ILLUSTRATED GUIDE
TO THE
Collection of Fossils

EXHIBITED IN THE
NATIONAL MUSEUM OF VICTORIA

By

FREDERICK CHAPMAN

A.L.S., Hon.F.Roy.Soc.S.A., F.G.S., &c.

Palæontologist of the Museum

1929

By Authority :

H. J. Green, Government Printer, Melbourne

ILLUSTRATED GUIDE
TO THE
Collection of Fossils

EXHIBITED IN THE
NATIONAL MUSEUM OF VICTORIA

By

FREDERICK CHAPMAN

A.L.S., Hon.F.Roy.Soc.S.A., F.G.S., &c.

Palæontologist of the Museum

MUSEUM OF VICTORIA

12144

1929

By Authority :

H. J. Green, Government Printer, Melbourne

PREFACE.

Although the manuscript of this Guide to the Fossil Galleries was prepared some years ago, various circumstances prevented its publication at an earlier date.

Its preparation has been carried out by Mr. Frederick Chapman, who has occupied the position of Palaeontologist to the National Museum since 1902, and whose excellent work in advancing the knowledge of the Australian Fossil Fauna is so well known.

With few exceptions, all the figures have been especially prepared for this work by Mr. Chapman from photographs taken from the actual specimens shown in the cases.

This Guide is so arranged that the Australian fossils shown in the Eastern Gallery nearest the Russell-street entrance may be examined first. The exhibits in the Floor Cases and then those in the Wall Cases are described and noted, and lastly the Table Cases. The Table Cases are numbered 1 to 45, and contain a representative collection of the Australian Fossil Fauna and Flora, although by no means complete, on account of the limited space. To display an adequate Australian Fossil collection would occupy at least four times the space now allotted to it, and this could be drawn from material already stored in the Museum.

The arrangement of the Table Cases is in numerical order, and from Sub-recent to Cambrian. This series contains many described and figured types, the former being indicated by a red disc (holotypes) and the latter by a green one (plesiotypes, paratypes, and lectotypes).

In a Guide of limited extent it has only been possible to mention the more striking exhibits, and it does not convey any idea of the rich and varied collections which have been brought together and are available to students of research.

The building up of the extensive collections of both Australian and Foreign Fossils now in the Museum was largely due to the wide knowledge and foresight of the late Professor Sir Frederick McCoy, who held the position of Director of the Museum almost from its foundation until his death in July, 1899. The bulk of the foreign collection was acquired by him, some of the more important material being obtained from Krantz, of Bonn (mainly invertebrates); Thos. Bean, of Scarborough (Jurassic plants of Yorkshire, England—a collection only second to that of Cambridge); the Ammonite collection of 2,000 specimens from Dr. Thos. Wright; the English Oolite fossils of Dr. John Lycett (over 3,000 specimens) and several notable collections, including Paris Basin and Old Red Sandstone Fossils, from Robert Damon, of Weymouth.

The Australian Collection has been largely built up from specimens obtained by the Geological Survey, public donations, purchases, exchanges, and special collecting by the Palaeontologist.

The more important of the separate collections are those of Geo. Sweet, Cresswell, Hall, Spry, Mulder and Robertson.

JAS. A. KERSHAW,
Curator.

January, 1929.

VIEW OF GALLERY OF FOREIGN FOSSILS.

MESOZOIC AND ZOOGENIC	QUATERNARY AND TERTIARY	HOLOCENE	RECENT DEPOSITS. - SAND DUNES
	CRETACEOUS	PLEISTOCENE	RAISED BEACHES. NEWER BASALT OLD DUNES, WITH DIPROTODON.
	JURASSIC	PLIOCENE	UPPER: ESTUARINE SERIES, GLENELG AND MURRAY. LOWER: KALIMNAN OF JEMMY'S PT. BEAUMARIS- GRANGE BURN.
	TRIAS	MIOCENE	UPPER MIOCENE. - IN BORINGS. - BROWN COAL BEDS OF YALLOURN. VANJUKIAN. - TORQUAY, BATESFORD WAURN PONDS, MOORABOOL VALLEY, CAMPERDOWN, BAIRNSDALE. LEAF BEDS OF BACCHUS MARSH AND NARRACAN.
	PERMIAN	OLIGOCENE	BALCOMBIAN. - MORNINGTON, MUDDY CK. (LOWER), SORRENTO AND ALTONA BORES.
	CARBONI- FEROUS	JURASSIC	COAL-BEARING SANDSTONES AND SHALES (WALLOON SERIES). S. GIPPSLAND, CAPE OTWAY, AND THE WANNON RIVER.
	DEVONIAN	TRIAS	SCHIZONEURA BED, BALD HILL (LIPSWICH SERIES)
	SILURIAN	PERMO- CARBONIFE- ROUS	GLACIAL TILL AND GANAM- OPTERIS SANDSTONE, BACCHUS MARSH.
	ORDOVICIAN	CARBONI- FEROUS	GRAMPIAN SANDSTONE WITH PHYSONEMUS MANFIELD SHALES AND SANDSTONE WITH GYRACANTHIDES.
	CAMBRIAN	DEVONIAN	UPPER. - ARCHAEOPTERIS BEDS, LUVANA CREEK. MIDDLE. - MARBLE AND SHALE, BUCHAN AND MITTA MITTA RIVER. LOWER. - SNOWY MOUNTAIN, PLACEDON.
PALAEOZOIC	PRE-CAMBRIAN	SILURIAN	TANJILIAN AND YERINGIAN SERIES OF MATLOCK AND LILYDALE.
		UPPER ORDOVICIAN	MELBOURNIAN SERIES. - SOUTH YARRA, ROYAL PARK, YAN YEAN.
		LOWER ORDOVICIAN	GRAPTOLITE SHALES AND SLATES, SALTWATER RIVER AND MT. MATLOCK.
		CAMBRIAN	DARRIWIL SERIES CASTLEMAINE " BENDIGO " LANCEFIELD "
		PRE-CAMBRIAN OR ALGONKIAN	HEATHCOTIAN AND DOLODRONK LIMESTONE. SCHISTS AND GNEISSES OF N.E. AND WESTERN DISTRICTS.

GENERALIZED TABLE OF
GEOLOGICAL EPOCHS,
SHOWING RELATIVE
THICKNESS.

GEOLOGICAL TABLE OF THE SEDIMENTARY
ROCKS OF VICTORIA.

LIST OF PLATES.

View of Gallery of Foreign Fossils	Frontispiece
Tables of Geological Strata. Foreign and Victorian.	vii

LIST OF ILLUSTRATIONS IN TEXT.

FIG.		PAGE
1	<i>Thylacoleo carnifex</i> Owen. Lower right and upper left jaws. Pleistocene. Buchan Caves, Gippsland	2
2	<i>Diprotodon australis</i> Owen. Restoration. After C. H. Angas and F. Chapman	4
3	Skeleton of <i>Diprotodon australis</i> Owen. Reproduced from casts of skeletons found at Lake Callabonna, South Australia, by Dr. E. C. Stirling	5
4	<i>Wynyardia bassiana</i> Spencer. Upper Cainozoic (<i>Turritella</i> bed), Table Cape, Tasmania	6
5	Cranial rostrum of a Beaked Whale. <i>Mesoplodon compressus</i> Huxley. Kalimnan (Lower Pliocene). Grange Burn, near Hamilton, Victoria	6
6	<i>Dinornis maximus</i> Owen. The Great Moa. Pleistocene, New Zealand	7
7	Restored skeleton, by Dr. C. W. Andrews, of the Madagascan Moa (<i>Aepyornis hildebrandti</i>). Late Pleistocene. Central Madagascar	8
8	Head and part of paddle of the Australian Fish-lizard. <i>Ichthyosaurus australis</i> McCoy. Lower Cretaceous. Flinders River, Queensland	9
9	Ideal Seascape in the Liassic period, with Saurians. From a water-colour by F. Chapman. After E. Fraas	9
10	Block of Tertiary Foraminiferal (<i>Lepidocyclina</i>) Limestone, from the Filter Quarries, Batesford, near Geelong, containing teeth of <i>Isurus</i> and of <i>Carcharodon</i>	10
11	<i>Goniograptus speciosus</i> T. S. Hall. A graptolite from the Lower Ordovician. Black Forest, south-west of Woodend, Victoria	11
12	Leaf of <i>Glossopteris browniana</i> , Brongniart. Permo-carboniferous. Newcastle, New South Wales	12
13	Ideal Tasmanian Landscape in the Pleistocene period. Showing extinct Marsupials— <i>Palorchestes</i> , <i>Nototherium</i> , and <i>Phascogonus</i> . After Victor Henry	13
14	<i>Scaldicetus macgeei</i> Chapm., L. Pliocene. Beaumaris, Port Phillip	14
15	<i>Nothofagus risdoniana</i> Ettingshausen, in Tertiary travertine. Lindisfarne, Hobart, Tasmania	14
16	<i>Palliocypræa gastrolax</i> (McCoy). Balcombian (Oligocene). Muddy Creek, near Hamilton	15
17	A fossil <i>Nautilus</i> , <i>N. altifrons</i> , showing interior of chamber filled with transparent gypsum, and with the siphuncle in position. Miocene. Murray Cliffs, South Australia	16
18	<i>Spirulirostra curta</i> Tate. Of Miocene age. Bird Rock Cliffs, Torquay	17
19	<i>Boliteceras daintreei</i> Etheridge. Lower Cretaceous. Flinders River, Queensland	18
20	<i>Ginkgo digitata</i> Brongniart. (Ipswich Series). Brisbane	19

LIST OF ILLUSTRATIONS IN TEXT—*continued*.

FIG.		PAGE
21	Claw bone (phalangeal) of a carnivorous dinosaur allied to <i>Megalosaurus</i> . Jurassic. Cape Paterson, Victoria ..	20
22	Scale of Mudfish. <i>Metacerasodus(?) arus</i> A. S. Woodw. Jurassic. Kirrak, South Gippsland ..	20
23	<i>Pristisomus crassus</i> A. S. Woodward. A ganoid fish from the Trias of Gosford, New South Wales ..	21
24	<i>Gyracanthides</i> . Outline restored by A. Smith Woodward ..	22
25	<i>Phlyctenaspis australis</i> McCoy var. <i>confertituberculata</i> Chapm. Medium dorsal plates. Devonian. Buchan, Gippsland ..	23
26	<i>Discophyllum mirabile</i> Chapm. A Silurian Jellyfish. Brunswick, near Melbourne, Victoria ..	24
27	<i>Gregoriura spryi</i> Chapm. A brittle-star Silurian. South Yarra, Victoria ..	24
28	<i>Helicocrinus plumosus</i> Chapm. Silurian. Brunswick, Victoria ..	25
29	<i>Atrypa fimbriata</i> Chapm. Silurian. Lilydale, Victoria ..	26
30	<i>Phanerotrema australis</i> Etheridge fil. Silurian. (Yeringian). Cave Hill Quarry, Lilydale ..	27
31	<i>Coelocaulus brazieri</i> Etheridge fil. Silurian. Cave Hill, Lilydale, Victoria ..	28
32	<i>Goblius greenii</i> Chapm. A Silurian Trilobite. From the Mudstone of Lilydale, Victoria ..	29
33	<i>Rhinopterocaris maccayi</i> Eth. fil. Lower Ordovician. (Castlemaine series). Lerderderg River, Victoria ..	30
34	<i>Girvanella</i> Limestone. Cambrian. Roan Horse Gully, North-east Gippsland ..	31
34A	<i>Girvanella</i> (A single pellet). From the same limestone) ..	31
35	<i>Syringocnema farus</i> Taylor. Cambrian. Ajax mine, South Australia. Photo. by Prof. T. G. Taylor ..	32
36	<i>Pterophyllum matauriensis</i> Hector. Jurassic. Mataura Falls, Otago, New Zealand ..	34
37	<i>Pseudomonotis richmondiana</i> Zittel. Triassic. New Zealand ..	35
38	Restoration of the Giant Sloth— <i>Megatherium</i> . (After J. Smit.)	36
39	Restoration of the Pliocene Elephant— <i>Deinotherium</i> . (After J. Smit.) ..	37
40	Restoration of a Stegosanrian Reptile. (From coloured drawing by F. Chapman) ..	38
41	A Carnivorous Dinosaur— <i>Tyrannosaurus rex</i> . (Cast of head). Cretaceous. Montana, U.S.A. Ex. U.S. Nat. Mus. ..	39
42	Restoration of the Eocene Elephant— <i>Moerithium</i> . Egypt ..	40
43	<i>Palaeospondylus gunni</i> Traquair. Old Red Sandstone. Caithness, Scotland. ..	42
44	<i>Protomyia bucklandi</i> Heer. A dipterous insect. Oligocene of Aix, Provence, Southern France ..	43
45	<i>Ophioderma egertoni</i> Broderip. A brittle-star. Lias. Dorset ..	46
46	<i>Calamocladius equisetiformis</i> Schloth. A Carboniferous "Horse-tail." Silesia ..	47
47	<i>Roemeraster asperula</i> Roemer. A Devonian brittle-star. Bundenbach, Germany ..	48
48	<i>Paradoxides davidis</i> Salter. A Middle Cambrian Trilobite. South Wales. About one-third natural size ..	50

GUIDE TO THE FOSSILS IN THE NATIONAL MUSEUM.

INTRODUCTION.

FOSSILS, which we find embedded in the solid rock, or which we dig out of the ground, are the remains of once living animals and plants.

Our marble halls, with all their quarried stones—
What are they but the bleached and whitened bones
Of countless generations piled on high.

The LIMESTONE, the MUDSTONE, or the SANDROCK which we often find enclosing fossils, may represent the deposit of an old sea-bed, a lake bottom, or the accumulation of a river or swamp. Over these ancient surfaces there once lived and crawled the extinct animals whose remains are now preserved as petrifications. In the case of the plant remains, these may have been rooted in the mud of a swamp, if found in the position of growth, or they may have been washed down by rivers and streams, as, for example, in the case of the brown coal formation.

It was supposed by some of the ancient writers that these fossil remains were actually generated within the mud or slime and that they lived in the position where they are now found. Other authorities of the time thought them to be freaks of nature—*lusus naturae*.

Aristotle, the Greek philosopher, imagined fossils to have been produced by a plastic force in the rock, and this opinion was long accepted.

It was not until the beginning of the 18th century that the true nature of fossils was understood. It was also realized that these ancient animals could not all have lived at the same time, so that their presence was not easily explained by a Universal Flood.

Geological investigations, such as those made by Leonardo da Vinci, the great civil engineer and artist of the early part of the 16th century, proved that the land and sea had exchanged relative positions, and that what was once a sea-bed has become dry land.

The true SUCCESSION and the RELATIVE AGES of the ROCKS with the FOSSILS were discovered by William Smith (1769-1839). He was an English civil engineer, and he showed by his observations made on a journey through England and Wales that the rocks were superposed on one another according to their age, the oldest being found at the base of the series. Thus he was able to draw up a table of strata which showed this relationship of the beds.

A TABLE OF EUROPEAN STRATA on these lines, only more complete, is hung on the South Wall, near the staircase.

A smaller table, showing the VICTORIAN STRATA, is hung in the Australian Gallery near the entrance to the Australian zoological collection.

FIG. 1. *Thylacoleo carnifex* Owen.

Lower right and upper left jaws. Pleistocene. Buchan Caves, Gippsland.
(Original $7\frac{1}{2}$ inches long.)

In earlier historic times, whilst the beds of fossiliferous rocks and their distribution were being studied, the fossil contents received attention at the hands of the naturalists Blumenbach, Cuvier, Lamarck, and Brongniart. They compared these fossils with living forms, and found that they belonged to kinds no longer living.

The science of Ancient Life, called PALAEONTOLOGY (by H. D. de Blainville and Fischer de Waldheim), discusses these "fossils" or "things dug up" in relation to existing forms of life ; it is also concerned with their distribution through the various strata of the earth's crust.

AN INTRODUCTION TO THE STUDY OF FOSSILS.

Visitors who are not familiar with the elements of this interesting study will do well to consult a series of eight Table-cases at the west end of the South Gallery. These cases contain a series of carefully selected specimens, both Australian and foreign, and there are also drawings, photographs, and descriptions, which altogether serve as a "Primer of Palaeontology." The head-lines of the groups of specimens are as follows :—

EXAMPLES OF FOSSILS.

IDEAS OF THE ANCIENTS REGARDING FOSSILS.

HOW ANIMALS AND PLANTS HAVE BEEN BURIED IN THE STRATIFIED ROCKS.

FOSSILIFEROUS ROCKS.

EXAMPLES OF THE HARD PARTS OF ANIMALS WHICH ARE USUALLY PRESERVED AS FOSSILS.

EXAMPLES OF PLANT REMAINS WHICH ARE USUALLY PRESERVED AS FOSSILS.

EVIDENCE AFFORDED BY FOSSILS OF ACCOMPANYING CONDITIONS OF ENVIRONMENT AND SEDIMENTATION.

METHODS OF FOSSILIZATION AND THE VARIOUS CONDITIONS OF PETRIFICATION.

REPLACEMENT OF ORGANIC STRUCTURES—PSEUDOMORPHS. THE DISTORTION OF FOSSILS.

IMITATIVE FORMS, OR PSEUDO-FOSSILS.

ON THE VALUE AND SIGNIFICANCE OF FOSSILS.

TYPE FOSSILS (108 SPECIES).

VARIATION IN FOSSIL "SPECIES."

RECENT ADDITIONS CASE.

Here are exhibited newly-described or recently-donated specimens, accompanied by simple diagrams and descriptive labels. These are changed from time to time.

AUSTRALASIAN FOSSILS.

THESE ARE EXHIBITED IN THE EAST GALLERY.

The WALL-CASE of this Gallery contains a remarkably fine selection of the larger Australasian fossils; comprising specimens, shells, bones, and groups of fossils in their matrix.

In Australia and New Zealand many kinds of fossilized remains are found to be similar to those occurring in other parts of the world; some, however, are peculiar to this region and are consequently of especial interest.

Such are the extinct Marsupials, as DIPROTODON (=“two front teeth,” in reference to the upper incisors). This was a gigantic animal of the Pleistocene period, as large as a Rhinoceros and rather taller. The Diprotodon lived amongst the

FIG. 2. *Diprotodon australis* Owen.

Restoration of the giant marsupial.

After C. H. Angas and F. Chapman.

herbage and low forests, especially of the southern and eastern parts of Australia, which were well watered at that time, but became extinct in recent times owing in all probability to the diversion of rivers, now more or less dried up, which

then supplied moisture to these localities. A fine replica of the skeleton of the *Diprotodon* stands in a Floor-case in the centre of the Australasian Gallery, and other remains and casts from Queensland, Geelong, Colac, Mount Macedon, and Footscray are to be seen in the Wall-case of this Gallery.

FIG. 3. SKELETON OF *Diprotodon australis* Owen.

Reproduced from Casts of Skeletons found at Lake Callabonna, South Australia, by Dr. E. C. Stirling.

The NOTOTHERIUM (=“southern beast”) was somewhat like the *Diprotodon*, but smaller and with a shorter and broader skull. Some authorities suppose this extinct animal to have carried a fleshy horn or proboscis. Its remains are found in Queensland, Tasmania, Victoria, and Western Australia. It is here represented by a cast of the cranium (see Wall-case), and by jaws and teeth (Table-case 4).

WYNYARDIA is another peculiar and extinct marsupial, having characters apparently connecting the Kangaroos with the Native Cats. Casts of the head, limb-bones, and vertebrae are seen in the Wall-case. It was living in Tasmania in about Miocene times.

FIG. 4. *Wynyardia bassiana* Spencer.
Upper Cainozoic (*Turritella* bed), Table Cape, Tasmania.

Amongst the Cetaceans (Whales, Porpoises, and Dolphins) the Beaked Whales, *MESOPLODON*, are important. A very fine cranial rostrum from the Lower Pliocene of Grange Burn, Hamilton, is exhibited in the Wall-case. This form is identical with the species described by Owen and Huxley from the

A.

B.

FIG. 5. CRANIAL ROSTRUM OF A BEAKED WHALE—*Mesoplodon compressus* (Huxley).
Kalimnan (Lower Pliocene). Grange Burn, near Hamilton, Victoria.

A = side view.

B = lower surface.

Red Crag of Suffolk, England. Huge bones, which represent ribs, vertebrae and parts of the limb-bones of great whales, are found from time to time in the Grange Burn and Beaumaris sandy marls. One of these ribs, found at Beaumaris, measures 64 inches in length. Other remains of whales (teeth and tympanic or ear-bones) are found in Table-cases 7 and 18. Amongst the teeth are those of *SCALDICETUS*, formerly known only from the Antwerp Crag of Belgium, but here represented by species from Muddy Creek (Oligocene) and Beaumaris (Lower Pliocene)—Table-cases 18 and 7. Another *Sperm Whale* is *METASQUALODON*, a widely distributed Australian species in the Tertiary marls and limestones of Miocene age (Table-case 18). For foreign examples of toothed Whales see the casts in the Foreign Fossil Gallery (Wall-case, Vertebrates), of *ZEUGLON* from Malta and *PROZEUGLON* from Egypt.

FIG. 6. *Dinornis maximus* Owen.

THE GREAT MOA.

Height along spine, 10ft. 8 in.

Pleistocene. New Zealand.

The fine skeletons of *DINORNIS maximus*, the Great Moa, with a height of 10 feet 8 inches, and *EURAPTERYX gravis*, the Heavy-footed Moa, adapted for running over rough ground, are shown in separate cases. Especially notable is the fine, re-constructed skeleton of a Madagascar Moa, *AEPYORNIS hildebrandti*, showing the short and broad breastbone and

FIG. 7. RESTORED SKELETON, by Dr. C. W. Andrews, OF THE MADAGASCAR MOA (*Aepyornis hildebrandti*).

Late Pleistocene. Central Madagascar.

remains of a very small wing. In the same case is the great egg of a larger species of *AEPYORNIS*, the capacity of which is equal to 148 hen's eggs. Like the New Zealand *APTERYX*, this bird laid an enormous egg, compared with its size.

Giant Marine Reptiles were once abundant in the Cretaceous seas around Australia and New Zealand continents. *Ichthyosaurus australis* is a typical Fish-lizard, having the limbs modified into enormous paddles by the multiplication of the digital bones. A fine head, paddle, and vertebrae,

FIG. 8. HEAD AND PART OF PADDLE OF THE AUSTRALIAN FISH-LIZARD—*Ichthyosaurus australis* McCoy.

Lower Cretaceous. Flinders River, Queensland.

as well as the orbit, of a Flinders River species, are exhibited in the Wall-case of the East Gallery. The orbital region of the cranium shows the sclerotic plates lying over the eye-lens of this Fish-lizard which enabled the reptile to change its focus of vision when pursuing its prey. Vertebral bones of the long-necked Saurians (SAUROPTERYGIA) are seen in the Wall-case, from Central Australia. They are probably related to *ELASMOSAURUS* of the Upper Cretaceous of Kansas, U.S.A.

FIG. 9. IDEAL SEASCAPE IN THE LIASSIC PERIOD, WITH SAURIANS.

After E. Fraas.

Reference may here be made to a cast of the Sauropterygian, *THAUMATOSAURUS*, affixed to the wall of the South Gallery. A cretaceous marine Turtle, *NOTOCHELONE costata*, from Flinders River, Queensland, is represented by two well-preserved examples.

Amongst Fishes, the type specimen of *BELONOSTOMUS sweeti*, which was an elongate, predatory Ganoid (or armoured enamelled scale fish) is shown in the wall-case, along with the Jurassic fish *PSILICHTHYS selwyni*, from the Western District of Victoria. The block of limestone of Miocene age, from Batesford, should be noted, for it contains twenty-nine teeth of an extinct shark, *ISURUS retroflexus*, besides one other genus, *CARCHARODON*, related to the living Great White Shark.

FIG. 10. BLOCK OF FORAMINIFERAL LIMESTONE from the Filter Quarries, Batesford, near Geelong, with 29 teeth of *Isurus* and 1 of *Carcharodon*, embedded.

Amongst shells of Mollusca, or Shell-fish, some specimens of fossil *NAUTILUS* and their related kinds are exhibited in the wall-case ; these include the largest known specimen of *ATURIA*, a flattened nautiloid form with curiously convoluted septal walls, from Muddy Creek, Hamilton. A

fine natural mud-cast of *NAUTILUS geelongensis* from the Miocene of the Orbost district should here be noted. The giant Ammonite-like forms are represented by *CRIOCERAS* and *ANCYLOCERAS* from the Cretaceous of Queensland. Amongst the Gasteropods or Univalves, the Giant Cowrie (*CYPRAEA gigas*) from Muddy Creek and the enormous Volutes (*PTEROSPIRA validicostata*) are conspicuous. Of the Bivalves, the Oyster (*OSTREA*) is common in the fossil condition, forming oyster beds in the limestone deposits of Dartmoor, Bairnsdale, and Cape Otway, examples of which shells are shown here: some of these are indicated by their great thickness of shell-plates or lamellae to have been quite 100 years of age when covered by sediment.

The Hydroids (allies of the living "Sea-firs") are represented by some fine Graptolites (from *graphe*, I write; *lithos*, a stone), on slabs of slate from Lancefield, Bendigo,

FIG. 11. *Goniograptus speciosus* T. S. Hall.
A GRAPTOLITE FROM THE LOWER ORDOVICIAN.
Black Forest, south-west of Woodend, Victoria.

and Woodend. These hydroids have been long extinct as they are confined to the older series of rocks or Palaeozoic slates; they are of the greatest use in determining the zones or particular beds over large areas in the search for gold. An especially striking form of Graptolite shown here is a species of GONIOGRAPTUS (*G. speciosus*) from the last-named locality.

Corals are here shown from Silurian and Permocarboniferous strata, one of the more noteworthy specimens being a fine polished slab of coral limestone from the Thomson River, Gippsland, containing the "Sunstone Coral" (HELIOLITES) and the "Honey-comb Coral" (FAVOSITES).

Amongst Tertiary fossil leaves, some of the genus EUCALYPTUS are seen on a rock slab in the Wall-case; they are interesting from the fact that they were embedded in volcanic dust showered down from the craters round Warrnambool. Triassic and Palaeozoic Ferns and fern-like plants are represented by THINNFELDIA from Mount Victoria, and GLOSSOPTERIS

FIG. 12. LEAF OF *Glossopteris Browniana* Brongniart.

Permian-carboniferous of Newcastle, New South Wales (half nat. size).

from Newcastle, in New South Wales. A fossil tree-trunk, ARAUCARITES, from the Stockton Colliery, New South Wales, is shown here; it is probably related to living Australian conifers, as ARAUCARIA. One of these tree-trunks, turned into flint but with the structure of wood still within it, is shown about the middle of the Gallery.

AUSTRALASIAN FOSSILS.

TABLE CASES.

These are arranged in order of Geological Ages, from 1 to 45, beginning at the SUB-RECENT or HOLOCENE fossils and ending with the oldest, the CAMBRIAN.

The following specimens are of especial interest :—

A fine series of shells of living species from raised beaches **Cases 1 and 2.**
and sunken estuaries.

Marsupial and other remains from Sub-recent and **Cases 3 and 4.**
Pleistocene cave-floors, creek-beds, and sand-blows.
Note the remains of the King Island extinct Emu (*DROMAEUS minor*), the remains of *THYLACOLEO* or Marsupial Lion, the Giant Kangaroos (*MACROPUS titan* and *PROCOPTODON goliah* ; also *NOTOTHERIUM*).

FIG. 13. IDEAL TASMANIAN LANDSCAPE IN THE PLEISTOCENE PERIOD.
Showing extinct marsupials—*Palorchestes*, *Nototherium*, and *Phascolomys*.
After Victor Henry.

These cases contain Lower Pliocene fossils, including **Cases 5 to 7.**
a fine series of fruits, wood, and leaves from the
buried river silts of the Deep Leads. Also a fine

collection of Sharks' and Whales' teeth (ISURUS, CARCHARODON, SCALDICETUS, and PHYSETODON).

FIG. 14. TOOTH OF A FOSSIL SPERM WHALE—*Scaldicetus macgeei* Chapm.
L. Pliocene. Beaumaris, Port Phillip.

Cases 8 to 18. These contain Oligocene and Miocene fossils; amongst which may be noted fossil Leaves, Foraminifera

FIG. 15. LEAVES OF *Nothofagus risdoniana* (Ettingshausen), in Tertiary travertine.

Lindisfarne, Hobart, Tasmania.

and Sponges (case 8). Here may be seen the remarkable leaf impressions in travertine limestone from Hobart.

Here is shown a beautiful and unique series of Australian **Case 9.** Tertiary Corals. Diagrams of the structure of the calyx accompany the chief types.

A typical set of Sea-urchins or Echinoids, including **Case 10.** the gigantic LINTHIA, from the Murray Basin.

Sea-mats or Polyzoa (RETEPORA), and Lamp-shells **Case 11.** or Brachiopods (MAGELLANIA); one cast in clear gypsum shows the brachial loop.

Bivalved Mollusca, such as TRIGONIA, CHLAMYS, and **Cases 11 to 13.** SPONDYLUS. TRIGONIA, once living in the English area, is now only found round Australia.

Scaphopods (Elephant-tooth shells), Chitons or Mail- **Case 13.** shells, and Gasteropods or Snails.

These contain ancient Mutton-fish shells (HALIOTIS), **Cases 13 to 18.** Turret-shells (TURRITELLA), Cowries (CYPRAEA), Volutes (VOLUTA), Cones (CONUS), and NAUTILUS.

FIG. 16. A FLANGED COWRIE—*Palliocypraea gastrophax* (McCoy).
From the Balcombian of Muddy Creek, near Hamilton.

Case 17.

Here is a cast of a Nautilus shell in pure gypsum or selenite ($\text{Ca SO}_4 + 2\text{H}_2\text{O}$); through the transparent mineral infilling can be seen the median siphuncle preserved in natural position.

FIG. 17. FRAGMENT OF A FOSSIL *Nautilus*,—*N. altifrons*, showing interior of chamber filled with transparent gypsum, and with the Siphuncle in position.

Miocene. Murray Cliffs, South Australia.

Case 18.

Here are shown extinct forms of Cuttle-bones. *SPIROLIROSTRA* is a very rare Miocene genus which is known to occur in only two other localities in the world. *NOTOSEPIA* is a fore-runner of the common *Sepia* and has a very strong and thick point or guard. In this case is also shown a fine series of Sharks' teeth, mostly of Miocene age, as well as a remarkably preserved fossil imprint of a Bird's feather in ironstone.

Teeth of the extinct Sperm-whales, PARASQUALODON and METASQUALODON are also exhibited here, and also the tympanics ("ear-bones") of Whale-bone Whales (Fam. *Balaenidae*)

FIG. 18. MODEL AND SHELL OF THE EXTINCT CUTTLE-FISH—*Spirulirostra curta* Tate. Of Miocene age.

Bird Rock Cliffs, Torquay.

Here is an interesting series of Cretaceous Mollusca, **Case 19.** including INOCERAMUS, whose prism-like shell-fragments form thick beds of limestone in the marl series of Queensland. The impressions of a fern, MICROPHYLOPTERIS, in sandstone is worth noting; also fossil Sponges (probably of the Lithistid type, SIPHONIA, which although originally siliceous or flinty, have been changed into iron pyrites (marcasite, a rhombic form of FeS_2)), but still showing the exact fig-like shape of the ancient sponge.

Case 20.

This case contains some striking forms of Ammonites (BOLITECERAS) and a NAUTILUS. The internal bones of Cuttle-fishes (BELEMNITES) are also exhibited, which are very like those found in similar beds in Europe. A remarkable replacement in precious opal of the tooth of a Cretaceous Mudfish, METACERATODUS, is seen here, and also the sealy armour of the Ganoid fish, BELONOSTOMUS. The phalangeal or toe-bone of an extinct marine reptile, CIMOLIOSAURUS, makes a conspicuous object, as it, also, has been changed into precious opal.

FIG. 19. AN AMMONITE—*Boliteceras daintreei* (Etheridge).
Lower Cretaceous. Flinders River, Queensland.

Cases 21 and 22.

These contain a unique series of Jurassic plants from Victoria, Queensland, and other parts of Australia. They comprise ferns, leaves of the Maiden-

hair Tree (GINKGO), and Conifers, and represent the flora of the age of the Victorian bituminous coal.

FIG. 20. *Ginkgo digilata* (Brongn).
Triassic (Ipswich Series). Brisbane.

A good series of Jurassic shells of the tiny Foraminifera **Case 22.** are shown, some as small as one-sixtieth of an inch in length; these were all picked out from the matrix of one fossil shell (TRIGONIA) from Geraldton, Western Australia.

This case contains Jurassic Mollusca, Ostracoda (bivalved **Case 23.** crustaceans) and a fine example of the small armoured fish, LEPTOLEPIS. Other unique fossils seen here

are the claw of a carnivorous Deinosaur, and the scale and mandibular tooth of a Mudfish (METACERATODUS) from Cape Paterson, Gippsland.

FIG. 21. CLAW BONE (Phalangeal) OF A CARNIVOROUS DEINOSAUR ALLIED TO *Megalosaurus*.
Jurassic. Cape Paterson, Victoria.

FIG. 22. A SCALE OF THE EXTINCT MUDEFISH—*Metaceratodus ? avus* (A. S. Woodw.).
Jurassic. Kirrak, South Gippsland.

Here is a series of plants and fishes from the Trias **Cases 24 and 25.**
 of New South Wales and Victoria. There are
 exhibited some remarkably well preserved fishes
 from the railway ballast quarry at Gosford, as
 CLEITHROLEPIS and the deep-bellied grovelling form
 PRISTISOMUS.

FIG. 23. *Pristisomus crassus* A. S. Woodward.

A GANOID FISH FROM THE TRIAS OF GOSFORD, NEW SOUTH WALES.

These contain Permocarboniferous ferns, Foraminifera, **Cases 26 to 27.**
 Corals, and Molluscs. Amongst the noteworthy forms
 are GLOSSOPTERIS, a fern-like seed-bearing plant of the
 the Newcastle coal-beds; Tasmanite shale, composed
 of spores (*TASMANITES punctatus*); ARAUCARIOXYLON,
 probably the oldest Araucarian tree; the widely-
 distributed Sea-mats, as FENESTELLA; and the
 great AVICULOPECTEN, EURYDESMa, and KEENEIA,
 of the phylum Mollusca.

Here is shown the type specimen of *LEPIDODENDRON* **Case 28.**
australe, supplemented with drawings of a restoration
 and specimens of leaves and bark. Here also is the

Carboniferous Sponge, RECEPTACULITES, and a selection of the fishes from Mansfield, such as GYRACANTHIDES (an early form of Shark), CTENODUS (a lung-fish), and STREPSODUS (a predatory fish with comparatively large tearing teeth).

FIG. 24. GYRACANTHIDES.
Outline restored by A. Smith Woodward.

Cases 29 and
30.

These comprise a series of Devonian fossils, including ferns, corals, mollusea, and the ancient air-breathing fish, PHLYCTAENASPIS ("*Asterolepis*" of McCoy).

Case 31.

Silurian Corals are well represented, chiefly from Lilydale and Yass. Here we see the mound-shaped FAVOSITES, large forms of CYATHOPHYLLUM, and the interesting anchoring Coral, RHIZOPHYLLUM,

which threw off root-like processes from the outer skeleton, enabling it to stand upright in the coral mud.

Cases 29 and 30.

Case 31.

FIG. 25. MEDIAN DORSAL PLATES OF A "BERRYBONE" FISH—*Phlyctaenaspis australis* (McCoy), var. *confertituberculata* Chapm.
Devonian. Buchan, Gippsland.

Here may be seen the unique impression of a jelly-fish **Case 32.** (*DISCOPHYLLUM mirabile*) which was lately discovered in a Brunswick brick-pit. It is so well preserved that it shows the concentrically ribbed ornament, the manubrium, the genital pouches and even the hair-like tentacles.

In this case are also some Silurian Graptolites (*MONOGRAPTUS*, *CYRTOGRAPTUS*, and *RETIOLITES*); a remarkable series of Brittle-stars (*PROTASTER*, *GREGORIURA*, *STURTZURA*); Starfishes (*URASTERELLA*, *PALAEASTER*); and Crinoids (*HAPALOCRINUS* and *HELICOCRINUS*). The last-named is a remarkably fine example of a stalked starfish with a plumy crown, and a slender stem with coiled termination for attachment to seaweed or other marine objects. The stem-joints of Crinoids have in the past built up great masses of limestone at Toongabbie and the Thomson River in Gippsland.

FIG. 26. A SILURIAN JELLYFISH—*Discophyllum mirabile* Chapm.
Brunswick, near Melbourne, Victoria.

FIG. 27. *Gregoriura spryi* Chapm.
A BRITTLE-STAR, from the Silurian of South Yarra.

FIG. 28. *Helicocrinus plumosus* Chapm.

A CRINOID OR FEATHER-STAR, from the Silurian of Brunswick, Victoria.

Case 33. This contains Worm-tubes and the wonderful gill impressions of TRACHYDERMA, Sea-mats, as FENESTELLA and PINNATOPORA, and numerous Lamp-shells or Brachiopods; all of Silurian age. Amongst the Brachiopods we may note LINGULA lewisii, var. flemingtonensis, in which the original phosphate of lime in the shell is still preserved after the lapse of many millions of years; also CHONETES, remarkable for having hollow hinge-spines.

Case 34. Amongst the Brachiopods in this series may be noted ORTHIS, a common fossil in the Silurian mudstones round Melbourne; CAMAROTOECHIA, found in the sandstone under the Museum foundations; ATRYPA fimbriata, a handsome shell with a fringe of long spines around the edges: and SPIRIFER, named from the complex spiral brachidia or breathing apparatus.

FIG. 29. A SPINOSE LAMP-SHELL—
Atrypa fimbriata Chapm.
From the Silurian of Lilydale, Victoria.

Case 35. Note the large ribbed, cockle-like shells of PANENKA, from the newest Silurian or lowest Devonian beds of Gippsland (Mount Matlock, &c.). These shells measure nearly four inches across. The genus PALAEONEILO is also a striking shell in its graceful contours and delicate surface markings. More than one species is identical with some from North America.

A Silurian Limpet of fine ornamentation is shown here, **Case 36.**

HELICIONOPSIS elegantulum ; it occurs in the limestone of Cave Hill, Lilydale. Another notable shell from the same locality is the trumpet-mouthed TREMATONOTUS, which has a series of openings along the back, reminding one of *Haliotis*, the ear-shell. BELLEROPHON is also a noteworthy genus a very form of which, *B. cresswelli*, has a large bell-mouth and prominent dorsal keel. PLEUROTOMARIA and the allied PHANEROTREMA belong to a group whose living descendants are very rare, PLEUROTOMARIA being known only by a few individuals at the present time.

FIG. 30. A SILURIAN SLIT-BAND SNAIL—*Phanerotrema australis*
Etheridge fil.

From the Cave Hill Quarry, Lilydale.

Case 37.

The various forms of the *Murchisonia*-type (turreted shells with a slit-band) are well seen here, as COELOCAULUS, GYRODOMA, and CYRTOSTROPHA. Other forms are the large, flat, spiral gastropods, EUOMPHALUS, like the living *Planorbis* in shape, though unrelated; and the top-shaped shell, SCALAETROCHUS. Pteropods are seen in STYLIOLA, a minute "sea-butterfly", also TENTACULITES, HYOLITHES (with a closing lid or operculum) and CONULARIA (having a fine surface ornament).

B.

A.

FIG. 31. A.B. A *Murchisonia*-LIKE SNAIL—*Coelocaulus brazieri* (Etheridge fil.).

From the Silurian of Lilydale.

A. Broken whorls, with infilled Columella.

B. Section of Shell.

Case 38.

The Cephalopods of the straight *Nautilus* type (orthocones) are well represented. Some shown here attain a length of eight inches. The Chinese call them "pagoda-stones," as they resemble in outline their tall, tapering temples.

The Trilobites are amongst the commonest and most interesting of the Australian fossils. In the Silurian Table-case are *TRINUCLEUS* (with head-spine); *GOLDIUS* (formerly *Bronteus*) with fan-shaped tail segments; *CALYMENE* (capable of inrolling itself like a woodlouse); and *DALMANITES* (a large and handsome form with big compound eyes and a sharp tail-spine). **Case 39.**

FIG. 32. A SILURIAN TRILOBITE—*Goldius greenii* Chapm.
From the mudstone of Lilydale, Victoria.

This case is devoted to the Bivalved Crustacea known as Ostracoda; also the Pod-shrimps (*CERATIOCARIS*), and the Sea-scorpion (*PTERYGOTUS*). **Case 40.** An interesting head-shield, referred to the primitive, jawless fish, *THYESTES*, is also to be seen here.

Here the Graptolites of the Upper Ordovician slates are grouped. **Case 41.** Amongst these may be noticed the sigmoidal hydrosome of *NEMAGRAPTUS*, the calliper- and lyre-shaped *DICELLOGRAPTUS*, and the tongue-shaped *GLOSSOGRAPTUS*. The primitive Brachiopod,

SIPHONOTRETA, is also shown by a series of specimens from the grey shales of Bulla, Victoria. From the Macdonnell Ranges, South Australia, are some fine examples of Cephalopoda (ORTHO CERAS and ENDOCERAS).

Cases 42 to 44.

The Lower Ordovician fossils in these cases are chiefly Graptolites, such as the net-like DICTYONEMA, the tuning-fork DIDYMOGRAPTUS, and the branching TETRAGRAPTUS, DICHOGAPTUS, GONIOGRAPTUS, and CLONOGRAPTUS. Other interesting modifications are the biserial DIPLOGRAPTUS and GLOSSOGRAPTUS, and the leaf-like PHYLLOGRAPTUS. Molluscoids and Mollusca are rare (SIPHONOTRETA and HYOLITHES). The crustacea are represented by the well-distributed Pod-shrimps (RHINOPTEROCARIS), whose bodies were enclosed in a gauzy or chitinous covering, joined by a hinge-line along the back.

FIG. 33. *Rhinopterocaris maccoyi* Eth. fil.
Lower Ordovician. (Castlemaine series.)
Lerderderg River, Victoria.
G. S. V. Coll.

In this are arranged a good series of Cambrian fossils, **Case 45.**
comprising the lime-secreting sea-weed, *GIRVANELLA*;

FIG. 34. *Girvanella* LIMESTONE.

Cambrian. Roan Horse Gully, North-East Gippsland.

also Coral and Sponge-like animals (*ARCHAEOCYATHINA*), primitive Lamp-shells and Mollusca (*ORTHIS*, *PATELLA*, *EUOMPHALUS*, *PLATYCERAS*, and *SALTERELLA*. Trilobites are seen in genera such as *AGNOSTUS*, *CONOCORYPHE*, *OLENUS*, *PTYCHOPARIA*, *DIKELLOCEPHALUS*, *CREPICEPHALUS*, and *DINESUS*.

FIG. 34A. *Girvanella* PELLET.

From the same limestone.

FIG. 35. ONE OF THE *Archaeocyathina* GROUP OR "SPONGE-CORALS," OF CAMBRIAN AGE—*Syringocnema favus* Taylor.

From the Ajax Mine, South Australia.

Photo. by Professor Griffith Taylor.

Exhibited on the wall next to the Geological map of Victoria is an outline map of Victoria, showing the principal localities where fossils have been found in the past.

One hundred and fifty-two localities where fossils have been obtained are marked on this map by a black spot. The chief *Groups of fossils* found in each locality and the *Age of the beds* are indicated by the lettering on the accompanying tables. Thus :—

"Bairnsdale (8 BDFdG-KMPT)" signifies "of Barwonian age ; Fossils.—Foraminifera, Corals, Sea-urchins, Worms, Polyzoa, Brachiopods, Pelecypods, Scaphopods, Gasteropods, Ostracods, Fishes."

The rivers are shown in *blue*, the railways in *red*.

FOSSILS OF NEW ZEALAND.

(EXHIBITED IN THE EAST GALLERY.)

The Newer Tertiary series (Wanganui System) is represented by a good collection of Molluscan shells, (including GLYCYMERIS, OSTREA, PECTEN, LUCINA, and STRUTHIOLARIA). **Cases 46, 47.**

The Older Tertiary fossils of the Oamaru System are well shown by a series of Echinoids (CIDARIS, LOVENIA, LINTHIA) and large specimens of MAGELLANIA, CUCULLAEA, CHLAMYS, and DENTALIUM. The type of VOLUTOSPINA *huttoni*, var. *rarispira*, McCoy, is also to be seen here. *ATURIA australis*, McCoy, a nautiloid shell also occurring in Victoria, shows the relationship of the Australian and New Zealand Tertiary faunas. **Cases 47, 48.**

The plant fossils of the Brown Coal Measures of the Lower Oamaru Series (Oligocene) are represented by leaves referred to the genera PODOCARPIUM (Coniferous) and PHYLLITES (Dicotyledonous). **Case 48.**

In the same case are exhibited a typical series of the Amuri System, recently acquired for the Museum from the New Zealand Geological Survey. Amongst these are the curiously twisted shells of CONCHOTHYRA *parasitica*, a unique type of shell related to the Strombids; and also a fine series of fish teeth, including those of the Goblin Shark (SCAPANORHYNCHUS).

The marine Jurassic (Putataka) Series of the Hokonui Ranges comprise genera such as INOCERAMUS, MACCOYELLA, MYTILUS, PHOLADOMYA, and BELEMNITES. **Case 49.**

The Jurassic Plant-beds of the Mataura (Estuarine) series contain many types common also to Australia. Amongst the notable kinds are the Horse-tail (EQUISETITES); Ferns, as CONIOPTERIS, DICTYOPHYLLUM and CLADOPHLEBIS; the primitive seed-bearing plant, TAENIOPTERIS; the Cycad, PTEROPHYLLUM; and the Conifers, PALISSYA and TAXITES.

FIG. 36. A NEW ZEALAND FOSSIL FERN-PALM—*Pterophyllum matauriensis* Hector.
Jurassic. Mataura Falls, Otago.

Case 50. The Upper Triassic (Otapiri) fauna is represented by the handsome bivalved shell, *PSEUDOMONOTIS richmondiana*. Lower Triassic fossils of the Wairoa series are the interesting Mount Torlesse Annelid

(worm tubes), the minute bivalved shell, *HALOBIA hochstetteri* and the comparatively large mussel, *MYTILUS problematicus*. Other Triassic shells exhibited here are the striking lamp-shell, *HECTORIA bisulcata*, the bivalved *MYOPHORIA*, and the slit-band snail, *PLEUROTOMARIA*.

FIG. 37. A TRIASSIC BIVALVED SHELL FROM NEW ZEALAND—
Pseudomonotis richmondiana (Zittel).

The Silurian fauna is contained in the Wangapeka series of Reefton, including the corals, *FAVOSITES* and *PLEURODICTYUM*; crinoids, lamp-shells as *ORBICULOIDEA*; a large form of *ORTHOTHETES*, *CHONETES*, *ORTHIS*, and *SPIRIFER*; the bivalved molluscs, *GRAMMYSIA*, *PALAEONEILO* and *ACTINOPTERIA*; the cephalopod, *ORTHOCERAS*; and the trilobite *HOMALONOTUS*.

FOREIGN FOSSILS.

THESE SPECIMENS ARE EXHIBITED IN THE SOUTH GALLERY.

Part of the floor-space is occupied by large cases and restorations.

COLOSSOCHELYS atlas.—This is a restoration of fragments of the carapace and plastron of a giant Tortoise from the Lower Pliocene beds of the Siwalik Hills, India. It probably measured about eight feet in length. The living Giant Tortoise of the Galapagos Islands off the coast of South America, and the Mascarenes near Madagascar, measures about four feet long.

The Edentates or group of the Sloths are here represented by magnificent casts of the Giant Sloth (*MEGATHERIUM*) and the curious carapaced *GLYPTODON* with armoured tail;

FIG. 38. RESTORATION OF THE GIANT SLOTH—
Megatherium americanum.

both are from the Pleistocene or Pampas Formation of South America. A group of outline sketches of the contemporaneous animals of this Pampas Formation is framed, above the Mammal case.

The extinct Elephants are represented by casts of the cranium of the Lower Pliocene *DEINOTHERIUM*, which has a pair of tusks only in the lower jaw, and the Mastodon

(*MASTODON americanus*). Other casts are :—Crania of the extinct Pliocene Indian Elephants of the Stegodont (“ plated-tooth ”) type, and the Loxodont (“ lozenge-tooth ”) types.

FIG. 39. RESTORATION OF THE PLIOCENE ELEPHANT—
Deinotherium giganteum.

The fore-leg and cranium (casts) of *SIVATHERIUM*, a gigantic Giraffe of the Siwalik Formation of India, form notable objects. An accompanying drawing of a restoration shows the characteristic bilobed canine peculiar to the Giraffidae. (See also the modern OKAPI in the Lower hall.)

Two extinct Birds, the Dodo (*DIDUS ineptus*), from Mauritius, and the New Zealand Pigeon Goose (*CNEMIORNIS calcitrans*), are represented by partial skeletons.

On the wall are hung some fine slabs of sandstone showing Fossil Footprints. These were impressed, many aeons ago, on the soft Triassic sands, by the giant Amphibian named *CHEIROTHERIUM* (literally “hand-beast” on account of the shape of the prints). Casts of other footprints, from Connecticut, show the impressions which were made by small bird-footed reptiles.

Marine Crocodiles (*STENEOSAURUS*) are shown both by casts and an original skeleton embedded in marlstone. These early forms were armoured both above and below. A cast of the Jurassic Crocodile, *PELAGOSAURUS typus*, in a Table-case near the Elephants, shows the slender body and delicate scutes of this Liassic form, which in the original consists of 75 parts, and worked out of the matrix of the rock by Professor Deslongchamps.

The armoured Stegosaurian Reptile, *HYLAEOSAURUS armatus*, is shown by a cast of Mantell's original specimen from the Weald of Sussex.

FIG. 40. RESTORATION OF A STEGOSAURIAN REPTILE—
Stegosaurus unguulatus.
Upper Jurassic. Colorado.

A fine collection of Fish-lizards, or *ICHTHYOSAURUS*, is hung on the wall of this Gallery, comprising five species (*I. acutirostris*, *I. communis*, *I. intermedius*, *I. platyodon*, and *I. tenuirostris*). Some of these are original examples, and most of them show the kinked caudal region of the vertebra which indicates the fish-like heterocercal tail, predicted by Owen and confirmed by later discoveries. Compare the Queensland specimen from the later formation of the Cretaceous (in Case on east wall of Gallery), representing the last dying members of the race which, besides living in European seas, sought refuge in southern waters, as in Chile, New Zealand, and Australia.

THAUMATOSAURUS, a short-necked Marine Reptile, is represented by a fine replica of the fossil which is in the Museum of the Royal Dublin Society. It measures about 27 feet in length. These Sauropterygians ("Lizard-finned" Reptiles) were contemporaneous with the Fish-lizards, and had similar paddles, but unlike them, the five reptilian toes were not supplemented by extra bones. (See Fig. 9.)

A cast of *PLESIOSAURUS hawkinsi* here exhibited is another but more slender form of the same order.

Of the flesh-eating reptiles, a notable example among the Deinosaurus is *TYRANNOSAURUS rex*, a huge carnivorous reptile found in the Cretaceous beds of Montana. U.S.A. A fine cast of the skull is here exhibited, of which the original is in the American Museum of Natural History. The complete skeleton of this beast measures over 44 feet in length.

FIG. 41. A CARNIVOROUS DEINOSAUR, CAST OF HEAD OF—
Tyrannosaurus rex. Cretaceous.

Montana, U.S.A.
Exch. U.S. Nat. Mus.

Some of the herbivorous reptiles of the Jurassic seas were egg-laying (oviparous) and a fine series of their fossilized eggs were obtained by an expedition from the American Museum of Natural History in Mongolia. A cast of one of these eggs is shown in this Gallery. On the other hand, the Ichthyosaurs or Fish-lizards are known to be viviparous.

Other casts on the wall of the South Gallery are :—an Upper Jurassic Turtle (*PLEUROSTERNUM*); a great Ganoid Fish (*LEPIDOTUS maximus*); a “Fringe-finned” Ganoid of the

Old Red Sandstone (*HOLOPTYCHIUS*); a Jurassic fore-runner of the Angel-fish (*SQUATINA alifera*); Sea-scorpions (*SLIMONIA* and *STYLONURUS*); and Sea-lilies (*PENTACRINUS*), of which there are also two fine original specimens from Dorset and Wurtemberg.

A Case of MODELS OF FORAMINIFERA, prepared by Reuss and Fritsch, shows the wonderful variation in this group of microscopic fossils, and actual specimens are mounted alongside indicating their minute size.

Ranged just above the floor angle is a series of large Cephalopod shells, comprising Ammonites such as *PACHYDISCUS* from the Lower Chalk, *PARKINSONIA* from the Inferior Oolite, *AEGOCERAS* from the Lower Lias, as well as a *NAUTILUS* from the Oxford Clay. This series is supplemented by a Floor-case with *STEPHANOCERAS*, *CYRTOCERAS*, *AGONIATITES*, *ARIETITES*, *SONNINIA*, *ASPIDOCERAS*, and *AMALTHEUS*, also large specimens of *LIMA*, *PINNA*, *CAPRINA*, *PLEUROTOMARIA*, and *NATICA*, in illustration of the Phylum Mollusca.

Two long Wall-cases are devoted to exhibits of Fossils generally too large to show in the Table-cases.

MAMMALS.

Here are seen the Giant Lemur, *MEGALADAPIS* (cast of skull); the Sabre-toothed Cat, *MACHAERODUS* (cast of skull); a fine original skull of the Cave-Bear, *URSUS spelaeus*, from

FIG. 42. RESTORATION OF THE EOCENE ELEPHANT—
Moeritherium lyonsi. Egypt.
See model of skull in Wall-case.

Bohemia ; a series of casts illustrating the ancestry of the Horse ; various types of primitive Pigs, Camels, and Cattle ; the early forms of Elephants as *MOERITHERIUM* and *PALAEOMASTODON* (casts) ; teeth and casts of jaws of the Mammoth and Mastodon ; and the ancestral Toothed Whales, *PROZEUGLON* and *ZEUGLON*.

BIRDS.

Three fine replicas of *ARCHAEOPTERYX*, from the Berlin and London Museums, are shown here. The originals are from the Upper Jurassic lithographic stone of Bavaria. This ancient bird shows connecting links with certain reptiles like *COMPSOGNATHUS*. Their bones were not pneumatic (cellular) as in modern birds, the vertebrae were flattened or concave and the tail was lizard-like, whilst the margins of both jaws carried a row of socketed teeth.

In a small case, near by, is a perfect specimen of the egg of the great extinct Ostrich, *STRUTHIOLITHOS*, which lived in late Pleistocene times in Russia, India, and Northern China. It was found in red loess associated with chipped tools of ancient man of the Azilian period, dating back about 25,000 years.

REPTILES.

MOSASAURUS is represented by a vertebral bone. Various types of Crocodiles are illustrated by *GONIOPHOLIS*, *ATOPOSAURUS*, *STENEOSAURUS*, and *THORACOSAURUS*.

The Deinosaurian remains comprise gigantic footprints and a cast of the foot of *IGUANODON*.

The flying Dragons (Pterosauria) are illustrated by a restoration (drawing) of *PTERANODON*, which probably measured 29 feet from tip to tip of the wings. Some of these flying reptiles were as small as a sparrow, as *PTERODACTYLUS meyeri*, of which casts of this and other related fossil remains are shown.

Examples of the curious primitive reptiles, the Theromorphs ("beast-forms") exhibit strong laniary and crushing teeth.

AMPHIBIA.

These are represented by a cast of *ANDRIAS scheuchzeri* (referred to by the old geologists as "*homo diluvii testis*"), —Man the witness of the Flood), which sensational discovery

of two centuries ago turned out to be simply the remains of a Salamander. The Labyrinthodont, TREMATOSAURUS, of which there are some good originals from the Bunter Sandstone of Germany, and ARCHEGOSAURUS, a still older (Lower Permian) Amphibian.

Coloured drawings of restorations of extinct animals are mounted above these cases.

FISHES.

From a very complete series of these remains the following may be selected as of especial interest. The jawless fishes (Agnatha), as BOTHRIOLEPIS, show the primitive armoured body having anterior jointed swimming appendages. PALAEO-SPONDYLUS is a small forerunner of the modern Lamprey. These fossils measure a little more than an inch in length and are found in the bituminous sandstone of Caithness.

FIG. 43. A PRIMITIVE LAMPREY-LIKE FISH—
Palaeospondylus gunni Traquair.
From the Old Red Sandstone of Caithness,
Scotland.

The Dipnoi ("double-breathers"), to which the modern lung-fishes belong, were much in evidence as far back as Devonian times (PHANEROPLEURON). PHLYCTAENASPIS is a Coccoostean ("berry-bone fish") which occurs in the Buchan limestone, and here well shown by Scottish specimens.

In the *Crossopterygii* ("fringe-finned " Ganoids) the teeth are of remarkable structure, having a tree-like grouping of the dentine tubules, seen in cross section, hence the name "*Dendrodus* " for the teeth of *HOLOPTYCHIUS*.

The Ganoids, or enamelled scale fishes, were either of the grovelling type (short and deep bodied), or predatory (with thinner and lithe bodies). The former are represented by *LEPIDOTUS* and the latter by *CATURUS*. Many of the short forms had bean-shaped teeth, which were shed successionaly. Early types of Bony Fishes (*Teleostei*) are seen in *LEPTOLEPIS* and *OSMEROIDES*. Herrings (*CLUPEA*) made their appearance in the Cretaceous, and most of the living genera followed in early Tertiary times, as Pike, Perch, and Mackerel, of which there are examples shown here.

The first Sharks were small and spiny, and began to appear in the Lower Devonian (*MESACANTHUS* and *DIPLACANTHUS*). The modern genera, as *LAMNA*, did not exist, however, before Cretaceous times, whilst *CARCHARODON* is typically early Tertiary to Recent, though some teeth have lately occurred in New Zealand rocks which have been referred to the Danian (Upper Cretaceous).

ARTHROPODA.

A good series of the animals with "jointed feet" is shown here, including Flies (*Diptera*), Ants (*Hymenoptera*), Beetles

FIG. 44. A DIPTEROUS INSECT—*Protomyia bucklandi* Heer.
From the Oligocene of Aix, Provence, Southern France.

(Coleoptera), Dragon-flies (Odonata), Locusts (Orthoptera), Prawns, Lobsters, and Crabs (Decapoda), King Crabs and Sea-Scorpions (Merostomata), Barnacles (Cirripedia), and Trilobites. An Ant, *FORMICA lignitum*, is here exhibited, beautifully preserved in Eocene clay; whilst a Fly, *MUSCA lithophila*, and a Beetle, *CHRYSOBOTHRUS veterana*, are seen embedded in Upper Jurassic marlstone.

MOLLUSCA.

Amongst the shell-fish we may notice the Cephalopoda or Cuttle-fishes, as *NAUTILUS*, *ORTHOCERAS*, and *Ammonites*. The delicate *COSMOCERAS*, a pearly *Ammonite* from Wiltshire, should be noted; also the showy median slices of other *Ammonites*, as *PARKINSONIA* and *AEGOCERAS*.

Of the Gasteropods, *CERITHIUM giganteum*, from the Tertiary of the Paris Basin, is a conspicuous object, the shell measuring fifteen inches in length.

Other specimens shown here include various Corals ("madreporites"), Sponges ("Ventriculites"), and Worms.

PLANT FOSSILS.

A selected series of plant-remains is placed in the end of this Wall-case. The specimens range from fossil Sea-weed, through Mosses, Horse-tails, Club-mosses, Ferns, Fern-palms, Conifers, and Flowering Plants.

The TABLE-CASES OF FOREIGN FOSSILS (numbered from 101 to 120) contain fossils from extra-Australasian localities, as Europe, North America, India, &c., and range in age from PLIOCENE to CAMBRIAN.

Table, Case 101.

The faunas of the White and Red Crag of Suffolk are well represented. Amongst these fossils may be noted an encrusting Hydroid, *HYDRACTINIA*; the large boulder-like limy skeleton or zoarium of a Polyzoan, *THENOA*; a reversed Whelk, *CHRYSODOMUS*; and a tympanic bone of a Whale, *BALAEONODON*.

Cases 102 and 103.

Comprise Miocene fossils, many of which are of the same generic type as those found round Geelong and Bairnsdale. Here are the curious Sea-urchin, *CLYPEASTER umbrella*; *SPONDYLUS gaederopus* (very like the Victorian species, *S. gaederopoides*); and a fine series of Sharks' teeth and compressed remains of the Toothed Carp, *PROLEBIAS*.

Contains some interesting Oligocene Corals (*TURBINOLIA* **Case 104.** and *CARYOPHYLLIA*), the freshwater Snail (*PLANORBIS*) of the Oligocene of the Isle of Wight; also Sharks' teeth (*NOTIDANUS*, *ODONTASPIS*, and *CARCHARODON*). The eggs of Turtles are rare fossils, and some exhibited here were found associated with a freshwater fauna.

Here are some delicate fossil leaves from the Eocene of **Cases 105, 106.** of Alum Bay in the Isle of Wight; also discoidal Foraminifera known as *NUMMULITES* from Italy and India; the giant Sea-urchin, *CLYPEASTER*; a fine series of volute Gasteropods; the extinct Cuttlefish bone, *BELOSEPIA*; and a series of Sharks' teeth.

Cretaceous fossils are represented by a Fern stem, **Case 107.** *TEMPSKYA*, found in the Weald of Buckinghamshire; Siliceous Sponges as *SIPHONIA* and *PLOCOSCYPHIA*; "Shepherd's Crowns" (*CYPHOSOMA*); Cephalopods, as *BACULITES* (showing foliated sutures); and various Ammonites. Here are some good specimens of the teeth of a kind of Ray, *PTYCHODUS*, termed "Fossil slugs" by quarrymen.

This Case is occupied by Jurassic Plants, chiefly from **Case 108.** the Wm. Bean collection, of Yorkshire. They comprise Liverworts (*MARCHANTITES*); Horse-tails (*EQUISETITES*); Ferns (*TODITES*, *CLADOPHLEBIS*, and *SPHENOPTERIS*); the Fern-like (*TAENIOPTERIS*); Fern-palms (*WILLIAMSONIA*); and Maiden-hair Trees (*GINKGO*).

Amongst Oolitic fossils here shown is a remarkable **Case 109.** Starfish (*ASTROPECTEN*). Other specimens of interest are "pear Encrinites" (*APIOCRINUS*), in which the crown of this Sea-lily is shaped like the fruit; a curious Bivalve with bar-like hinge-teeth, *PARALLELODON*; some ancestral Trigonias, differing from the living Australian species in having concentric ribs; and an interesting series of Ammonites, Belemnites, Prawns, and a Dragon-fly.

Liassic fossils include fossil Ferns, as *LACCOPTERIS*, **Case 110.** *DICTYOPHYLLUM*, and *SAGENOPTERIS*; whilst the Maiden-hair Tree has an early relative in *BAIERA*. The beautiful little Brittle-star, *OPHIODERMA*, is seen

lying on the original hardened sea-mud as found in the cliffs at Bridport, England. The "devil's toe-nail" (GRYPHAEA), the slit-band Snail (PLEUROTOMARIA), and an Ammonite with the mouth-closing operculum (aptychus) in position, form other interesting exhibits.

FIG. 45. A BRITTLE-STAR FROM THE LIAS OF DORSET—
Ophioderma egertoni (Broderip).

- Case 111.** Amongst the plants of the Trias are the ancestors of the living Horse-tails (EQUISETUM), and some ancient types of Fern-palms (OTOZAMITES and PTEROPHYLLUM). The handsome Stone-lily (ENCRINUS) from Brunswick, Germany, and a NAUTILUS (*N. sauperi*) from Austria showing pearly lustre after many aeons, are worth noting.
- Case 112.** Club-mosses, Fern stems and Coniferous wood, some of which are shown in polished slices, form an interesting exhibit in this Permian series; and from the same formation are marine representatives: Corals, Lamp-shells, Molluscs, and Fishes, the latter group including a spine-bearing Shark, ACANTHODES, only five inches long. In the same case are several beautifully preserved stems and branches of Carboniferous trees belonging to the Horse-tail

(CALAMITES, CALAMOCCLUS) and the Club-moss (LEPIDODENDRON) groups.

FIG. 46. A CARBONIFEROUS HORSE-TAIL—*Calamocladus equisetiformis* (Schloth).

From Silesia.

Here are Carboniferous examples of the true Ferns **Case 113.**

(SPHENOPTERIS, PECOPTERIS, as well as fern-like seed-bearing Plants (ALETHOPTERIS, NEUROPTERIS)). The marine fossils of this period include Foraminifera (FUSULINA and SCHWAGERINA); Corals (CYATHAXONIA, LITHOSTROTION); Sea-lilies (ACTINOCRINUS); Lamp-shells (LINGULA, SPIRIFER); and Molluscs (AVICULOPECTEN, CARBONICOLA, BELLEROPHON, and GLYPHIOCERAS).

Case 114.

Devonian Corals are well represented by ZAPHRENTIS, CYATHOPHYLLUM, and PHILLIPSASTRAEA, amongst others. Stromatoporoids are seen in the massive ACTINOSTROMA. Sea-lilies in MELOCRINUS with coiled stem, and Starfishes in ASPIDOSOMA and ROEMERASTER, the latter a very fine species from the Upper Devonian slate of the Harz district. Other fossils include SPIRIFER *laevicosta*, interesting in being so nearly related to the Australian *S. yassensis*.

FIG. 47. A DEVONIAN BRITTLE-STAR—*Roemeraster asperula* (Roemer).
From Bundenbach, Germany.

Case 115.

Devonian Molluscs are represented by numerous genera, the Cephalopods being of particular interest and diversity (PHRAGMOCERAS, OXYCLYMENIA, and GEPHYROCERAS). Devonian Trilobites are shown HOMALONOTUS, CHEIRURUS), as also Ostracoda (ENTOMIS). Numerous examples of Devonian Fishes are represented by PALAEOSPONDYLUS, an ancient Hag-fish, as well as the armoured fish with appendages, PTERICHTHYS. Representatives of the oldest Sharks are seen amongst these fossils, as MESACANTHUS, and there are spines of fishes of the same group, as CLIMATIUS.

Here is the interesting Silurian bag-shaped Sponge, **Case 116.**

ISCHADITES. Silurian Corals are well represented, as CYATHOPHYLLUM, CYSTIPHYLLUM, LINDSTROEMIA, OMPHYMA, ACERVULARIA, FAVOSITES, HALYSITES, and others. The Stomatoporoids exhibit various modes of growth: LABECHIA, encrusting; STROMATOPORA, boulder-like; CLATHRODICTYON, tumulose. A fine collection of Graptolites, as MONOGRAPTUS, RASTRITES, and DIPLOGRAPTUS is placed here, chiefly from Bohemia; whilst Stone-lilies are seen in the Wenlock forms, PERIECHOCRINUS, EUCALYPTOCRINUS, TAXOCRINUS, and others.

The bud-shaped Cystoids, of Silurian age (CARYOCRINUS, **Case 117.**

PSEUDOCRINITES) are shown. Brittle-stars are seen in PROTASTER, STURTZURA, and LAPWORTHURA; whilst among Starfishes we may note PALAEOCOMA with its long brush-like series of ossicles, BDELLACOMA and RHOPALOCOMA; also Polychaete Worms (CORNULITES) and Lamp-shells, as STROPHONELLA, CHONETES, ORTHIS, CAMAROTOECHIA, SPIRIFER, and many others.

Continuing the Silurian series, Bivalved Molluscs are **Case 118.**

seen in the cockle-like PANENKA, the winged PTERINAE, and PROLUCINA. Of the Silurian Snails we may note MURCHISONIA, EUOMPHALUS, OMPHALOTROCHUS, and the air-breathing HERCYNELLA, also found in the Silurian rocks of Victoria. Cephalopods of this age are very striking in appearance and include ORTHOCERAS, GEISONOCERAS, DAWSONOCERAS, KIONOCERAS, and OOCERAS. Trilobites are in great variety (HARPES, ILLAENUS, GOLDIUS, PROETUS, ACIDASPIS, ENCRINURUS, CALYMENE, and CHEIRURUS). Exceptionally large species of Ostracoda are seen here, in LEPERDITIA from the Baltic clays, and there is also a fine head of a water-scorpion, EURYPTERUS.

The oldest species of the RECEPTACULITES group of **Case 119.**

Sponges is shown here, in which the placing of spicules in quincuncial manner and the handsome platter-like form is very striking. Other Ordovician fossils are Corals (STREPTELASMA and FAVOSITES); Graptolites (DIDYMOGRAPTUS and PHYLLOGRAPTUS);

Lamp-shells (ORTHIS and RHYNCHOTREMA) ; Bivalved Molluscs (NUCULA and AMBONYCHIA) ; Marine Snails (PLEUROTOMARIA and HOLOPAEA) ; Cephalopods (ENDOCERAS and CYCLOCERAS) ; and Trilobites (including the handsome HARPES, TRIARTHURUS in which air-breathing appendages were first found), and DALMANITES with its conspicuously faceted eyes.

Case 120.

Contains some of the oldest fossils known, of Cambrian age. Amongst the more interesting of these are the supposed fossil Seaweed, OLDHAMIA, and the gigantic, spined Trilobite, PARADOXIDES. HYMENOCARIS *vermicauda* is a pod-shrimp allied to the living NEBALIA, and which is also represented generically in Victorian rocks.

FIG. 48. A MIDDLE CAMBRIAN TRILOBITE—
Paradoxides davidis Salter.
From South Wales.
About one-third natural size.

INDEX.

	PAGE		PAGE
<i>Acanthodes</i>	46	Bivalved Crustacea ..	29
<i>Acervularia</i>	49	Bivalved Mollusca ..	15
<i>Acidaspis</i>	49	Blainville, H.D.de ..	3
<i>Actinocrinus</i>	47	<i>Boliteceras</i>	18
<i>Actinopteria</i>	35	Bony Fishes	43
<i>Actinostroma</i>	48	<i>Bothriolepis</i>	42
<i>Aegoceras</i>	40, 44	Brachiopods	15, 26, 29
<i>Aepyornis</i>	8	Brittle-stars	23, 45
<i>Agnatha</i>	42	<i>Bronteus</i>	29
<i>Agnostus</i>	31	Brown Coal Measures, N.Z.	33
<i>Agoniatites</i>	40	<i>Calamocladus</i>	47
<i>Alethopteris</i>	47	<i>Calamites</i>	47
<i>Amaltheus</i>	40	<i>Calymene</i>	29, 49
<i>Ambonychia</i>	50	<i>Camarotoechia</i>	26, 49
Ammonites	18, 40, 44, 45, 46	<i>Caprina</i>	40
Amphibia	41	<i>Carbonicola</i>	47
Amuri system	33	<i>Carcharodon</i>	10, 14, 43, 45
<i>Ancyloceras</i>	11	Carniverous Deinosauurs ..	39
<i>Andrias</i>	41	<i>Caryocrinus</i>	49
Angel Fish	40	<i>Caryophyllia</i>	45
<i>Apiocrinus</i>	45	<i>Caturus</i>	43
<i>Apteryx</i>	8	Cave-Bear	40
Aptychus	46	Cephalopods	28, 30, 45, 48, 49
<i>Araucaria</i>	12	<i>Ceratiocaris</i>	29
<i>Araucarioxylon</i>	21	<i>Cerithium</i>	44
<i>Araucarites</i>	12	<i>Cheirurus</i>	48, 49
<i>Archaeocyathina</i>	31, 32	<i>Cheirotherium</i>	37
<i>Archaeopteryx</i>	41	<i>Chlamys</i>	15, 33
<i>Archegosaurus</i>	42	<i>Chrysodomus</i>	44
<i>Arietites</i>	40	<i>Chonetes</i>	26, 35, 49
Aristotle	1	<i>Chrysobothrus</i>	44
Arthropoda	43	<i>Cidaris</i>	33
<i>Aspidoceras</i>	40	<i>Cimoliosaurus</i>	18
<i>Aspidosoma</i>	48	Cirripedia (Barnacles) ..	44
" <i>Asterolepis</i> "	22	<i>Cladophlebis</i>	34, 45
<i>Astropecten</i>	45	<i>Clathrodictyon</i>	49
<i>Atoposaurus</i>	41	<i>Cleithrolepis</i>	21
<i>Atrypa</i>	26	<i>Climatus</i>	48
<i>Aturia</i>	10, 33	<i>Clonograptus</i>	30
<i>Aviculopecten</i>	21, 47	<i>Clupea</i>	43
Australasian Fossils ..	4, 13	<i>Clypeaster</i>	44, 45
<i>Baculites</i>	45	<i>Cnemioznis</i>	37
<i>Baiera</i>	45	Coccoctean	42
<i>Balaenodon</i>	44	<i>Coelocaulus</i>	28
<i>Bdellacoma</i>	49	Coleoptera (Beetles) ..	44
<i>Belemnites</i>	18, 33	<i>Colossochelys</i>	36
<i>Bellerophon</i>	27, 47	<i>Compsognathus</i>	41
<i>Belonostomus</i>	10, 18	<i>Conchothyra</i>	33
<i>Belosepia</i>	45	Cones	15
"Berry-bone" fish	23, 42	Conifers	19, 34
Birds	41	<i>Coniopteris</i>	34
Bird's feather	16	<i>Conocoryphe</i>	31

INDEX—continued.

	PAGE		PAGE
<i>Conularia</i>	28	Edentates	36
<i>Conus</i>	15	Egg-laying Dinosaurs ..	39
Corals 12, 15, 22, 44, 45, 46, 48, 49		<i>Elasmosaurus</i>	9
<i>Cornulites</i>	49	Emu	13
<i>Cosmoceras</i>	44	<i>Encrinurus</i>	46
Cowrie	11, 15	<i>Encrinurus</i>	49
<i>Crepicephalus</i>	31	<i>Endoceras</i>	30, 50
Cretaceous Ray	45	<i>Entomites</i>	48
Crinoids	23, 25	<i>Equisetites</i>	34, 45
Crinoidal limestone	23	<i>Equisetum</i>	46
<i>Crioceras</i>	11	<i>Eucalyptocrinus</i>	49
Crossopterygii	43	<i>Eucalyptus</i>	12
Crustacea	30	<i>Euomphalus</i>	28, 31, 49
<i>Ctenodus</i>	22	<i>Eurapteryr</i>	8
<i>Cucullaea</i>	33	<i>Eurydesma</i>	21
<i>Cyathaxonia</i>	47	<i>Eurypterus</i>	49
<i>Cyathophyllum</i>	22, 48, 49	Extinct Ostrich	41
Cycads, N.Z.	34	<i>Favosites</i>	12, 22, 35, 49
<i>Cycloceras</i>	50	Feather-star, Silurian ..	25
<i>Cyphosoma</i>	45	<i>Fenestella</i>	21, 26
<i>Cypraea</i>	11, 15	Fishes	42
<i>Cyrtostropha</i>	28	Fish Lizards	38
<i>Cyrtoceras</i>	40	Flying Dragons	41
<i>Cyrtograptus</i>	23	Foraminifera	19, 40, 47
<i>Cystiphyllum</i>	49	Foraminifera, Models of ..	40
Cystoids	49	Foreign fossils	36
<i>Dalmanites</i>	29, 50	<i>Formica</i>	44
<i>Dawsonoceras</i>	49	Fossils	1
Decapoda (Prawns, Lobsters, Crabs)	44	Fossil foot-prints	37, 41
Deep Leads Fossils	13	Fossil Giraffes	37
<i>Deinosaur</i>	20	Fossil Locality Map of Victoria	32
<i>Deinotherium</i>	36	" Fossil slugs "	45
<i>Dendrodus</i>	43	<i>Fusulina</i>	47
<i>Dentalium</i>	33	Ganoid Fishes	39, 43
<i>Dicellograptus</i>	29	<i>Geisonoceras</i>	49
<i>Dichograptus</i>	30	<i>Gephyroceras</i>	48
<i>Dictyophyllum</i>	34, 45	Giant Kangaroos	13
<i>Dictyonema</i>	30	Giant Lemur	40
<i>Didus</i>	37	Giant Sloth	36
<i>Didymograptus</i>	30, 49	Giant Tortoise	36
<i>Dikellocephalus</i>	31	<i>Gingko</i>	19, 45
<i>Dinesus</i>	31	<i>Girvanella</i>	31
<i>Dinornis</i>	7, 8	<i>Glossograptus</i>	29, 30
<i>Diplacanthus</i>	43	<i>Glossopteris</i>	12, 21
<i>Diplograptus</i>	30, 49	<i>Glycymeris</i>	33
Dipnoi	42	<i>Glyphioceras</i>	47
<i>Diprotodon</i>	4, 5	<i>Glyptodon</i>	36
Diptera (Flies)	43	Goblin Shark	33
<i>Discophyllum</i>	23, 24	<i>Goldius</i>	29, 49
Dodo	37	<i>Goniograptus</i>	11, 12, 30
<i>Dromaeus</i>	13	<i>Goniopholis</i>	41
Echinoids	33	<i>Grammysia</i>	35

INDEX—*continue l.*

	PAGE		PAGE
Graptolites	11, 23, 29, 30, 49	<i>Lima</i>	40
<i>Gregoriura</i>	.. 23, 24	Limpet	27
<i>Gyracanthides</i>	.. 22	<i>Lingula</i>	26, 47
<i>Gryphaea</i>	.. 46	<i>Lindstroemia</i>	49
<i>Gyrodesma</i>	.. 28	<i>Linthia</i>	15, 33
<i>Haliotis</i>	.. 15, 27	<i>Lithostrotion</i>	47
<i>Halobia</i>	.. 35	"Lizard-finned" Reptiles	38
<i>Halysites</i>	.. 49	Locality Map of Victoria	32
<i>Hapalocrinus</i>	.. 23	<i>Lovenia</i>	33
<i>Harpes</i>	.. 49, 50	Lower Devonian Sharks	43
<i>Hectoria</i>	.. 35	Lower Pliocene	13, 36
<i>Helcionopsis</i>	.. 27	<i>Lucina</i>	33
<i>Helicocrinus</i>	.. 23, 25	Lung-fish	22, 42
<i>Heliolites</i>	.. 12	Lower Triassic, N.Z.	34
Herbivorous Dinosaurs	.. 39	<i>Maccoyella</i>	33
<i>Hercynella</i>	.. 49	<i>Machaerodus</i>	40
Herrings	.. 43	<i>Macropus</i>	13
Holocene	.. 13	<i>Magellania</i>	15, 33
<i>Holopaea</i>	.. 50	Mammals	40
<i>Holoptychius</i>	.. 40, 43	Mammoth	41
<i>Homalonotus</i>	.. 35, 48	<i>Marchantites</i>	45
"Horse-tail"	.. 34	Marine Crocodiles	37
<i>Hydractinia</i>	.. 44	Marsupial Lion	13
<i>Hylaesaurus</i>	.. 38	Mastodon	36, 37, 41
<i>Hymenocaris</i>	.. 50	Mataura Series	34
Hymenoptera (Ants)	.. 43	<i>Megaladapis</i>	40
<i>Hyolithes</i>	.. 28, 30	<i>Megatherium</i>	36
<i>Ichthyosaurus</i>	.. 9, 38	<i>Megalosaurus</i>	20
<i>Iguanodon</i>	.. 41	<i>Melocrinus</i>	48
<i>Iliaenus</i>	.. 49	Merostomata (King Crabs	
<i>Inoceramus</i>	.. 17, 33	and Sea Scorpions)	44
Introduction Case	.. 3	<i>Mesacanthus</i>	43, 48
<i>Ischadites</i>	.. 49	<i>Mesoplodon</i>	6
<i>Isurus</i>	.. 10, 14	<i>Metaceratodus</i>	18, 20
Jawless fishes	.. 29, 42	<i>Metasqualodon</i>	7, 17
Jelly-fish, Silurian	.. 23, 24	<i>Microphylopteris</i>	17
Jurassic Ferns, N.Z.	.. 34	<i>Moeritherium</i>	40, 41
Jurassic Plants	18, 34, 45	<i>Monograptus</i>	23, 49
Jurassic Series, N.Z.	.. 33	<i>Mosasaurus</i>	41
Jurassic Turtle	.. 39	Mount Torlesse Annelid,	
<i>Keilorites</i> (or <i>Trachyderma</i>)	26	N.Z.	34
<i>Keeneia</i>	.. 21	Mud Fish	20
<i>Kionoceras</i>	.. 49	<i>Murchisonia</i>	28, 49
<i>Labechia</i>	.. 49	<i>Musca</i>	44
<i>Labyrinthodont</i>	.. 42	<i>Myophoria</i>	35
<i>Laccopteris</i>	.. 45	<i>Mytilus</i>	33, 35
<i>Lamna</i>	.. 43	<i>Natica</i>	40
<i>Lapworthura</i>	.. 49	<i>Nautilus</i>	10, 11, 15, 16, 18, 28,
<i>Leperditia</i>	.. 49		40, 44, 46
<i>Lepidodendron</i>	.. 21, 47	<i>Nebalia</i>	50
<i>Lepidodus</i>	.. 39, 43	<i>Nemagraptus</i>	29
<i>Leptolepis</i>	.. 19, 43	<i>Neuropteris</i>	47
Liassic Seascape	.. 9	New Zealand Fossils	33

INDEX—continued.

	PAGE		PAGE
Newer Tertiary	33	<i>Pelagosaurus</i>	37
<i>Notidanus</i>	45	<i>Pentacrinus</i>	40
<i>Notochelone</i>	10	<i>Periechocrinus</i>	49
<i>Notofagus</i>	14	<i>Phaneropleuron</i>	42
<i>Notosepia</i>	16	<i>Phanerotrema</i>	27
<i>Nototherium</i>	5, 13	<i>Phascolonus</i>	13
<i>Nucula</i>	50	<i>Phillipsastraea</i>	48
<i>Nummulites</i>	45	<i>Phlyctenuspis</i>	22, 23, 42
Oamaru System	33	<i>Pholadomya</i>	33
<i>Odontaspis</i>	45	<i>Phragmoceras</i>	48
Odonata (Dragon-flies) ..	44	<i>Phyllites</i>	33
Okapi	37	<i>Phyllograptus</i>	30, 49
<i>Oldhamia</i>	50	<i>Physetodon</i>	14
<i>Olenus</i>	31	<i>Pinnatopora</i>	26
Older Tertiary	33	<i>Planorbis</i>	45
Oligocene, N.Z.	33	Plant Fossils	44
<i>Omphalotrochus</i>	49	<i>Platyceras</i>	31
<i>Omphyma</i>	49	Pleistocene	13, 36
<i>Ooceras</i>	49	Pleistocene landscape, Tas-	
<i>Ophioderma</i>	45, 46	mania	13
<i>Orbiculoidea</i>	35	<i>Pleurodictyum</i>	35
<i>Orthis</i>	26, 31, 35, 50	<i>Pleurosternum</i>	39
<i>Orthoceras</i>	30, 35, 44, 49	<i>Pleurotomaria</i>	27, 35, 40, 46, 50
Orthoptera (Locusts) ..	44	<i>Plesiosaurus</i>	38
<i>Orthothetes</i>	35	<i>Placoscyphia</i>	45
<i>Osmeroides</i>	43	Pod-shrimps	29, 30
Ostracoda	19, 29, 48, 49	<i>Podocarpium</i>	33
<i>Ostrea</i>	11, 33	Polychaete Worms	49
Otapiri Series	34	Polychaeta	15
<i>Otozamites</i>	46	<i>Pristosomus</i>	21
Owen, R.	38	<i>Procoptodon</i>	13
<i>Oxyglymenia</i>	48	<i>Proetus</i>	49
<i>Pachydiscus</i>	40	<i>Prolebias</i>	44
"Pagoda-stones"	28	<i>Prolucina</i>	49
<i>Paleaster</i>	23	<i>Protaster</i>	23, 49
<i>Palaecocoma</i>	49	<i>Protomyia</i>	43
<i>Palaecomastodon</i>	41	<i>Prozeuglodon</i>	7, 41
<i>Palaconeilo</i>	26, 35	<i>Pseudocrinites</i>	49
<i>Palaeospondylus</i>	42, 48	<i>Pseudomonotis</i>	34
Palaeontology	3	<i>Psilichthys</i>	10
<i>Palissya</i>	34	<i>Pteranodon</i>	41
<i>Palliocypraea</i>	15	<i>Pterichthys</i>	48
<i>Palorchestes</i>	13	<i>Pterinaea</i>	49
Pampas Formation	36	<i>Pterodactylus</i>	41
<i>Panenka</i>	26, 49	<i>Pterophyllum</i>	34, 46
<i>Paradozides</i>	50	Pteropods	28
<i>Parallelodon</i>	45	<i>Pterosauria</i>	41
<i>Parasqualodon</i>	17	<i>Pterospira</i>	11
<i>Parkinsonia</i>	40, 44	<i>Pterygotus</i>	29
<i>Patella</i>	31	<i>Ptychodus</i>	45
"Pear Enerinites"	45	<i>Ptychoparia</i>	31
<i>Pecopteris</i>	47	Putataka Series	33
<i>Pecten</i>	33	<i>Rastrites</i>	49

INDEX—continued.

	PAGE		PAGE
<i>Receptaculites</i> ..	22, 49	<i>Struthiolithos</i> ..	41
Reptiles ..	41	<i>Sturtzura</i> ..	23, 49
<i>Retepora</i> ..	15	<i>Styliola</i> ..	28
<i>Retiolites</i> ..	23	<i>Stylonurus</i> ..	40
<i>Rhinopterocaris</i> ..	30	<i>Syringocnema</i> ..	32
<i>Rhizophyllum</i> ..	22	<i>Taeniopteris</i> ..	34, 45
<i>Rhopalocoma</i> ..	49	<i>Tasmanites</i> ..	21
<i>Rhynchotrema</i> ..	50	<i>Taxites</i> ..	34
<i>Roemeraster</i> ..	48	<i>Taxocrinus</i> ..	49
Sabre-toothed Cat ..	40	<i>Teleostei</i> ..	43
<i>Salterella</i> ..	31	<i>Tempyska</i> ..	45
<i>Sagenopteris</i> ..	45	<i>Tentaculites</i> ..	28
<i>Sauropterygia</i> ..	9, 38	<i>Tetragraptus</i> ..	30
<i>Scalaetochus</i> ..	28	<i>Thaumatosaurus</i> ..	10, 38
<i>Scaldicetus</i> ..	7, 14	<i>Thenoa</i> ..	44
<i>Scapanorhynchus</i> ..	33	<i>Theromorphs</i> ..	41
Scaphopods ..	15	<i>Thinnfeldia</i> ..	12
<i>Schwagerina</i> ..	47	<i>Thoracosaurus</i> ..	41
Sea-lilies ..	40	<i>Thyestes</i> ..	29
Sea-mats (Silurian) ..	26	<i>Thylacoleo</i> ..	2, 13
Sea-mats (Tertiary) ..	15	<i>Todites</i> ..	45
Sea-scorpion ..	29, 40, 44	Toongabbie Limestone ..	23
Sea-urchins ..	15, 44	Toothed Carp ..	44
"Shepherds' Crowns" ..	45	Toothed Whales ..	41
Silurian, N.Z. ..	35	<i>Trematosaurus</i> ..	42
<i>Siphonia</i> ..	17, 45	<i>Triarthrus</i> ..	50
<i>Siphonotreta</i> ..	30	<i>Trigonia</i> ..	15, 19, 45
<i>Sivatherium</i> ..	37	Trilobites ..	29, 31, 35, 48, 49
Sivalik Formation ..	36, 37	<i>Trinucleus</i> ..	29
<i>Slimonia</i> ..	40	<i>Tyrannosaurus</i> ..	39
Smith, William ..	2	<i>Turbinolia</i> ..	45
<i>Sonninia</i> ..	40	<i>Turritella</i> ..	15
<i>Sphenopteris</i> ..	45, 47	Upper Triassic, N.Z. ..	34
<i>Spirifer</i> ..	26, 35, 47, 48, 49	<i>Urasterella</i> ..	23
<i>Spirulirostra</i> ..	16, 17	<i>Ursus</i> ..	40
<i>Spondylus</i> ..	15, 44	Vinci, Leonardo da ..	1
Sponges ..	17, 44, 49	<i>Voluta</i> ..	15
<i>Squatina</i> ..	40	<i>Volutospina</i> ..	33
Starfishes ..	23, 49	Volutes ..	11, 15
Stegosaurian Reptile ..	38	Wairoa Series ..	34
<i>Stegosaurus</i> ..	38	Waldheim, Fischer de ..	3
<i>Steneosaurus</i> ..	37, 41	Wanganui System ..	33
<i>Stephanoceras</i> ..	40	Wangapeka Series ..	35
Stone-lilies ..	49	Whale-bone Whales ..	17
<i>Strepsodus</i> ..	22	<i>Williamsonia</i> ..	45
<i>Streptelasma</i> ..	49	Worm-tubes ..	26, 44
Stromatoporoids ..	49	<i>Wynyardia</i> ..	5
<i>Stromatopora</i> ..	49	<i>Zaphrentis</i> ..	48
<i>Strophonella</i> ..	49	<i>Zeuglodon</i> ..	7, 41
<i>Struthiolaria</i> ..	33		

P 560
C 3665

560.74
C466