the Alligator; but the true Alligator is a very different animal, and is found only in America. The latter has the head relatively shorter and broader than the former, and the first and fourth teeth of the lower jaw both bite into pits in the upper, whereas in the Crocodile the first alone bites into a pit, the fourth into a groove. A mounted skeleton of the Crocodile will be found in room 5, and skulls of the Gavial and the Crocodile in room 6.

The Sharks in this collection are, among others, the formidable Rayner's Shark or "Tiger Shark" (*Galeocerdo Rayneri*), the "Grey Nurse" *(Odontaspis cinereus)*, and the "Grey Shark" (*Carcharodon Rondeletii*).

VII.—FOREIGN MAMMALS.

The wall-cases on the ground floor of the old building (6 in plan) are occupied mainly by a general collection of Foreign Mammalia. The first two cases, however, contain anthropological specimens, skulls and complete skeletons illustrating the modifications of form which characterise different races of the human species. The third case is occupied by skeletons of Apes and Monkeys. Of the Apes which approach in structure nearest to Man (called on that account Man-Apes or *Anthropomorpha*) there are skeletons of the Gorilla, the Orang-Utan and the Chimpanzee. Of these the Gorilla, according to Prof. Huxley, is the most man-like in the proportions of the length of the leg to that of the body and of the foot to the hand; in the size of the heel, the curvature of of the spine, the form of the haunch bones and the capacity of the skull. The Orang most nearly resembles Man in having

twelve pairs of ribs instead of thirteen, as in the others; but in the proportions of the limbs and other points it differs more from Man than the Gorilla or the Chimpanzee do. The latter approaches Man most closely in the form of the skull, the teeth and the proportional length of the arms.

A much lower grade, with greatly more remote resemblances to the human skeleton, is exhibited by the skeletons of Baboons in the same case.

A mounted specimen of a male Gorilla is in a special case at present placed in room No. 2, but may be noticed here. The ordinary height of the male Gorilla is from five feet two inches to five feet eight inches, of the female about four feet six inches. "The colour of the skin in the Gorilla, young as well as adult, is intense black, so far as the face, breast and palms of the hands are concerned. The fur of a grown but not aged specimen, is iron-grey, and the individual hairs are ringed with alternate stripes of black and grey. It is long on the arms and slopes downwards from the shoulder to the elbow, and upwards from the wrist to it. The head is covered with reddish-brown hair which is short and reaches the short neck. The chest is bare in the adults and thinly covered with hair in young males. In the female the breast is bare and the hair elsewhere is black with a red tinge, but is not ringed as in the male; moreover the reddish crown which covers the scalp of the male is not apparent in the female till she has almost become full grown. The head is large; there is no forehead, the frontal region sloping rapidly backwards. The eyes are deeply sunken, the immense overhanging long ridge giving the face the expression of a constant savage scowl. The mouth is wide and the lips are sharply cut, exhibiting no red on the edges as in the human face. The jaws are of tremendous weight and power. The huge eye-teeth or canines of the male which are fully exhibited when, in his rage, he draws back his lips and shows the red colour of the inside of his mouth, lend additional ferocity to his aspect. In the female these teeth are smaller. The almost total absence of neck, which gives the head the appearance of being set into the shoulders, is due to the

backward position of the joints which fix the head to the spine, and this allows the chin to hang over the top of the front of the chest. The brain-case is low and compressed, and its lofty top ridge causes the profile of the skull to describe an almost straight line from the back part or occiput, to the ridge over the brow. The immense development of the muscles which arise from this ridge and the corresponding size of the jaw are evidences of the great strength of the animal. * * * The eyes are wide apart; and the ears which lie on a line with them are smaller than those of man, but very much like his. In a front view of the face the nose is flat but somewhat prominent—more so than in any other ape; this is on account of a slightly projecting nose-bone very unusual in Apes. The chest is of great capacity; the shoulders being exceedingly broad. The abdomen is of immense size, very prominent, and rounded at the sides. The front limbs have a prodigious muscular development and are very long, extending nearly as low as the knees. The forearm is nearly of uniform size from the wrist to the elbow, and indeed the great length of the arms and the shortness of the legs form one of the chief differences between it and man. The arms are not long when compared with the trunk, but they are so in comparison with the legs. These are short and decrease in size from below the knee to the ankle, having no calf. The hands, especially in the male, are of large size, strong boned and thick; the fingers are short and broad, the circumference of the middle finger at the first joint being five and a half inches in some Gorillas. The skin on the back of the fingers near the middle is callous and very thick, which shews that the usual mode of progression of the animal is on all fours, and resting on the knuckles. The thumb is short and not half so thick as the forefingers, which are covered with short thin hairs. The palm of the hand is naked, callous and intensely black. The nails are black and are shaped like those of man, but are smaller in proportion and project very slightly beyond the ends of the fingers. They are thick and strong and always seem much worn. The hand of the Gorilla is almost as wide as it is long and in these it approaches nearer to those of man than any of the other Apes. The foot is proportionally

wider than in man ; the sole is callous and intensely black, and looks somewhat like a giant hand of immense power and grasp. The transverse wrinkles show the frequency and freedom of movement of the two joints of the great toe-thumb, proving that they have a power of grasp. The middle toe or third is longer than the second and fourth, and that is unlike the foot in man. The toes are divided into three groups, so to speak; inside the great toe, outside the little toe, and the three others partly united by a web."

From the structure of its skeleton the Gorilla is not adapted for the erect posture; its favourite attitude is semi-erect with the weight partly resting on the knuckles of its long arms, and in this way it swings itself along as with a pair of crutches. It has been seen, however, to walk with its hands clasped across the back of its head and when enraged it is said to stand erect beating its huge chest with its hands. Many stories are told of its strength and ferocity, a large proportion of which doubtless are "travellers' tales"; but that it is capable of feats of great muscular strength may readily be believed when we look at its immense breadth of shoulder and width of chest.

The Orang-Utan or Wild Man of the Woods, (*Simia satyrus*), of which there are three specimens from Borneo in case 4, is another of the man-like or anthropomorphic apes. "The Orangs all have long ruddy-brown hairs, the tinge being decidedly red, a dark face, with small eyes, small nose and great projecting jaws. The hair comes over the forehead and backwards over the neck; it is long on the limbs and points downwards on the upper and upwards on the lower arm. It covers the back and seat, and legs, standing out often, and gives a very wiry look to the fur. What strikes one directly on looking at a well-stuffed specimen of an old male for instance, is the great length of the fore-limbs, which reach far towards the ankle, the length of the muzzle and the extraordinary breadth of the face under the eyes, where the flatness resembles a mask more than a natural growth. In the females and young this growth of the cheek-bone and its covering of fat and skin are not seen ; and it appears to be a mark of male

beauty, as are also two sets of ridges on the skull which greatly resemble those of the Gorilla."

Also belonging to the Man Apes are the two specimens of a Gibbon or Wou-Wou (*Hylobates leuciscus*) from the Malay Archipelago.

Among the Old-World Monkeys in the same case and the next are several species of sacred apes (*Semnopitheci*) distinguished by their slender form, round heads, long tails, by the fore-limbs being much shorter than the hind limbs; the thumbs small, sometimes almost rudimentary. Examples are the "Chingkau" (*Semnopithecus cristatus*) of Sumatra and Eastern Java, the Loutou (*S. maurus*) of Java, and *S. entellus* of India. Following these is a specimen of the Patas (*Cercopithecus* or *Chlorocebus ruber*) and one of the Moustache Monkey (*Cercopithecus cephus*) from Western Africa, the Red Teetee (*Callithrix ruber*), and several representatives of the Macaque family from India and the Eastern Archipelago; specimens of the Baboon (*Cynocephalus babouin*) and Mandrill (*Mormon maimon* or *Papio mormon*) from Africa. The New-World Monkeys are represented by one of the "Howling Monkeys" (*Mycetes seniculus*), by *Cebuella pygmæa* or *Jacchus pygmæus*, the Pigmy Marmoset, and other species.

The Lemurs or Half-Apes are (case 6) represented by several species—*Lemur catta* from Madagascar, *Galago dimidoffi* and *G. alleni* from Africa. These Half-Apes habitually use all four feet in locomotion like all the lower groups of Monkeys, but some are able to hop about on their hind feet kangaroo-wise. They are exceedingly agile climbers, and the great toe has a range of motion enabling the animal to grasp firmly with its hind foot, but the long tail is not prehensile. The fore-limbs are shorter than the hind limbs. The form of the skull indicates a lower grade of structure than that of the Monkeys—the case in which the brain is lodged being small relatively to the face; the brain itself is of much simpler structure than in most of the Monkeys. A remarkable peculiarity of the Lemurs is the presence of a sort of fringe or frill situated on the floor of the mouth in front of the tongue. The head quarters of the Lemurs is the island of

Madagascar; but members of the family are to be found also on the continent of Africa and in some of the islands of the East-Indian Archipelago. Some subsist on fruits, many are insect-eating and some prey upon small birds.

The following seven cases are taken up by the order Carnivora: The seventh and eighth cases are occupied by skeletons of Carnivora—Lions, Tigers, Dogs, the Racoon, the Coati, the Mongoose. In the seventh case there are also two specimens of the skeleton of that remarkable animal the Hyrax (order *Hyracoidea*) one of the two species of which (*Hyrax syriacus*) seems to have been the "coney" of the Old Testament.

The ninth case contains skins of the Leopard, Lion, Bengal Tiger and the Lynx; the tenth contains a Leopard, the Chaus, smaller Cats, Civets, and the spotted Hyæna of Africa.

In case No. 11 is a specimen of the Sun-Bear or Bruang (*Helarctos malayanus*), a native of the Malay Peninsula and the islands of Java, Sumatra and Borneo; and one of the Polar Bear (*Thalassarctos maritimus*). In the same case are also specimens of the European Badger (*Meles taxus*) and the American Racoon (*Procyon lotor*). In the next case (12), is a specimen of the common Brown Bear of Europe (found also in Siberia, Kamtschatka, Japan, and the Arctic regions of North America). The same case also contains two members of the Dog family—the Black-Backed Jackal of the Cape of Good Hope (*Canis mesomelas*) and the Jackal or Kolah (*Canis aureus*) of Asia and the North of Africa. In case 13 are the remainder of the specimens of the Dog family, the common Fox (*Vulpes vulgaris*) the Racoon Dog of Japan (*Nyctereutes procyonoides*) the Arctic Fox (*Vulpes lagopus*) and various varieties of the Domestic Dog.

The fourteenth case contains a specimen of the European Otter; and the smaller carnivora such as the Genett (*Genetta tigrina*), the Stoat or Ermine (*Putorius erminea*) a native of the Northern portions of all three Northern Continents, the Ferret (*Putorius furo*), the Pole-Cat (*Putorius fœtidus*), the Weasel (*Mustela* or *Putorius vulgaris*), the Beech Marten (*Mustela foina*), the

Mongoose (*Herpestes griseus*), the Brown Mongoose or Ichneumon (*Herpestes paludosus*), and the Garangau (*Herpestes javanicus*).

In the same case are the only representatives in the collection of the order Insectivora—the common European Mole (*Talpa Europæa*) the Hedge-hog (*Erinaceus europaeus*) the Golden Mole (*Chrysochloris capensis*) of the Cape of Good Hope, and the European Garden Shrew (*Crocidura aranea*); also the Bats and "Flying Foxes," comprising the order Cheiroptera.

The following six cases are devoted to the Ungulata or Hoofed Animals—an order which includes the Horses, Rhinoceri, Tapirs, Deer, Antelopes, Oxen, Sheep, Camels, Llamas, Pigs, Hippopotami etc. All these have the last toe-bones invested with a horny hoof which takes the place of the nail of most other mammals, and the weight usually rests entirely on the tips of the toes, only one or two of which are usually developed in each foot. The Horses, Rhinoceri and Tapirs have the third toe in each foot central and symmetrical, and the toes of the hind foot odd in number, whence the name Perissodactyla or odd-toed hoofed-animals. Of these the only specimen in the present collection is the Tapir. The rest have the third and fourth toes of each foot forming a symmetrical pair, and the toes of the hind feet even in number; hence they are called the Artiodactyla or even-toed Hoofed Animals. The fifteenth case contains skeletons of Hoofed Animals of the Even-Toed subdivision, Deers, Gazelles, Goats, &c. In the sixteenth case are mounted skins of the Roe-Deer (*Capreolus capræus*), the Axis or Spotted Deer (*Axis maculata*) of India and Antelopes; and in the seventeenth and eighteenth various species of Indian and African Antelopes and the Chamois (*Rupicapra tragus*) of the Alps, Pyrenees, Caucasus and Carpathian Mountains. In the sixteenth case are exhibited specimens of the remarkable little Javanese Chevrotain (*Tragulus javanicus*) frequently, though quite erroneously, termed the Musk Deer—the true Musk-Deer being a very different animal; the Chevrotains differ from the ordinary Deer and Antelopes, among other points, in the absence of horns in both sexes and the possession of prominent canine teeth. In the nineteenth case

are specimens of the Llama of South America, a member of the same group of Hoofed Animals (*Tylopoda*) to which the Camels belong; and in the same case are skeletons of the wild boar and the New Guinea Pig, and skulls of the Babirussa, a wild hog of the islands of Borneo and Celebes.

In case 20 are stuffed specimens of the Wild Boar, the Collared Peccary and the New Guinea Pig. For a skeleton of the Hippopotamus see room 3. In the same case are likewise specimens of the South American and the East Indian Tapir—the only representatives of the odd-toed Hoofed Animals at present in the collection. The Tapirs are pig-like animals with a long snout, four toes in the front and three in the hind feet, each provided with a small hoof; they are nocturnal, taking refuge in the densest parts of the forests during the day-time and emerging at night to feed, and are very expert swimmers. Besides the two species (*Tapirus americanus* and *Tapirus Malayanus*) represented (the former by a very young specimen) in the collection, a third species (*Tapirus villosus* or the Hairy Tapir) is found in South America.

In the twenty-first case is a stuffed specimen of a young Elephant and the skull of a Rhinoceros.

The twenty-second and twenty-third cases contain the representatives of the order Rodentia or Gnawers—the Squirrels, Marmots, Beavers, Rats and Mice, Guinea Pigs, Hares and Rabbits—all distinguished by their prominent chisel-like front teeth.

In the twenty-fourth case, are specimens of the order *Edentata*, Sloths, Armadillos, and Ant-Eaters. The members of this order are most abundant in South America, but one or two are found in South Africa and in Asia. At a former geological period South America was populated by gigantic members of this group, a cast of the skeleton of one of which—the *Megatherium*—forms a prominent object in the centre of the New Building.

The Sloths are exclusively natives of South America. They are arboreal animals, rarely touching the ground save to pass from one tree to another. To this mode of life their structure is

peculiarly adapted, the middle fingers and toes being provided with long curved claws, two or three in the front, and always three in the hind feet, which form very efficient hooks, by means of which the sloth climbs or rests body downwards. The collection includes specimens both of the three-toed and of the two-toed forms.

Another group of the order Edentata is the Ant-Eaters, represented in the collection by the Tamandua, the Little Ant-Eater, and the Scaly Ant-Eater.

Of these the Scaly Ant-Eaters or Pangolins, which are found in Africa and in Asia, are perhaps the most remarkable, having the body covered with overlapping horny scales, and all having the claws of the front foot bent under so that the weight of the body rests partly on the dorsal surface of those, but mainly on the soles of the hind feet, which rest flat on the ground. The specimen in the case is the Great Manis or Pangolin (*Pholidotus* or *Manis giganteus*) a native of West Africa.

The South American Ant-Eaters on the other hand have no horny scales, but are clothed with fur, and the front foot rests on its outer edge in walking. Representing this group is a stuffed specimen of the Little Ant-eater (*Myrmecophaga didactyla*) and a skeleton of the Great Ant-Eater (*Myrmecophaga jubata*).

The Armadilloes are another very interesting family of this curious order, having the body covered with a bony armour formed of movable shields or bands of bony plates which are differently arranged in the different genera and species. The only species represented in the collection is the Peba (*Tatusia* or *Dasypus peba*) a species of wide range, occurring in Texas, Mexico, Central America, Guiana, Brazil and Paraguay; a skeleton of the same is shewn beside it.

In the same case is a specimen of the Crab-Eating Opossum—representing the American family of Marsupials, the Didelphidæ, or true Opossums. The American Opossums resemble the Australian Opossums or Phalangers in their arboreal habits, in the possession of long prehensile tails and in having the inner

toe of the hind foot capable of acting thumb-like against the others so as to enable the animal to grasp firmly; but in their diet, which is mainly of animal nature, their teeth, and many other points, they differ entirely from the Phalangers.

FOREIGN BIRDS.

In the wall-cases in the gallery of the old building (12) are arranged the foreign birds. The Diurnal Birds of Prey—Eagles, Vultures, Falcons, Kestrels, Hawks, Kites—are arranged in the cases along the west half of the north wall. [The names of the orders are placed over the cases]. Among those attention may be called to the Griffon Vulture of Southern Europe (*Gyps fulvus*) the Black Vulture (*Vultur monarchus*) of Africa, and the great American Condor (*Sarcorhamphus gryphus*), which attains a length of three and a half feet; to the Secretary Bird (*Serpentarius secretarius* or *S. reptilivorus*) of Africa, noted for its snake-killing habits, the Goshawk (*Astur palumbarius*) of Northern Europe and Asia, the European Sparrow-Hawk (*Accipiter nisus*), the European Buzzard (*Buteo vulgaris*), the Lämmergeier (*Gypaëtus barbatus*), the Golden Eagle (*Aquila chrysaetus*), the European Kite (*Milvus ictinus*), the Peregrine Falcon (*Falco peregrinns*), the Osprey or Fishing Eagle (*Pandion haliaetus*), which is found nearly all over the world. Next to these, passing round to the right, are the Nocturnal Birds of Prey or Owls. Following the Owls are the Night-Jars or Goat-Suckers (Fam. *Caprimulgidæ*) the Swifts (*Cypselidæ*), the Swallows (*Hirundinidæ*), the Rollers (*Coraciidæ*), the Broadbills (*Eurylæmidæ*), the *Todidæ*, the Motmots (*Momotidæ*), the Trogons (*Trogonidæ*), the Buccos (*Bucconidæ*), the Kingfishers (*Alcedinidæ*), and the Bee-Eaters (*Meropidæ*). These all belong to the suborder *Passeres fissirostres*.* Then follow the various families of the *Passeres tenuirostres*—the Hoopooes (*Upupidæ*), the Sun-Birds (*Promeropidæ*) the American Creepers (*Cœrebridæ*), the Humming-Birds (*Trochilidæ*), the Honey-Eater (*Meliphagidæ*), the Climbers (*Anabatidæ*), the Creepers (*Certhidæ*), and the Wrens (*Troglo-*

* The classification followed with these birds is a somewhat old one, but is adopted as a matter of convenience.

dytidæ. After these come the *Passeres dentirostres*—the Warblers and their allies, the Tits, the American Warblers (*Mniotiltidæ*), the Wagtails and Pipits (*Motacillidæ*), the Thrushes (*Turdidæ*), the Bulbuls (*Pycnonotidæ*), the Drongos (*Dicruridæ*), Wood-Swallows (*Artamidæ*), Orioles (*Oriolidæ*), Ground-Thrushes or Ant-Thrushes (*Pittidæ*), the American Ant-Thrushes (*Formicariidæ*), the Fly-Catchers (*Muscicapidæ*), the Tyrant Birds (*Tyrannidæ*), the *Ampelidæ*, American Chatterers (*Cotingidæ*), Greenlets (*Vireonidæ*) and the Shrikes (*Laniidæ*). In the next suborder—the *Passeres Conirostres*—are arranged the Crows and Ravens (*Corvidæ*), the Birds of Paradise (*Paradiseidæ*), the thrushes (*Sturnidæ*), the *Icteridæ*, the Weaver-Birds (*Ploceidæ*), the Tanagers (*Tanagridæ*), the Finches (*Fringillidæ*), the *Emberizidæ*, the *Colidæ*, and the Horn-Bills (*Bucerotidæ*). Then come the Scansores or Climbers, including the Toucans (*Rhamphastidæ*), the Woodpeckers (*Picidæ*), the Cuckoos (*Cuculidæ*), Parrots (*Psittacidæ*), Cockatoos (*Cacatuidæ*) and the Kakapos (*Strigopidæ*). The next case contains the order Columbæ or Pigeons with the singular Didunculus and the New Guinea Goura; and the next the Gallinæ, which contains the Sand-Grouse (*Pteroclidæ*), the Curassows (*Cracidæ*), the Megapodes (*Megapodidæ*), the Pheasants and Fowls (*Phasianidæ*) and the Grouse and Partridges (*Tetraonidæ*). Upon these follow the members of the order Cursores or Struthiones—the Ostriches, Emus, and Cassowaries, and the Kiwis. The next order consists of the Grallæ or Waders, containing the Bustards (*Otidæ*), Plovers (*Charadriidæ*), Oyster-Catchers (*Haematopidæ*), Cranes (*Gruidæ*), Herons, Bitterns (*Ardeidæ*), Spoonbills (*Plataleidæ*), Ibises (*Tantalidæ*) Snipe and Avocets (*Scolopacidæ*), Phalaropes (*Phalaropidæ*), Rails (*Rallidæ*), Water Hens and Coots (*Gallinulidæ*), and the Jacanas (*Parridæ*). In the last order,—the Natatores or Anseres—are arranged the Petrels and Albatrosses (*Procellaridæ*), Gulls and Terns (*Laridæ*), Auks (*Alcidæ*), Pelecans (*Pelecanidæ*), Divers (*Colymbidæ*), Gannets (*Sulidæ*), Grebes (*Podicipidæ*), Penguins (*Impennes*), Frigate Birds (*Phætonidæ*), Cormorants (*Spheniscidæ*), and Flamingoes (*Phaenicopteridæ*) and the Ducks, Geese, and Swans (*Anatidæ*).

INVERTEBRATA.

The collections of shells are at present being re-arranged in rooms Nos. 7 and 10; the principal portion is the Hargraves' Collection, purchased by Mr. Thos. Walker of Yaralla, from Mr. Hargraves by whom they were collected, for presentation to the Australian Museum. The specimens which belong to this collection will have "Hargraves' Coll." marked upon them. As the arrangement of these collections is not very far advanced at the time of writing this Guide, it will be impossible to say more at present with regard to their disposition. A Catalogue of the whole will be issued when the work of arrangement is completed.

The Insects are at present placed in the Old Building (No. 6) in two long cases running along the centre of the room. The case placed nearest the door contains the collections of foreign Coleoptera (beetles) and Lepidoptera (moths and butterflies) and the general collections (Australian and foreign) of Orthoptera (grasshoppers, locusts, etc.), Diptera (flies &c.) Neuroptera (Dragon-flies &c.), Hemiptera (bugs, etc.), and Hymenoptera (bees, wasps, etc). The other case contains the Australian collections of Coleoptera (beetles), and Lepidoptera (butterflies and moths). It is likely that the Insects will shortly be removed to No. 7.

The Spiders and Scorpions are placed in a case in room No. 7 (upper floor of New Building) together with the Centipedes and Millepedes.

The collection of Crustacea (Australian and foreign) will be found in room 9. A catalogue of the Australian Crustacea has recently been issued by the Trustees. In the same room are the collections of Echinodermata (Sea-urchins, Star-fishes, etc.) the Bryozoa and Zoophytes, glass models of Zoophytes, the Sponges, and a collection of models of Foraminifera. The corals will be found in room No. 7.

TYPE COLLECTION.

In the end room north in the upper floor of the New Building (No. 9) is placed a type collection or educational collection illus-

trating zoology and comparative anatomy. At present this is incomplete; but it will be found very useful to those making a general study of these subjects. It is made up largely of European specimens having been imported from Germany. The following notes are intended for students making use of the ordinary text-books of Zoology.

To begin with the lowest forms shewn, the class **Spongida** or Sponges is represented (1) by a section of the common Turkey sponge (*Spongia officinalis*), shewing the arrangement of the fibrous skeleton of the sponge, (2) by a fibrous sponge (*Suberites domuncula*) interstices in which are occupied by a Hermit Crab, (3) by *Tethea lyncurium*, another of the Fibrous Sponges, and (4) by *Spongilla fluviatilis* the common English Fresh-water Sponge.

The next class in ascending order—the **Hydrozoa**, or Zoophytes and Jelly-Fishes is illustrated by spirit specimens and glass models of Jelly-Fishes (order *Acalephae*), by *Oceania pileata* and *Æquorea Forskaliana*, which are medusiform gonophores, the first of one of the Hydroida Gymnoblastea, the second of one of the Hydroida Calyptoblastea; by *Sertularia myriophyllum* and *Campanularia* of the Calyptoblastic Hydroida, shewing the horny skeleton of the polype-colony or zoarium, consisting of branching tubes bearing a series of cups or hydrothecæ in which the polypes are contained; by the Portuguese Man of War (*Physalia*) one of the Siphonophora (suborder Physophora) shewing the bladder like dilatation of the proximal end of the cænosarc (the *pneumatophore)*, with its contained air-sac, the hydranths attached to the under surface of the cænosarc and the long thread-like feelers; by *Porpita*, another of the Siphonophora (suborder Discoidea), shewing the flat disk-like shape of the cænosarc with the chambered disk-like float or pneumatophore on its upper surface, the series of hydranths attached to its under surface, and the circlet of tentacles round the margin; and by *Velella*, an example of the same order as *Porpita*, but distinguished from it by the possession of the delicate vertical plate arising from the upper surface of the pneumatophore.

The class **Actinozoa** is represented in great part by glass models of sea-anemones and corals. A specimen in spirits of an *Actinia* and a large series of glass-models illustrate the family of the Actinidæ or Sea-Anemones, a family of the Zoantharia Malacodermata, shewing the short fleshy cylinder without skeleton of any kind composing the body, the circlets of tentacles surrounding the mouth, and the broad sucker-like base of attachment. The model of *Zoanthus Crouchii* represents the sub-family Zoanthinæ of the Actininæ, in which the anthozooid, in place of remaining solitary as in the case of the ordinary sea-anemones, gives off buds which form a branching colony of anthozooids connected by a soft cœnosarc. The family Cerianthidæ is represented by the models of *Ilyanthus scoticus*, *Cerianthus Lloydii C. membranaceus* and *Edwardsia callimorpha*, shewing the two circlets of tentacles and the pointed hinder extremity without a sucker-like base.

The models of *Balanophyllia italica*, *Caryophyllia Smithii*, *Cladocora caespitosa* and *Dendrophyllia ramea* represent the true hard corals, the *Zoantharia sclerodermata*, in which the body-wall of the anthozooids and the connecting cœnosarc (in the compound forms) is strengthened by carbonate of lime.

All the above-mentioned specimens and models of Actinozoa belong to the sub-division **Zoantharia**. The **Alcyonaria**, with fringed tentacles and with the mesenteries and tentacles in multiples of eight, are represented by models of the Red Coral (*Corallium rubrum*), the organ-pipe coral (*Tupipora*), and by spirit specimens of *Pennatula rubra*, *Alcyonium palmatum* and *Seripularia*.

In the class of the **Echinodermata** the Holothuroidea are represented by *Cucumaria pentactes* and *Holothuria tubulosa;* the Echinoidea by *Echinus saxatilis*, the Asteroidea by *Asteracanthion glacialis* and *Asteriscus palmipes*, the Ophiuroidea by *Ophiolepis ciliata* and the Crinoidea by *Comatula mediterranea*.

In the large and heterogeneous group, the so-called **Vermes**, the class **Cestoidea** or Tape-worms is illustrated by spirit speci-

mens of the common human tape-worm (*Taenia solium*) with its bladder-worm stage (*Cysticercus cellulosae*), *Taenia mediocanellata* also a common human parasite, the common tape-worm of the Dog (*Taenia cœnurus*), with its bladder-worm stage (*Cœnurus cerebralis*) from the brain of the sheep, the tape-worm of the Cat (*Taenia crassicollis*), *Cysticercus pisiformis* from the liver of the hare or the rabbit, and other species.

The class **Chaetognatha** is represented only by the aberrant *Sagitta;* and the **Acanthocephala** by specimens of *Echinorhynchus gigas* from the intestines of the swine.

The **Nematoidea** are illustrated by specimens of *Ascaris lumbricoides*, the human round-worm, by the round-worm of the Dog and Cat (*Ascaris mystax*) by *Spiroptera obtusa*, the thread-worm of the mouse, by *Oxyuris vermicularis*, a common human parasite, by *Filaria papillosa*, a thread-worm found in the horse, and others.

The **Trematoda** are represented by *Distoma hepaticum* (*Fasciola hepatica*) the liver-fluke, which is the cause of the disease known as "rot" in sheep, *Tristoma sturionis*, a parasite of the sturgeon, and *Diplozoon paradoxum*, a parasite on the gills of numerous fresh-water fishes, remarkable as being formed of two individuals united to form a double animal.

The Rhynchocœle **Turbellaria** are represented by a species of *Borlasia*, and the Dendrocœla by a species of *Planaria*.

The **Annelida** or **Chaetopoda** have the following representatives—*Aphrodita aculeata*, the northern Sea-Mouse, *Polynoë elegans*, a species of *Nereis*, *Arenicola piscatorum*, a species of *Serpula*, a species of *Sabella*, *Lumbricus agricola* the common English earth-worm, and *Enchytraeus galba*, a mud-worm. All these except the last two are examples of the Polychaeta, the last two alone representing the Oligochaeta; of the former the first three are members of the Errantia, the rest of the Tubicola.

Representatives of the **Hirudinea** are *Sanguisuga* (*Hirudo*) *medicinalis*, the English medicinal leech, *Sanguisuga* (*Hirudo*) *officinalis* a variety of the same, *Aulostomum gulo*, the horse-leech

of Europe, *Pontobdella muricata* a fish-leech, and *Clepsine complanata*, a European fresh-water leech. *Phascolosoma albo-lineata*, represents the class **Gephyrea** or spoon-worms (order Inermes).

The **Molluscan** type falls next to be illustrated in the collection. Examples of the class **Lamellibranchiata** or Bivalves are the common European Oyster (*Ostrea edulis*) with one valve removed so as to shew the arrangement of the mantle and the gills and the adductor muscle, the European sea-mussel (*Mytilus edulis*) with the right valve separated, *Lithodomus lithophagus*, a rock-boring mussel of Europe, a fresh-water mussel (*Unio pictorum*) with the adductor muscles divided and the two valves of the shell separated so as to shew the projecting foot in the middle with the folds of the mantle closely applied to the shell and the plate-like gills between the mantle and the foot, *Margaritana margaritifera*, *Solen vagina* the rasor shell, *Pholas dactylus* and *Teredo navalis* the "ship-worm."

The sub-class Pulmonata of the class **Gasteropoda** is illustrated by a slug (*Limax cinereo-niger*), *Arion empiricorum*, the European garden-snail (*Helix pomatia*), and the European pond-snail, (*Limnaeus stagnalis*). The sub-class Branchiogasteropoda is represented by *Paludina vivipara*, *Cerithium* sp. *Haliotis tuberculata*, *Aplysia virescens*, a sea hare, *Doris* sp., *Tethys fimbria*, and *Glaucus atlanticus*. Of these the first four are examples of the Prosobranchiata, the remainder of the Opisthobranchiata, the last three belonging to the sub-division Nudibranchiata or Gymnobranchiata.

The **Cephalopoda** are represented (in the Dibranchiate order) by the common Octopus (*Octopus vulgaris*) and by a glass model of the same, by *Eledone moschata*, by the common Cuttle-fish (*Sepia officinalis*), *Loligo vulgaris*, *Sepiola Rondeletii*, and by the eggs of a Cephalopod. The **Pteropoda** are represented by *Clio borealis* and *Hyalea tricuspidata*.

The **Brachiopoda** are represented only by a specimen of *Lingula anatina* with the valves separated to shew the arrangement of the viscera.

Representatives of the **Bryozoa** are the fresh-water *Alcyonella stagnorum* and *Plumatella repens*, and the marine *Hornera frondiculata* (Cyclostomata) and *Flustra foliacea* (Cheilostomata).

The **Tunicata** are represented by a specimen of *Cynthia microcosmus* cut open so as to shew the disposition of the soft parts within the test; *Ascidia cristata*, *Phallusia mammillata*, *Botryllus* sp., *Pyrosoma atlantica* and *Salpa spinosa*. Of these the first three illustrate the Ascidiæ simplices, Botryllus is an example of the Ascidiæ compositæ, *Pyrosoma* of the Ascidiæ salpæformes, and *Salpa* of the Thaliacea.

The **Crustacea** are illustrated by a considerable series of types representing the many sub-divisions of this class.

Among the **Malacostraca** the Macrourous Decapods are represented by *Scyllarus Arctus*, one of the family Palinuridæ, *Astacus fluviatilis*, the English fresh-water Crayfish, *Homarus vulgaris*, the common European lobster, *Nephrops norvegicus*, the Norway lobster, *Crangon vulgaris*, the common English shrimp, *Palaemon antennarius*, a prawn, and *Phyllosoma commune*, which is the larval form of a *Palinurus*. The Anomoura are exemplified only by *Pagurus maculatus*, a Hermit-Crab. The Brachyura are represented by *Maja* sp., *Carcinus mœnas*, *Pilumnus hirtellus*, *Gonoplax rhomboideus*, *Ilia nucleus*, and *Gelasimus* sp. The Stomatopoda are exemplified by *Squilla mantis* and by a larval form—*Erichthus*. *Lucifer* and *Mysis flexuosa* are representatives of the *Schizopoda*. Among the Edriophthalmia the Amphipoda are represented by *Gammarus pulex*, the Laemodipoda by *Cyamus ceti* and *Caprella* sp, the Isopoda by *Asellus aquaticus*, *Limnoria terebrans*, *Oniscus murarius*, *Idotea entomon*, *Idotea hectica*, *Sphaeroma cinerea*, *Cymothoa œstrum*, and *Bopyrus squillarum*. *Limulus polyphemus*, the King-crab is the representative of the **Merostomata**. Of the **Entomostraca**, *Branchipus stagnalis* *Artemia salina*, *Apus cancriformis*, *Limnadia tetracera* and *Daphnia pulex* are illustrative of the Phyllopoda, *Cypris pubera* of the Ostracoda, *Argulus foliaceus* (a parasite of the Stickleback), *Caligus gracilis*, *Nicothoë astaci* (a parasite of the fresh-water crayfish), *Dichelestium sturionis* (a parasite of the sturgeon),

Achtheres percarum (a parasite of the perch), *Lernaea branchialis* (a parasite on the gills of the cod), and *Branchiella* sp. are all parasitic Copepoda. The following specimens are examples of the *Cirripedia—Dichelaspis Darwinii, Cyncras vittata, Scalpellum vulgare, Coronula testudinaria,* and *Balanus psittacinus.*

The **Arachnida** are represented, as regards the order Scorpionidea, by *Buthus afer* an African scorpion, and *Scorpio Europaeus.* The order Araneidea is exemplified by *Epeira diadematа, Argyroneta aquatica, Tegenaria domestica, Tetragnatha extensa* and *Lycosa tarantula.* The order Pseudoscorpionidea is represented by *Chelifer ixoideus,* and the order Acarina by *Trombidium tinctorium* and *Ixodes ricinus. Pycnogonum littorale* is an example of the order Pycnogonida which is sometimes placed with the Crustacea.

Representing the order Diptera of the **Insecta** are stages in the development of a blow-fly, the larva of *Hypoderma bovis,* and stages in the development of a gnat (*Culex pipiens).* The Hymenoptera are represented by stages in the development of the honey-bee (*Apis mellifica*); and the Coleoptera by stages in the development of *Cetonia aurata, Bostrychus typographus* and *Tenebrio mollis.*

Of the class **Myriopoda** the order Chilognatha is represented by *Glomeris pustulata, Polydesmus complanatus* and *Iulus bilineatus;* the order Chilopoda by *Lithobius forficatus.*

Among the spirit-specimens of Fishes, the sub-class **Pharyngobranchii** is represented by a specimen of its only member, the well-known Lancelet—*Amphioxus lanceolatus.*

The **Marsipobranchii** are represented by *Petromyzon marinus* the European sea-lamprey (a transverse section of the body), by a specimen of the river-lamprey, *Petromyzon fluviatilis,* one of *Petromyzon Planeri,* and *Ammocœtes,* which is the young of the river-lamprey.

Representatives of the sub-class **Elasmobranchii** are the electric torpedo (*Torpedo Galvani*), shewing the electric organ, and a species of *Raja,* both representing the order Plagiostomi;

and by *Squalus canicula* (with its eggs), a member of the sub-order Selachii of the Plagiostomi.

The sub-class **Ganoidei** is represented by the Sturgeon (*Accipenser ruthenus*).

The remainder of the Fishes are members of the sub-class **Teleostei** or Bony Fishes, and illustrate the various sub-divisions of that group.

The structure of the skeleton of fishes is illustrated in the Elasmobranchii* by skulls of several sharks and dog-fishes; and as regards the Teleostei by skeletons of the turbot (*Rhombus maximus*), a cod (*Gadus* sp.), the pike (*Esox lucius*), and the carp (*Cyprinus carpio*).

The bones of one or two of the skeletons among the fishes and in each of the other groups have had small numbers attached to them as follows:—

1. Basioccipital.
1¹. Basitemporal (in birds).
2. Exoccipital.
3. Supraoccipital.
4. Basisphenoid.
5. Parietal.
6. Presphenoid.
7. Alisphenoid.
8. Frontal.
9. Orbitosphenoid.
10. Ethmoid.
11. Vomer.
12. Squamosal.
12¹. Tympanic.
13. Proôtic.
14. Opisthotic.
15. Epiotic.
16. Pterotic.
16¹. Parotic processes.
17. Malar or jugal.
18. Quadrate.
19. Quadrato-jugal.
20. Maxilla.
21. Premaxilla.
22. Nasal.
23. Palatine.
24. Pterygoid.
24¹. Transverse bone (in reptiles).
25. Entopterygoid.
25¹. Columella (in skull of some lizards).
26. Ectopterygoid.
27. Metapterygoid.
28. Symplectic.
29. Supraorbital.
29a. Infraorbital.
30. Prefrontal.
31. Postfrontal.
32. Operculum.
33. Preoperculum.
34. Suboperculum.
35. Interoperculum.
36. Lachrymal.
37. Mandible.
38. Dentary.
39. Splenial.

* For entire skeletons see the collection of Australian Fishes.

40. Angular.
41. Articular.
42. Hyomandibular.
43. Stylohyal.
44. Epihyal.
45. Ceratohyal.
46. Basihyal.
47. Entoglossal.
48. Urohyal.
49. Branchiostegal rays.
50. Branchial arches.
51. Hypopharyngeal.
52. Epipharyngeal.
53. Coracoid.
53^1. Coraco-scapular.
54. Precoracoid.
55. Epicoracoid.
56. Scapula.
57. Clavicle.
58. Supraclavicle.
59. Postclavicle.
59^1. Interclavicle.
60. Posttemporal.
61. Humerus.
62. Radius.
63. Ulna.
64. Scaphoid.
65. Semilunar.
66. Unciform.
67. Trapezium.
68. Trapezoid.
69. Magnum.
70. Cuneiform.
71. Pisiform.
72^1, 72^2. etc., Metacarpals.
73^1, 73^2. etc., Phalanges.
74. Pelvic arch.
75. Ilium.
76. Ischium.
77. Pubes.
77^1. Marsupial bone.
78. Femur.
79. Tibia.
79^1. Tibio-tarsus,
80. Fibula.
81. Astragalus.
81^1. Tarso-metatarsus.
82. Calcaneum.
83. Scaphoid.
84. Lunare.
85. Ectocuneiform.
86. Entocuneiform.
87. Mesocuneiform.
88. Sternum.
89. Entoplastron.
90. Epiplastron.
91. Hyoplastron.
92. Hypoplastron.
93. Xiphiplastron.
84. Costal plates.
95. Marginal plates.
96. Nuchal plates.
97. Pygal plates.

Of the class **Amphibia** the order Anoura is illustrated by *Rana esculenta*, the common edible frog of Europe, *Alytes obstetricanus* (the male of which carries the eggs attached to his hind legs), *Bufo variabilis*, the variable toad, a tree-frog (*Hyla arborea*) and *Pelobates fuscus;* the order Urodela is represented by the spotted salamander (*Salamandra maculata*), the common newt (*Triton cristatus*), and the larva of the same species, and by the spotted newt (*Triton punctatus*). The osteology of the

Amphibia is illustrated by the skeletons of *Salamandra maculata* and *Rana esculenta ;* and the development by specimens in spirits of stages in the development of the Frog, and by models in wax shewing the same on an enlarged scale. Of the latter which are placed on a glass shelf in the centre of the case No. 1 :—

1.—Represents the unimpregnated egg, shewing the darker and lighter halves, with the " foggy mark " in the centre of the former.

2.—A section of the egg before segmentation has commenced, shewing the nucleus and the yolk-spheres.

3.—A section of the egg shewing the penetration of its substance by the spermatozoon.

4.—Section shewing the spermatozoon and the egg-nucleus or germinal vesicle in the act of coalescing.

5.—Section shewing the first appearance of the process of segmentation, the germinal vesicle having become divided into two and a cleft having made its appearance partially dividing the substance of the egg into two halves.

6.—The whole egg shewing the complete extension of the cleft round the egg and the consequent division of the egg into two halves or blastomeres.

7.—The next stage in the process of segmentation—the egg divided into four blastomeres by subdivision of the two primary blastomeres.

8.—A further stage; eight blastomeres formed, the four on the dark side of the egg much smaller than the four on the light side.

9, 10, and 11.—Successive stages in the process of segmentation.

12.—The morula or mulberry mass resulting from the process of segmentation, consisting of a mass of cells of which those situated on the light side are larger than those on the dark side of the egg.

13.—A vertical mesial section through the egg at a somewhat later stage shewing the blastocœle or cleavage-cavity with the first trace, indicated by a faint groove coloured pink, of the

invagination, or rather cleft, which subsequently forms the enteron, beginning near the circumference of the white area.

14 and 15.—Sections shewing the further growth inwards of the invagination.

16.—Section to shew the encroachment of the primitive enteron upon the blastocœle and the diminution of the latter.

17.—A section at a later stage when the blastocœle has altogether disappeared and the enteron has assumed a large size. The neural groove has made its appearance on the dorsal aspect of the egg.

18.—Section shewing a further stage in the development of the central portion of the nervous system; the lips of the neural groove are growing up on either side of it. The notochord (coloured white) is now being formed from the mesoblast below the neural groove.

19.—Vertical mesial section through the embryo at a somewhat later stage. The lips of the neural groove have now united along the middle line above so as to convert the neural groove into a canal lined by epiblast cells (coloured pink) from which the substance of the brain and spinal cord has now begun to be developed.

20.—A similar section at a later stage. The embryo is now much elongated. The neural canal has become widely dilated in front, and the dilatation has begun to be divided into three portions representing the fore-mid- and hind-brain. The mouth is beginning to be formed, but does not yet communicate with the cavity of the enteron.

21.—Model of the entire embryo at a later stage, shewing the rudimentary mouth and nostrils, gill-clefts and eyes.

22.—Early tadpole stage with external gills.

23.—Later tadpole stage; the external gills aborted and internal gills developed, the gill-slits covered by an opercular membrane.

The sub-order Annulata of the **Lacertilia** is represented by *Amphisbaena flavescens*, the suborder Fissilinguia by *Lacerta agilis*, *Lacerta viridis*, *Lacerta muralis* and *Zootoca vivipara*, the suborder Crassilinguia by *Stellio vulgaris*, *Phrynosoma Harlami*, and *Draco volans*, the Brevilinguia by *Scincus officinalis* and *Anguis fragilis;* the Vermilinguia by *Chamæleon africanus*. The osteology of the Lacertilia is illustrated by skeletons of *Monitor varius*, *Lacerta viridis*, *Grammatophora barbata*, *Draco volans*, and *Stellio vulgaris*, and by the skull of *Anguis fragilis*.

The class **Ophidia** is represented by *Vipera ammodytes* and *Pelias berus* (Section Viperina) and by *Hydrophis* sp., *Elaps corallinus* and *Pelamis bicolor* (Section Colubrina).

Representing the **Chelonia** are spirit specimens of *Emys europea*, *Chelonia virgata* and *Testudo graeca*, and skeletons of the same three species.

The order **Crocodilia** is exemplified by a spirit specimen of a young *Alligator lucius*, and a disarticulated skeleton of the same.

The class **Aves** is represented by a series of skeletons of a variety of types.

The class **Mammalia** is represented by the following specimens in alcohol—*Rhinolophus hippocrepis*, *Plecotus auritus*, and *Vesperugo noctula* (order Cheiroptera) *Sorex araneus*, a shrew (order Insectivora), *Hypudaeus arvalis* and *Mus musculus* (order Rodentia); and by skulls of a lemur, of the Polar Bear (*Ursus maritimus*), of the long-snouted bear (*Nasua socialis*), of the fox (*Canis vulpes*), the marten (*Mustela vulgaris*), the badger (*Meles taxus*), a seal (*Cystophora cristata*), the hedgehog (*Erinaceus europaeus*), the stag (*Cervus elephas*), the roe (*Cervus capreolus*), the sheep (*Ovis aries*), the goat (*Capra hircus*), the bull (*Bos taurus*), the wild boar (*Sus scrofa*), the guinea-pig (*Cavia cobaya*) the mouse (*Mus musculus*), a marmot (*Arctomys bobac*), the wombat (*Phascolomys fossor*), and the Virginian opossum (*Didelphis Virginiana*); and skeletons of the Chimpanzee, a baboon, a marmoset (*Hapale Jacchus*) a Cebus monkey, a bat (*Vespertilio murinus*), a lion (*Felis leo*), a dog (*Canis familiaris*), a marten (*Mustela foina*), a mole (*Talpa europaea*), a rat (*Mus*

decumanus), a rabbit (*Lepus cuniculus*), a sloth (*Cholæpus didactylus*), a Cape hyrax (*Hyrax capensis)*, and an Echidna (*Echidna hystrix)*.

Human anatomy is illustrated by the articulated skeleton in a special case, by a disarticulated set of bones, and by a disarticulated skull, a model in papier mâché of the head and trunk, a model of the leg dissected to shew the superficial muscles, one of the arm, and one of the eye. There are also a set of casts of skulls of various types.

In the model of the head and trunk the head is represented as dissected, so as to shew on the left side the deeper structures, and on the right to shew the facial muscles and the superficial vessels and nerves.

The *bones* of the skull exposed by the removal of the scalp on the left side are (1) the frontal, (2) the parietal, (3) the supra-occipital, (4) the alisphenoid, (5) the squamosal, (6) the mastoid (7) the malar, (8) the zygomatic process of the squamosal, (10) the maxillæ, (11) the mandible.

The *facial muscles* shewn on the right side are attollens aurem (numbered 3), retrahens aurem (4), orbicularis palpebrarum (5), pyramidalis nasi (6), levator labii superioris alæque nasi (7 and 9) orbicularis oris (8), levator labii superioris (10), zygomaticus minor (11), zygomaticus major (12), depressor labii (13), levator menti (15), risorius (16), buccinator (17), temporalis (18), masseter (19).

The external pterygoid is shewn on the left side.

The *muscles of the neck* shewn are the stylo-hyoid (21), the posterior belly of the digastric (20), the mylohyoid (22), the hyoglossus (23), the sternohyoid (25), the anterior belly of the omohyoid (26), the thyro-hyoid (27), the inner constrictor (29), the sterno-cleido-mastoid (30), the scalenus anticus (31), and scalenus medius (32), the splenius (33), and trapezius (34).

The *nerves of the face and neck* shewn in the model are the supraciliary (piercing the orbicularis palpebrarum), the temporal (on the temporal muscle), the malar, infraorbital and buccal (on

the sides of the cheek), the supramaxillary (on the lower jaw), branches of the mental (piercing the depressor anguli oris) the auricularis magnus (x.), mastoid (xi.), and occipitalis minor, the hypoglossal (vii.), spinal accessory (vi), phrenic (viii.), and the nerves of the brachial plexus (xiv.).

On the left side a portion of the lower and upper jaws is represented as having been removed so as to shew the dentary arteries, veins, and nerves, with their branches to the pulp-cavities of the teeth.

The hyoid bone, thyroid cartilage and trachea are shewn in the middle line of the neck.

The *glands* represented are the parotid (*a*), and submaxillary (*b*).

In the thorax are shewn the oesophagus and trachea, lungs, heart, and great blood-vessels. The lungs are represented as divided by a nearly vertical incision on a level with the point of entry of the vessels and the bronchi so as to shew the mode of distribution of their branches, the pulmonary arteries being coloured blue, the pulmonary veins red, and the air-tubes white.

In the heart the right auricle is coloured brown, the venæ cavae which open into it blue. The right ventricle (coloured yellow mottled with brown) giving off the pulmonary artery (coloured blue) shews in its interior the tricuspid valve with the chordæ tendineæ and musculi papillares.

The left auricle is coloured pink, and the pulmonary veins which open into it are coloured red. The left ventricle (coloured like the right), shews in its interior the bicuspid or mitral valve. The aorta is coloured red, and at its commencement are shewn the semilunar valves.

The branches give off from the arch of the aorta (M) are the right innominate, the left carotid (C) end left subclavian (A). The inferior thryroid (B) and transversalis colli (D) branches are shewn; together with the facial (G) lingual (F) and superior thyroid (E) the temporal (K) posterior auricular (H) and occipital branches of the external carotid.

The corresponding veins are coloured blue.

The diaphragm is represented separating the thorax and abdomen. In the abdomen are shewn the liver (G) with the gall-bladder (coloured green) and the termination of the portal vein (E), the stomach (D), spleen (H), duodenum (I), pancreas (J), the jejunum and ileum, the large intestine (F) with its ascending (H), transverse and descending (K) portions, the first shewing at its commencement the cœcum and vermiform appendix, and the last terminating in the rectum.

On the posterior wall of the abdomen are represented the kidneys (K) with the suprarenal bodies and the ureters, and in the pelvis is shewn the urinary bladder (coloured white).

In the model shewing the superficial muscles of the human arm the muscles represented are:—

1. Deltoid.
2. Pectoralis major.
3. Latissimus dorsi.
4. Teres major.
5. Biceps.
6. Coracobrachialis.
7. Brachialis anticus.
8. Triceps.
9. Supinator radii longus.
10. Extensor carpi radialis longior.
11. Pronator radii teres.
13. Flexor carpi ulnaris.
14. Flexor sublimis digitorum.
15. Palmaris longus.
16. Flexor carpi radialis.
18. Extensor carpi radialis brevior.
19. Extensor communis digitorum.
20. Extensor minimi digiti.
21. Extensor carpi ulnaris.
23. Extensor primi internodii pollicis
24 Extensor secundi internodii pollicis.
25. Extensor ossis metacarpi pollicis
26. Abductor and opponens pollicis.
27. Flexor brevis pollicis.
28. Adductor pollicis.
29. Abductor minimi digiti.
30. Flexor brevis minimi digiti.
31. Lumbricales.

The nerves shewn are the median and ulnar, accompanied by the brachial artery and vein. The ulnar artery is shewn at the wrist entering the palm and forming the superficial palmar arch. The radial artery is represented turning round the radial border of the lower end of the forearm beneath the tendons of the extensor muscles of the pollex to reach the interspace between the first and second digits. V is the annular ligament of the wrist.

In the model of the human leg the skin and subcutaneous fascia are supposed to be removed so as to display the superficial muscles. The muscles represented are:—the external oblique (1), the sartorius (4), the tensor vaginæ femoris (5), the pectineus (6), the iliacus (7), the psoas (8), the adductor longus (10), the vastus internus (12), the vastus externus (13), the rectus femoris (14), the gracilis (15), the adductor magnus (16), the gluteus maximus (17), the biceps (19), the semitendinosus (9), the semimembranosus (18), the tibialis anticus (20), the extensor longus hallucis (21), the extensor communis digitorum (22), the peroneus longus (24), the peroneus brevis (25), the peroneus tertius (23), the gastrocnemius (26), the soleus (27), the flexor longus hallucis (28), the flexor longus digitorum (29), the extensor brevis hallucis (31), the extensor brevis digitorum (32), the flexor brevis digitorum (35), the lumbricales (36), the abductor hallucis (37), the flexor brevis hallucis (38), the adductor hallucis (39), the abductor minimi digiti (40), the flexor brevis minimi digiti (41).

Other structures represented are the femoral artery (*a*) with the femoral vein and the branches of the anterior crural nerve, the external abdominal ring (*b*) with its outer (*h*) and inner (*e*) pillars, Pouparts ligament (*c*), fascia of the thigh (*k*), tendo Achillis (*l*), patella (*m*), internal malleolus (*q*), external annular ligament (*r*), anterior annular ligament (*u*), calcaneum (*v*).

The model of the eye represents a vertical section through the right orbit. The skin is supposed to have been removed from the front of the face displaying some of the facial muscles, nerves and blood vessels. The facial muscles shewn are the orbicularis palpebrarum (*r*) with its internal tendon (*u*) attached to the inner angle of the orbit, the superciliaris (*s*), the pyramidalis nasi (*pn*), the levator alæ nasi (*p*) and the compressor narium(*g*). Within the cavity of the orbit is represented the left half of the eyeball with the nerves and muscles in connection with it. The muscles shewn are the superior, inferior, and internal recti (*m*), and the superior and inferior obliqui (*n*) the tendon of the

superior passing through a fibrous pulley on the internal angular process of the frontal bone.

The nerves shown are (1) the branches of the supratrochlear and supraorbital nerves, the optic nerve (*l*) the ophthalmic (*w*) and superior maxillary divisions of the fifth nerve, with the frontal and nasal branches of the former, the sixth nerve going to supply the external rectus muscle of the eyeball, the fourth passing to supply the superior oblique, and the third supplying the internal, superior, and inferior recti.

The arteries shewn are the facial artery ascending at the side of the nose, giving off the lateralis nasi, and terminating in the angular at the inner angle of the orbit, the infraorbital passing through the infraorbital foramen, the ophthalmic with its ciliary, supraorbital, frontal and nasal branches.

At the inner angle of the orbit is represented the lachrymal sac.

In the eye itself are shewn the fibrous external capsule or sclerotic, continuous in front with the transparent cornea and forming a sheath for the optic nerve (*l*); the choroid (*c*) connected firmly in front with the iris (*f*) with its circular aperture—the pupil. On the surface of the choroid are represented the ciliary arteries and nerves and the *vasa vorticosa*. Within the capsule formed by the choroid and sclerotic are shewn the vitreous humour with, in front of it and behind the iris, the crystalline lens; behind the iris are represented the ciliary processes. Internal to the choroid are represented the several layers of the retina.

ETHNOLOGY.

Owing to lack of space not many ethnological specimens are at present on exhibition; but examples from some collections recently purchased will be found in rooms 7 and 10. These consist of various articles of dress and ornament worn by the natives of New Guinea, the Solomon Islands, the Admiralties, etc., with their cooking utensils, apparatus for betel chewing, cava-bowls, tobacco-pipes, musical instruments, canoe-paddles, tomahawks and weapons. There are also a series of casts of some rare New Zealand weapons, etc., and a collection of pre-

historic stone implements from Europe. It is to be hoped that before long accommodation will be provided for the systematic display of a more complete series of ethnological specimens, for, though the whole of the very extensive and valuable ethnological collections of the Museum, including many objects which can never be replaced, were destroyed in the fire of the Garden Palace, (where they were about to be exhibited for lack of proper accommodation in the Museum itself) a considerable number of specimens are now being got together again and remain stored away for the present.*

MINERALS.

The second room south in the first floor of the New Building (11 in plan) contains the general collection of minerals and a special collection of rocks. This collection was purchased for the Museum some years ago by Professor Liversidge during a visit to Europe, and contains a large number of carefully selected and valuable specimens, some of them almost unrivalled. To examine the collection systematically, the visitor should begin with the cases placed against the wall on the left-hand side of the entrance. First come the minerals formed of carbon including diamond, graphite, coal, lignite, &c. The largest specimens of graphite or black lead, so largely used in the manufacture of pencils, are in special cases on the opposite side of the room. They are from Ceylon; but in the same case is a smaller specimen from the celebrated graphite mine at Borrowdale in Cumberland. The discoverer of deposits of good graphite in New South Wales would speedily enrich himself, as the mineral is of considerable commercial value. In the same case as one of the large specimens of graphite are specimens of torbanite, a variety of cannel coal, used for making mineral lamp oils &c. Returning again to the left-hand (east) side of the room, among other carbon compounds will be seen specimens of bitumen or asphalt, and ozokerit or

* It is likely that before this edition of the Guide is exhausted, the Ethnological specimens will be arranged in the gallery of the Old Building (12), taking the place at present occupied by the foreign birds, which will be placed in room No. 10.

mineral wax, the former employed extensively for paving, the latter consisting chiefly of solid paraffin and used in the manufacture of candles; and specimens of amber—a fossil resin—so largely used in the manufacture of pipes and fancy articles, and found in nodules of various sizes in brown-coal formations; one of the specimens encloses the remains of insects. Next to these are the boron minerals. The sulphur specimens follow the boron; some of the finest specimens are from Girgenti in Sicily, in which island the most productive sulphur mines occur; another specimen is associated with the rather rare element selenium. Following the sulphur are the minerals composed of silica. These include the specimens of crystallized quartz or rock crystal—some of them being of the "drusy" variety, *i.e.* containing cavities filled with liquid; also the amethyst which is a variety of quartz coloured with binoxide of manganese; aventurine, a form of quartz impregnated with mica, and often imitated artificially by glass impregnated with small particles of copper; agates, onyxes, and opals, all of which are much employed as ornamental stones.

The next cases contain the silicates, which are compounds of silicic acid or silica with various bases—soda, potash, lime, magnesia, alumina, iron, &c. Of these attention may be directed to a large specimen of meerschaum, which is a hydrated silicate of magnesia. This mineral is obtained in various parts of Europe, but most largely in Asia Minor, and its principal use—for the manufacture of pipes—is well known; it occurs in veins and nodules in serpentine rocks, and when first dug out is soft and lathers like soap. Asbestos, which is a silicate of magnesia and lime, is remarkable for its fibrous structure, which has enabled it to be used for weaving fire-proof garments, for the packing of engines, and for various other purposes in connection with the arts; its properties were known to the ancients, by whom it was used for the manufacture of napkins which could be cleansed by being thrown into the fire, and for wicks for lamps in the temples. Next to these are specimens of jade, a mineral much used in making ornamental articles. Among the felspars the moonstone (adularia) specimens may also be specially noticed as

an ornamental stone, reflecting the light in a peculiar manner, producing a pearly play of colour not unlike the lustre of the moon, which has given origin to the common name of the stone. In the same class attention may be directed to the specimens of labradorite, the finest of which is on a special pedestal near the centre of the room. This is a highly ornamental stone, taking a fine polish, the surface displaying beautiful prismatic hues. Amazon stone, another felspar, also used for ornamental purposes, is represented by some unusually large crystals. Following upon those are the different varieties of garnets, the almandine being well known as a jewel-stone, and fine prisms of epidote. To these succeed the *zeolites*, hydrous silicates of alumina, and often alkalies and alkaline earths, usually found in interstices of igneous rocks, such as basalts, from whose decomposition they are derived. Chlorite, which is a hydrous magnesian silicate, is very often found associated with magnetic iron. Muscovite or mica is a nearly transparent silicate of alumina and potash, which takes the form of exceedingly thin transparent layers, formerly used in place of window-glass or as a substitute for horn in lanterns, now employed for lamp-reflectors and the fronts of gas stoves, and still used in place of window-glass in the Russian navy, being tough and not liable to fracture by the concussion of powerful guns. To these succeed the emeralds, aquamarines, a magnificent specimen of beryl, one of the largest in the world, and the zircons. Then comes topaz and red tourmaline (rubellite), both valued as gem stones; a particularly fine specimen of the latter in the British Museum is valued at £1000. The common tourmaline is also used as a gem stone, but is more valuable on account of its optical properties—its power of polarizing light. Near these is a fine specimen of lapis lazuli, also used in the manufacture of jewellery and mosaics, and formerly used for the production of ultramarine, which is now manufactured artificially.

Following the silicate is a case of various kinds of salts from Stassfürth; then comes the chloride of sodium or rock salt, a very fine specimen of which is placed in a special case further round to the right; the specimens of baryta, a mineral

used largely to adulterate white lead; celestine (sulphate of strontia), so named from the blue tint which it frequently assumes—a mineral from which the substance used to produce the red light in fireworks is derived. To these succeed the compounds of lime, comprising choice specimens of calcite, fluor-spar, selenite, anhydrite and apatite. A fine violet variety of fluor-spar called "Blue John" is much used in the manufacture of ornamental articles. Its principal uses in the arts are as a flux for lead, and in the manufacture of hydrofluoric acid for etching on glass. If we look through a crystal of fluor-spar it will appear yellow or green; but if we look at it in such a way that the light is reflected it will appear blue or purple; this phenomenon is known as fluorescence and is exhibited by some other substances, such as a solution of sulphate of quinine. The massive variety of selenite is known as alabaster, and is much employed for the manufacture of ornamental vases and the like. The finer varieties of anhydrite are used for a similar purpose. Apatite where it occurs in quantities sufficient to be systematically worked is a mineral of considerable value for the manufacture of artificial manure.

In one of the special higher cases is a group of remarkably large crystals of Iceland-spar, and in another is one of the largest crystals of apatite that have ever been discovered. Then come the metallic minerals.

Among the zinc minerals are particularly fine specimens of calamine (carbonate of zinc), and smithsonite (silicate of zinc); also of zinc-blende or Black Jack, which is the chief English ore of this metal. This ore occurs chiefly in association with galena, in veins in the carboniferous and magnesian limestones. Zinc is now largely imported into the United Kingdom from the United States, where the principal ore is calamine. Next to these are the manganese minerals, the principal being pyrolusite; manganese is used in the manufacture of chlorine for bleaching powder, in the manufacture of flint-glass, black enamel for pottery and Bessemer steel, and in calico printing. A large specimen of pyrolusite is shewn in a special case placed against the west wall of the room. A specimen of rhodonite, which

is a silicate of manganese, exhibits the beautiful pink hue which renders it valuable for ornamental purposes. The iron minerals come next, the first specimens being examples of meteoric iron which is an alloy chiefly of iron and nickel. Near it are the long silky crystals of sulphate of iron much resembling asbestos. Specimens of magnetic iron ore, a widely distributed mineral, come next, and are followed by hæmatite or sesquioxide of iron from Cumberland, (specular iron ore), gœthite, and limonite, or brown hæmatite. Of the last named mineral there are shewn various pseudomorphic specimens which have been chemically altered from iron pyrites, though still retaining the form of the latter mineral, and a specimen altered from siderite and retaining its crystalline form. After these are the specimens of iron-pyrites or sulphide of iron, which always contains a certain proportion of gold, and sometimes a large amount; the principal use of iron pyrites is for the manufacture of sulphuric acid or oil of vitriol. Another ore of iron is chalybite, also called siderite, or carbonate of iron, represented by several good specimens. But the most important variety of siderite extensively used in England for the manufacture of iron and steel is the common and compact variety occuring in the coal measures, and known as *sphærosiderite* and *black-band*.

To the iron succeeds cobalt, of which metal there are specimens of the ores cobaltine and smaltine. Oxide of cobalt is extensively used as a blue pigment in the arts. The compounds of nickel follow, such as Noumeaite, a hydrated silicate of nickel and magnesia, from New Caledonia, originally described by Prof. Liversidge; pimelite another silicate; millerite, the sulphide &c. In the arsenides and sulphides nickel is found usually associated with cobalt, and the two metals have to be separated by an elaborate process; this is not the case, however, with the New Caledonian nickel ores which are nearly free from cobalt, whilst the cobalt ores of the same country are free from nickel. Next are the compounds of tin, with specimens of different forms of stream tin and lode tin from the Cornish mines, and specimens shewing the different stages in the preparation of the metallic

tin from the ore. The Cornish stream tin is now nearly worked out, and the main source of English tin is from the lodes, but the Australian workings now produce an abundant supply. The presence of tin in Australia was predicted by the Rev. W. B. Clarke, the well-known geologist, as far back as 1849, and he actually discovered the ore near the Severn River in 1853. It is, however, only comparatively recently that the extent of the tin deposits of Australia has been discovered, and the working of the ore prosecuted with vigour. In 1881 8,200 tons of tin, with a total value of £724,000, were produced in New South Wales. The principal districts for Australian tin are in the northern districts of New South Wales, and the southern parts of Queensland, Mount Bischoff in Tasmania, and various districts in Victoria. Among the titanium minerals will be observed natural and artificial crystals of rutile, anatase and titanite or sphene ; also iserine or titaniferous iron.

A very important ore is chrome iron ore or chromite, its most important use is for manufacturing the yellow chromate and the red dichromate of potash used in dyeing. It is also used in small proportion for preparing hard qualities of steel. It is now shipped from New Zealand and New Caledonia in large quantities. Wolfram or tungstate of iron and manganese is often mistaken for tinstone, which, however, gives a grey streak, while the wolfram gives one of a reddish-brown colour. It is frequently associated with tin ores, but is never very abundant. One of its uses is in the manufacture of tungstate of soda, which gives hardness to plaster of Paris, is used as a mordant for dyers, and is also employed to make dress materials and stage scenery incombustible, and for hardening steel. The metal tungsten is used in certain alloys. Pitchblende is an ore of uranium, occurring in veins with ores of lead and silver in Saxony, and with tin in Cornwall. Zippeite is a sulphate of uranium.

Next to these are the compounds of arsenic. Orpiment is a compound of arsenic and sulphur found in Hungary, the Hartz Mountains, &c.; it is used as a yellow pigment. Realgar, which is of similar composition, occurs in veins in crystalline rocks, and in

volcanic districts, or in the shape of stalactites in fissures and rents of volcanos; its chief use is for fireworks; but most of the realgar that is used is produced artificially. Near these is a specimen of mispickel or arsenical pyrites, generally found in Australia associated with gold. Following this are the specimens of antimony ore, a mineral found extensively about the Clarence River and New England districts, and also in Victoria, and very abundantly in Borneo.

The bismuth specimens come next, including native bismuth and various compounds. Native bismuth is worth about 15s. a pound; the metal is used for the manufacture of various alloys (fusible metal, soft solder, etc.,) but the demand for it is limited. It has been found and worked in various parts of this Colony. Among the lead-specimens attention may be directed to specimens of native lead, of cerussite or carbonate of lead, and galena or sulphide of lead, which is the principal ore of the metal. Galena is a very common and widely distributed mineral, found in abundance in some parts of Australia, as well as in almost every other part of the world; it very often contains a large proportion of silver, which may frequently be profitably extracted from it. In 1881 the quantity of lead produced in New South Wales was 52 tons 14 cwt., with a total value of £5,025. Next to the galena are large crystals of anglesite, which is a sulphate of lead; also cotunnite or chloride of lead, crocoisite or chromate of lead, bournonite or sulphide of antimony, lead, and copper, and boulangerite, which is a sulphide of antimony and lead. The copper specimens come next; native copper, which is found in immense quantities near Lake Superior, being represented by some fine specimens; red oxide or plush copper, langite or hydrated sulphate, malachite or carbonate, one of the ores of copper, and often used for ornamental articles, copper pyrites or sulphide, and other rarer copper minerals.

The mercury specimens are not numerous; they include an interesting specimen of a crystal of native amalgam of mercury and silver, a specimen of cinnabar, the sulphide of mercury, the principal ore of the metal. There is also a piece of amalgam with

a curious history, from a Chilian mine, it having been taken from the stomach of a mule which had eaten it for the sake of the salt mixed with it during the process of manufacture. Then follow specimens of native silver and the various silver ores. The specimens of native tellurium are unusually large, this metal, which was formerly not uncommon in Transylvania and was valued for the gold it contained, being now very rare; the largest piece in the collection cost £28, though it weighs only two ounces. Other specimens of tellurium minerals are the nagyagite, a telluride of lead and gold, and the sylvanite which is a telluride of gold and silver—both being minerals of great rarity and value. The gold specimens are not numerous, but include one or two rare specimens, such as the specimen of native gold from Hungary, consisting of a mass of wire-like crystals; Australian gold as a rule forms large crystals, but a variety like the Hungarian is found in Queensland. There is also a small gold nugget from Ballarat crystallised in an irregular octahedron, and some crystallised specimens of gold from New Caledonia, in fern-like dendrites and in the shape of rods formed of elongated octahedrons. As gold occurs rarely in calcite, a specimen from the Lucky Hit, Tuena, where gold exhibits that mode of occurence, has been added to this collection.

A rare specimen is the crystal of native platinum placed next the gold specimens; near it is a nugget of platinum from the Ural Mountains. The chief value of platinum in commerce is dependent on the difficulty with which it fuses and its insolubility in strong acids, on account of which property it is used for crucibles and for other purposes in chemical and physical laboratories. It is found in Australia in minute quantities generally associated with gold, sometimes also with iridium and osmium.

The following two cases contain the collection of gems. In that placed farthest from the door are arranged at the left-hand end a collection of imitation gems. Next to these are a series of rough uncut gems. These are succeeded by specimens of the silica gems,—rock-crystal, amethyst (a pink variety of rock-

crystal), cairngorm (a variety of smoky quartz), citrine and opals. Among the last are some specimens of precious opal from this Colony. To these succeed the garnets, the fine blood-red or cherry-red varieties of which are highly esteemed as gems; essonite and cinnamon stones are varieties of the same stone; iolite or dichroite is remarkable for the difference of colour which it presents when viewed in different directions. Then follow the specimens of sphene, chrysolite and zircon, turquoise, cinnamon stone, crocidolite, spodumene, moonstone, peridote, bronzite, hypersthene, and obsidian, and in the next division of the case tourmaline, axinite and rubellite, phenacite, emerald, aquamarine, beryl, topaz, spinel, sapphire, ruby, and diamond. The other case contains specimens of agates, onyxes, rock-crystal, jasper and carnelian cut into various ornamental forms. A number of specimens of ornamental articles, vases, candlesticks, paper-weights, etc., made out of fluorspar, agate, carnelian, jasper, chalcedony, alabaster, malachite, steatite, serpentine, jade and rhodonite, are arranged in two special cases at the entrance to the room. Along the east wall of the room are arranged a series of slabs of different varieties of ornamental marbles and serpentines. On the opposite side in the table cases running along the wall is a collection of Italian rocks and minerals.

A second collection of minerals is arranged in table cases in the old building (No. 6); this contains some Australian as well as foreign specimens; and beside it is a collection of Australian and foreign rocks, the former of which, however, have not yet been thoroughly analysed and determined.

A catalogue of all these mineral collections is being prepared and will shortly be published.

FOSSILS.

In the gallery of the old building (No. 12 in plan), is a large collection of European and American fossils, which have been arranged stratigraphically, *i. e.* according to the age of the strata in which they were found. Beginning with the case labelled "Cambrian and Silurian," and passing round to the right the non-

scientific visitor will be enabled to realize to some extent the nature of the life that has prevailed on the earth during the successive periods of geological history from the earliest beginnings of life to the present time. A catalogue of this collection of fossils has been issued, with a general introduction pointing out some of its principal features, so that it will be unnecessary to say anything further about it here.

In room 5 is a large collection of Australian Post Tertiary fossils, chiefly obtained from the limestone caves at Wellington, where the remains of so many extinct animals have been discovered. The collection consists of bones of different extinct species of marsupials, some of them, such as the large kangaroos and wombats, nearly related to existing forms; while others, as for instance the *Diprotodon*, the *Nototherium* and the *Thylacoleo*, are very unlike any forms now living, and, in the case especially of the *Diprotodon*, attained a gigantic size. In the same room are placed the remains of the large, extinct, ostrich-like New Zealand birds—the Moas—which lived in New Zealand at a comparatively recent period.