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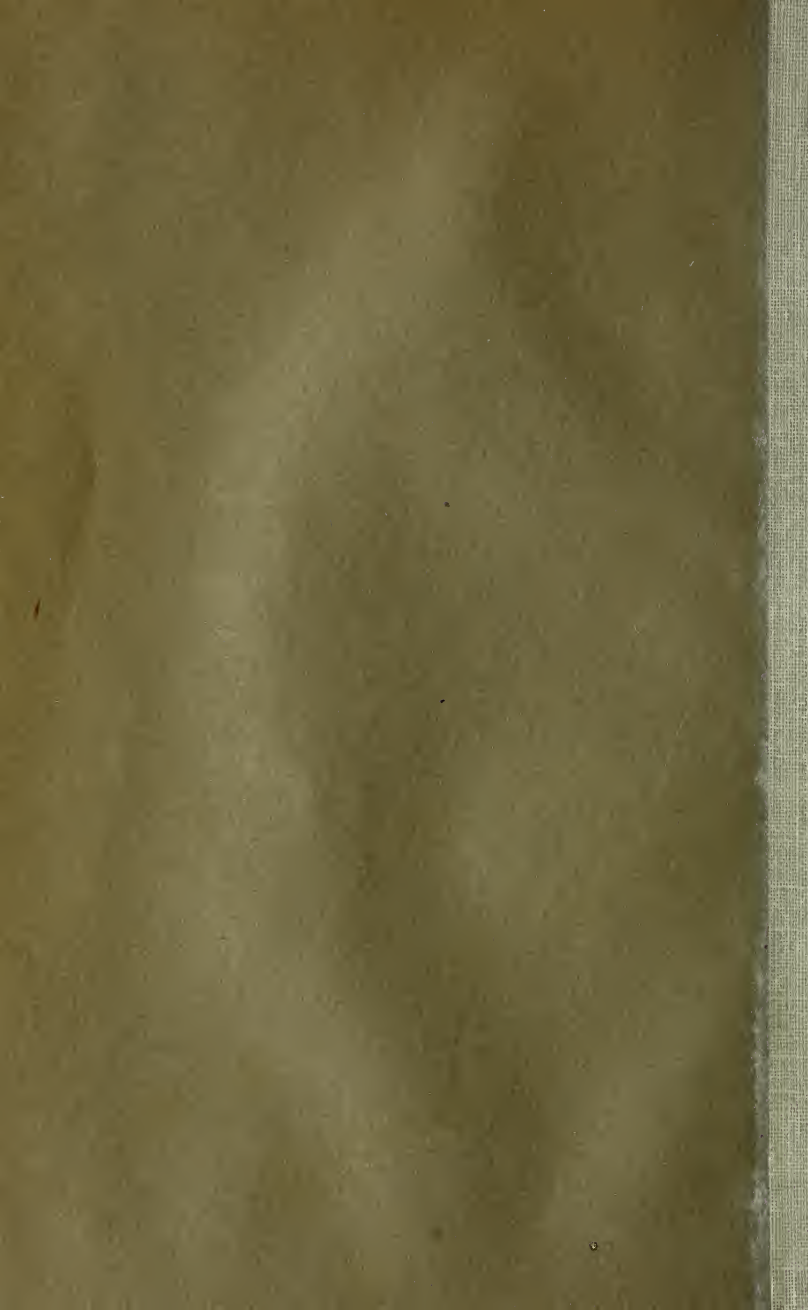
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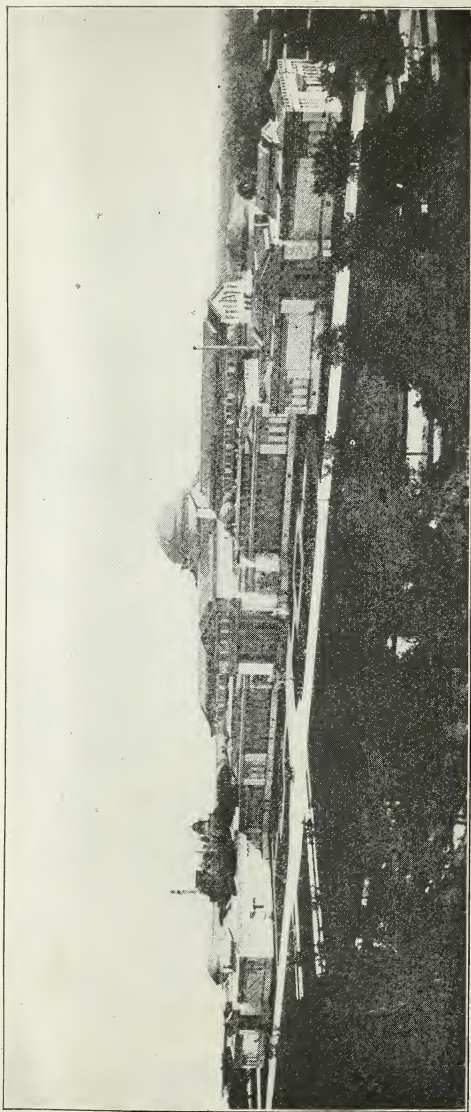
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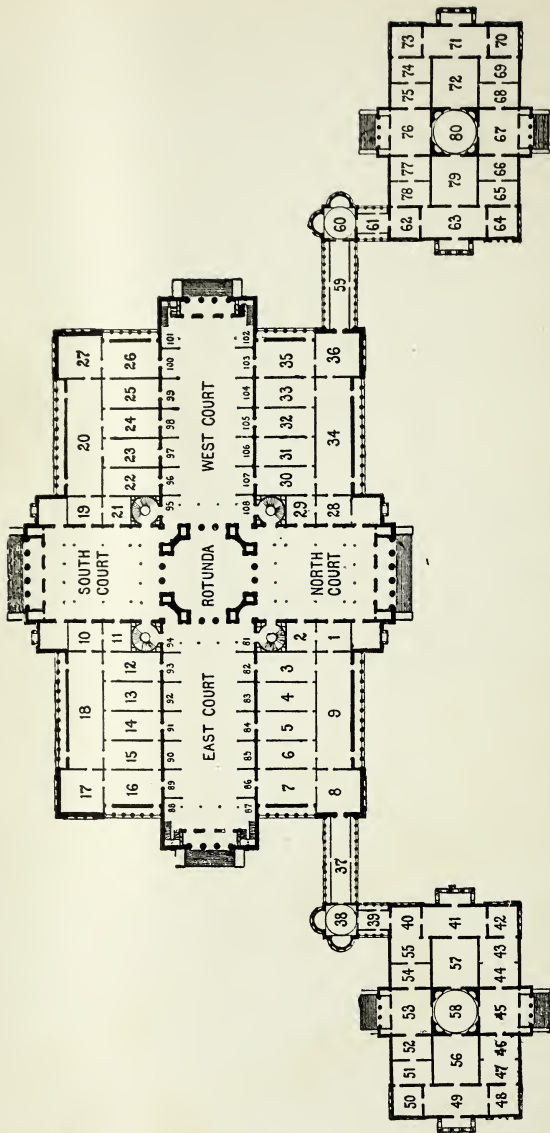
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PLAN OF BUILDING

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Department of Geology.

The collections of this Department illustrate the subject of geology and its subdivisions of paleontology, mineralogy, economic geology, and geographic geology. The collections are grouped so as to represent these subdivisions separately and also form a comprehensive whole. The collections occupy three halls of the main building and the entire west wing. The total number of specimens displayed is about 70,000, subdivided as follows: Paleontological specimens 25,000, mineralogical specimens 15,000, economic specimens 20,000, miscellaneous 10,000. Entering the Department from the West Court the visitor will find the alcove and first six halls devoted to paleontology.

Alcove 103. Halls 33, 35, 36, 59, 60, and 61.

PALEONTOLOGY.

In the Division of Paleontology it is sought to illustrate by fossils or by casts and models of these, the animal and vegetable forms which have characterized the life of the globe at the successive stages of its history. The arrangement is primarily chronological and secondarily zoological. Advancing from hall to hall the visitor sees the development of life upon the earth illustrated in the same order in which it occurred in Nature. Thus in the first hall of the series, Hall 33, are to be seen the fossils of the earliest era of the earth's history, the Paleozoic; in the next three halls, Halls 35, 36 and 59, those of the middle era or Mesozoic; and in the remaining three halls, Halls 59, 60, and 61, the fossils of the Cenozoic or recent era. Within each hall, so far as is possible, the fossils of each period are arranged so that those of the earliest period shall come first, then those of the next succeeding age, and so on. Within each period, however, the specimens are arranged in accordance with their zoological rank, beginning with the lowest. Fossil plants,

where they occur, are thus placed first; then in order, Protozoans, Radiates, Molluscs, Articulates, and Vertebrates.

The specimen labels show: 1st, the name of the species and that of the authority by whom named; 2d, the geological period or epoch to which each belongs; and 3d, the locality.

Alcove 103.

Here are shown several large specimens of general geological interest. Among them are two broad slabs of rock cut from ledges the surfaces of which had been scoured and polished by movement of the continental glacier over them. One of the slabs is sandstone from North Amherst, Ohio; the other is limestone from Kelley's Island, Lake Erie. Several types of glacial marking are illustrated on the slabs, including fluting and iceberg action. The slabs are probably the finest of the kind to be seen in any museum. Other specimens here shown are a section of *Arietites*, a huge mollusc allied to the modern nautilus, and tracks of reptiles of the Triassic period, on sandstone from Turner's Falls, Mass.

A model of the Moon is also exhibited here. This is a model in relief of the visible hemisphere of the Moon, made on a horizontal scale of 1:600,000 and vertical scale of 1:200,000. The hemisphere is 18 feet in diameter. It is much the largest and most accurate work of the kind ever executed.

The division of the Moon's surface into plains and mountainous regions is well illustrated, also the great size and peculiar forms of its so-called volcanoes.

Hall 33.

This hall is devoted to fossils of the Paleozoic era and the Triassic period of the Mesozoic era. The series begins at the south end of the hall with the Cambrian period and continues toward the north end with the Ordovician, Silurian, Devonian, Mississippian, Pennsylvanian, Permian, and Triassic in the order named.

Cambrian Period.—The Cambrian is the earliest period from which well-defined fossils are known, and many of these are fragmentary and rather obscure. *Eozoon canadense*, of which several specimens are shown, is found in rocks older than the Cambrian

and is supposed by some to represent the earliest form of life. The specimens are made up of alternate layers of calcite and serpentine, and are thought by some to represent the shell and body cavity of an ancient, huge Rhizopod. But most paleontologists regard the masses as of wholly inorganic origin.

Plants are represented by impressions of seaweeds such as *Paleophycus* and other Algae. Trails and borings of marine worms such as *Scolithus* and *Arenicolites* are shown. *Lingulepis* is one of the earliest Brachiopods. The tracks of *Climactichnites* on a large slab of sandstone from Wisconsin were probably made by some large mollusc, although they have been considered by some to be trilobite tracks. Trilobites are the most characteristic fossils of this period and a good series of specimens is shown, representing such genera as *Ogygopsis*, *Paradoxides*, *Olenellus*, *Chonocephalites*, *Dikelocephalus*, *Ptychoparia*, *Agnostus*, etc. These illustrate range in size.

Ordovician Period.—The fossils of this period, as a general rule, are well preserved and abundant. Nearly all classes of marine invertebrate animals are represented in the collection and the abundance of life is shown by slabs of *Plectambonites*, *Leptæna*, etc., which are literally masses of shells.

Receptaculites and *Brachiospongia* are calcareous sponges. *Graptolithus*, *Diplograptus*, *Tetragraptus*, etc., are hydroids known as graptolites, abundant fossils of this era. The name is derived from the Greek word meaning "to write," and refers to the plume-like nature of the remains.

Corals were rare in this period. Occurring forms are represented by *Streptelasma*, a cup coral and *Columnaria*, a large mass of honeycomb coral.

Glyptocrinus and *Iocrinus*, specimens of which are shown, are among the earliest known crinoids. They were attached by a jointed stem and bore many-branching arms. They have been appropriately termed sea-lilies.

Bryozoans are among the most important and abundant fossils of this period. They are illustrated by *Bythopora*, *Callopora*, *Batostoma*, *Constellaria*, *Monticulipora*, etc.

Brachiopods, though found only in small numbers at the present day, were in Paleozoic times one of the most abundant and characteristic forms of marine life. In structure they have

points of alliance with the Worms on the one hand and with Molluscs on the other.

Articulate Brachiopods, or those having a well-developed hinge, are represented by *Strophomena* and *Rafinesquina* of the concavo-convex forms, and by *Orthis*, *Rhynchotrema*, etc., of the globose forms.

Byssonychia, *Vanuxemia*, *Cystodonta*, *Orthodesma*, etc., are Pelecypods or bivalve molluscs.

Bellerophon, *Maclurea*, *Pleurotomaria*, etc., are Gastropods or single-valved molluscs.

Tentaculites are minute molluscs of the class of Pteropods. *Conularia* was perhaps also a Pteropod.

Cephalopods were the largest known animals of this period. *Orthoceras*, *Camaroceras*, *Endoceras*, etc., represent them. Some probably attained a length of fifteen or more feet when complete.

Trilobites were, perhaps, the most characteristic fossils of early Paleozoic time. They were crustaceans having a horny shell similar to the crabs of the present day. They reached their greatest development as to number of genera in this period. *Asaphus*, *Acidaspis*, *Illænus*, *Dalmanites*, *Triarthurus*, *Trinucleus*, etc., are typical genera shown.

Scales and teeth indicate the presence of fishes, which were the only vertebrate animals known. The number of important animal types having existence in even the early geological periods is worthy of note.

Silurian Period or *Age of Molluscs*.—Silurian fossils show continued development of life. Plants are still seaweeds, such as *Bythotrephis* and *Arthrophyucus*. Some writers consider the latter to be casts of the trails of some animal. *Astræospongia*, *Astylospongia*, *Paleomanon* and *Cerionites* are typical Silurian Sponges.

Monograptus, *Graptolithus* and *Diplograptus* continue from the Ordovician but disappear, as do all Graptolites, with the close of this period. *Stromatopora*, one of the reef-building hydroids, although quite different from the Graptolites in habit, is referred to the same group. True corals were abundant and are fully illustrated in the collections. The reef-builders, such as *Halysites* or Chain coral, *Favosites* or Honeycomb coral, *Theca*, *Heliolites* or Sun coral, etc., predominated. Cup corals, as *Zaph-*

rentis, *Streptelasma*, *Omphyma*, *Eridophyllum*, etc., are also shown.

Crinoids and Cystoids showed a wonderful development both as to size and number in this period. *Eucalyptocrinus*, *Periechocrinus*, *Siphonocrinus*, *Callicrinus*, *Caryocrinus*, *Holocystites*, etc., are some of the prominent genera represented. *Cladopora*, *Trematopora* and *Fenestella* illustrate Bryozoans. They were not abundant in this period.

As examples of Brachiopods may be noted, besides the concavo-convex *Stropheodonta* and the globose forms *Meristina*, *Pentamerus*, *Atrypa*, *Whitfieldella*, etc., of the preceding period, the winged form *Spirifer*. This is abundant.

Mytilarca and *Megalomus* among Pelecypods and *Platyceras*, *Platyostoma*, *Tremanotus*, *Strophostylus*, etc. among Gastropods are typical molluscs of the period.

Many specimens are shown illustrating the size and form of Silurian Cephalopods. Sections show that the shell was divided by cross partitions into chambers. The animal occupied only the end chamber, but a long tube or siphuncle connected the others to its body. The straight forms, such as *Orthoceras*, predominated but the curved *Cyrtoceras* and *Oncoceras*, the open coiled *Gyroceras* and the closely coiled *Nautilus* and *Trochoceras* occur and specimens are shown. *Phragmoceras* and *Gomphoceras*, having a constricted aperture, constitute a new type of Cephalopod.

Silurian Trilobites are fewer in number and somewhat smaller than those of the former period but show a marked tendency to ornamentation. Many of the old genera continue and to them are added *Phacops*, *Encrinurus*, *Proetus*, etc., which are represented by specimens. The Eurypterids form a group of crustaceans which first appear in this period. They resemble the scorpions in form. They are the ancestors of the modern horse-shoe crab. *Eurypterus*, *Pterygotus*, etc., belong to this group. They are represented in the collection by an especially fine series of specimens.

Devonian Period or Age of Fishes.—The fishes which by their size and abundance characterized this age, belonged to two orders—Ganoids, represented at the present day by the garfish and sturgeon, and Placoids, the order which includes sharks, skates and rays. They differed in many respects from the

fishes of the present day, however. Part of the Ganoids were covered with bony scales, had teeth of reptilian character, and jointed, paired fins. Others, the Placoderms, were protected by bony plates covering the head and fore part of the body. The Placoids had cartilaginous skeletons, no scales, no gill covers, and many of their characters were embryonic. In most cases only teeth and spines are found fossil. *Mesacanthus* and *Ptyctodus* are Placoids. *Paleospondylus* is considered an ancient lamprey. *Holoptychius* and *Palæoniscus* give a good idea of the general form of the scaled Ganoids and *Macropetalichthys*, *Pterichthys*, *Coccosteus* are representative Placoderms.

Aside from its fishes the Devonian period is noted for the appearance of the land plants, such as *Neuropteris* and *Alethopteris* (Ferns), *Asterophyllites* (Horsetails), *Adiantites*, etc.

Dictyophyton is a reticulate Sponge. Both the Honeycomb corals, such as *Favosites*, *Michelinia*, *Alveolites*, etc., and the Cup corals *Heliophyllum*, *Cyathophyllum*, *Acerularia*, *Cystiphyllum*, *Zaphrentis*, *Campophyllum*, etc., were very abundant both as to number of species and individuals. An especially large number of species of *Favosites*, *Heliophyllum* and *Zaphrentis* is shown.

Crinoids were comparatively rare in Devonian times. *Cupressocrinus*, *Megistocrinus* and *Hypsocrinus* represent the class in the collections. *Ræmeraster*, *Aspidostoma*, *Ophiura*, etc., are Star-fishes. Brachiopods reached their greatest development in this period and all the typical forms are represented: perhaps the most noticeable of these is the winged *Spirifer* of which many species are shown.

Pelecypods and Gastropods are abundant but exhibit no decided changes from the preceding period.

Cephalopods are represented by *Orthoceras*, *Gomphoceras*, *Gyroceras*, etc., as before, but to these is added the *Goniatites*, which is a closely coiled form having the juncture of the septa and shell forming a zigzag instead of a straight suture.

Mississippian or Subcarboniferous Period.—In the period intervening between the Devonian and the period of the deposition of coal (Pennsylvanian) occurred the so-called Subcarboniferous or Mississippian period. Especially characteristic forms of this period in some localities were the crinoids which were of various and striking forms. An exceptionally fine collection of these

from near Burlington, Iowa, is shown in the floor case in Hall 36, at the right of the entrance from Hall 35.

Other genera, shown in the regular order in Hall 33 are *Platycrinus*, *Batocrinus*, *Actinocrinus*, *Agaricocrinus*, etc., represented by many species. Those specimens having the arms and stems attached are of particular interest.

Pentremites, *Cryptoblastus*, *Schizoblastus*, *Granotocrinus*, etc., are typical Blastoids, or bud-like animals, near relatives of the Crinoids which flourished at this time.

Large slabs of *Melonites*, an ancient Sea-urchin, are shown. These echinoderms differed from the modern forms in the greater number and smaller size of the plates.

Corals are on the decline, but such genera as *Zaphrentis*, *Lophophyllum*, *Cyathophyllum* and *Lithostrotion* occur and are shown.

The corkscrew-like Bryozoan *Archimedes* is illustrated by a number of species.

Such Gastropods as *Straparollus*, *Euomphalus*, *Bellerophon*, *Pleurotomaria*, *Naticopsis*, etc., are still abundant.

The plain-sutured *Nautilus* and the zigzag-sutured *Goniatites* are the principal Cephalopods.

The Trilobites have disappeared and in their place is shown *Euprops* which somewhat resembles the horse-shoe crab.

Pennsylvanian Period or Age of Coal Plants.—Land plants are the striking features of this period. They are allied to the four modern groups of Ferns, Lycopods, Conifers and Horse-tails.

The Ferns surpassed all other land plants in number. *Pecopteris*, *Neuropteris*, *Alethopteris*, etc., are shown both as single leaflets and fronds. Many of these have been preserved in the center of clay concretions and are shown in a number which have been broken open.

Lepidodendron and *Sigillaria* are shown by sections of trunks and by impressions of the bark. The size of some of the stumps of *Sigillaria* shown indicates that the original tree must have attained a height of 80 or 100 feet. *Stigmara* probably represents the under water stems of *Sigillaria* or *Lepidodendron*. These were similar, except in size, to the modern Lycopods, or Club-mosses.

Cordaites appears to be allied to both the Conifers and the Cycads. It had a straight trunk 60 or 70 feet in height and long narrow leaves. *Trigonocarpum* and *Cardiocarpum* are supposed to be the fruit of this tree.

Calamites, *Annularia*, etc., are allied to the *Equisetum* or modern Horsetails. Stems of the former and leaf whorls of the latter are shown.

A portion of a trunk of a tree of this period is shown in a floor case. This trunk is about two feet in diameter and the portion shown is six feet in height. On the wall an oil painting represents a forest of this age, with Ferns, Club-mosses, *Equisetæ*, etc., grown to the height of forest trees of the present day.

The size of fish of the period is indicated by the teeth of *Rhizodus*, the scales of *Megalichthys*, and the spines of *Ctenacanthus*.

Permian, or Closing Period of the Paleozoic Era.—Fishes of this period are represented by *Paleoniscus*, and batrachians by *Archegosaurus*, an animal which combined the characters of batrachian and fish. It had both lungs and gills, and was covered with scales. Plants are represented by leaves of *Walchia*, a Lycopod, and *Alethopteris*, one of the Ferns.

The invertebrate fossils of the period shown are mostly Brachiopods and Pelecypods.

Triassic Period.—This period is the first of the Mesozoic era or Age of Reptiles. The land plants of the period are illustrated by series of impressions of the leaves of *Pterophyllum*, a Cycad, and stems of *Equisetum*, a form allied to the modern Horsetails.

Sponges are represented by *Stellispongia* and *Corynella*. Crinoids by *Encrinurus*, and Sea-urchins by detached spines of *Cidaris*.

Molluscs of this period assumed a decidedly modern appearance. This is illustrated by *Lima*, *Pleuromya*, *Nucula*, *Myophoria* and *Modiola* of the Pelecypods and *Monodonta*, *Holopella*, and *Murchisonia* of the Gastropods. Two new types of Cephalopods are shown. *Ceratites* has serrated suture lines and *Arcestes* and *Rhacophyllites* are true Ammonites having complex lobed sutures.

Pemphix is a crustacean of the type of the modern lobster.

Triassic fish are illustrated by the teeth of *Ceratodus* and nearly complete specimens of *Ischypterus* and *Samionotus*.

The huge frog-like head of *Labyrinthodon* shown by a cast is that of an Amphibian, and the Reptiles of the period are represented by a cast of a head of *Belodon*, an ancient crocodile.

Hall 35.

This hall contains two somewhat distinct series, one introductory to the study of fossils in general, the other, fossils of the Mesozoic era.

Entering the hall from the West Court, the three wall cases on the right are devoted to the introductory series. The first two of these show a comparison of ancient and modern forms. Beginning with the lower orders of life, there are shown, for example, Sponges which have lived at different periods of the earth's history, and a modern sponge for comparison; while in succession corals, crinoids, brachiopods, articulates, and vertebrates are similarly illustrated.

In the third case of the series, methods of fossilization are illustrated. The methods shown include preservation of hard parts, as shells and bones, internal moulds, external moulds, impressions and illustrations of incrustation, carbonization, silicification, phosphatization, etc.

The fossils of the Mesozoic era represented in this hall are chiefly the Dinosaurs of the Jurassic period. The Jurassic dinosaurs were great shore reptiles; they were the largest land animals that have ever been discovered. Among animals they are exceeded in bulk only by the great right-whales of modern times. The specimens exhibited were collected by special expeditions sent by the Museum for this purpose to Wyoming and Colorado.

The central exhibit is a partial skeleton of one of the largest dinosaurs known, *Apatosaurus*. Only a little more than half of the skeleton is here represented. The head, neck, shoulder girdle, fore legs and the extremity of the tail are wanting entirely. The right hind leg below the knee is copied in plaster from other similar specimens. The left is modeled entirely from the right.

The portion of the skeleton exhibited was found with all of its parts connected and has been carefully mounted in its natural position. Therefore, the body of the animal, the pelvis, the hind legs and the greater part of the tail are accurately represented in their natural relations.

The portion of the skeleton shown is thirty feet long and stands fifteen feet above the base. In life the neck was equal in length to the portion of the tail here exhibited. The tail was at least one-half longer. From this it may be seen that the entire length of the animal would have been about sixty feet, or eight feet longer than the hall in which it is exhibited.

The various series of vertebræ, scapulæ, pelves, sacra, leg bones, and feet exhibited in the adjoining wall cases represent a number of other types of Dinosaurs, most of which are smaller than the central figure. Among these are represented the following genera: *Morosaurus*, *Camarasaurus*, *Brachiosaurus*, and *Creosaurus*.

At the end of the hall may be seen a complete fore leg and shoulder-blade of the medium-sized dinosaur, *Morosaurus*. Two large leg bones of *Brachiosaurus* shown are the largest known to science. They measure six feet eight inches in length, and the thigh-bone weighs seven hundred pounds. The unusual length of the humerus in comparison with the femur shows that the animal to which they belonged must have stood higher at the shoulders than at the hips.

Halls 36, 59, 60, and 61.

These halls are devoted to fossils of the remaining geological periods, from the Jurassic onward. Owing to the size of many of the specimens it has not been possible to place them in exact geological order, but groups are shown together as far as possible.

Jurassic Period.—*Goniospongia*, *Cnemidiastrum*, *Retispongia*, *Craticularia*, *Hyalotragos* and *Pyrgochonia* illustrate the various forms of Jurassic sponges. *Rhizostomites* shows the form of the gastral cavity of a jelly-fish.

Two types of crinoids are shown. The first, illustrated by *Pentacrinus*, had a comparatively small body attached by a long stem and a large number of long, many-branching arms. The other type, illustrated by *Antedon*, was a stemless, free-swimming form with only a few short arms.

Ophiura and *Asterias* are typical starfishes.

Jurassic sea-urchins are of two types and a representative series of each is shown. *Cidaris*, *Hemicidaris*, *Acrocidaris*, *Dia-dema*, and *Stomechinus* belong to the type having the shell di-

vided into five equal rays. *Echinobrissus*, *Pygaster*, *Hyboclypeus*, and *Clypeus* represent the other type, in which the symmetry is bilateral instead of radial.

Many species of Brachiopods are shown but the majority of them belong to the genera *Terebratula* and *Rhynchonella*.

Molluscs were the most characteristic group of invertebrate animals in Jurassic time and both the Pelecypods and Gastropods bore marked resemblance to modern forms. Among Pelecypods are shown Oysters such as *Ostrea* and *Gryphæa*; Scallops such as *Pecten*, *Lima*, and *Avicula*; and Mussels and Clams such as *Modiola*, *Pinna*, *Pleuromya*, *Pholedomya*, *Trigonia* and *Cardina*. *Diceras* is a shell in which the beaks of each valve are long and coiled like a horn. *Nerinea*, *Natica*, *Pleurotomaria*, *Cerithium*, *Turbo*, and *Trochus* represent the Gastropods of this period.

Three distinct types of Cephalopods are shown. The first is illustrated by *Nautilus*, with a series showing variations in size and ornamentation. Polished sections show the internal characters of the shell.

The second type, the Ammonites, is the largest and most characteristic group of Jurassic invertebrate fossils. They are distinguished by their complex suture lines. A large and representative collection of this group is shown, comprising all the typical genera, and illustrating the variations in size from *Harpoceras*, less than half an inch in diameter, to *Olcostephanus*, attaining a diameter of three feet. Many of these specimens have the sutures colored to bring out their outlines. Polished sections show the interior of the shells.

The third type is that of the squids. These had no external shell but an internal bone or guard. A model shows the form of the animal and the location of the guard. Usually, all that is found fossil in *Belemnites* is the guard, of which quite a number are shown, but in several of the specimens the ink sac and hooks which are attached to the arms can be seen. Some of the specimens from the Lithographic limestone of Solenhofen, such as *Trachyteuthis*, *Geoteuthis* and *Plesiotteuthis*, show the impression of the body, others only the skeleton.

A good series of Crustaceans of the type of the lobster and horse-shoe crab is shown. Among the Insects shown may be

mentioned *Æschna* and *Petalia*, dragonflies; *Belostomum*, an ant; *Nepa*, a water bug.

Fishes of the Jurassic are represented (Hall 36) by a large number of specimens from England, Bavaria, and Wurttemberg. These are chiefly of two types. The Ganoids, which were the predominant type, may be recognized by their heavy, angular scales. The following genera are well represented: *Caturus*, *Aspidorhynchus*, *Thrissops*, *Leptolepis* and *Dapedius*. The Selachians or sharks, having neither bony skeleton nor scales, are represented by the teeth and fin-rays only. Some genera of this type shown are *Acrodus*, *Hybodus* and *Chondrosteus*.

Ichthyosaurs, from the Jurassic of England and Germany are represented (Hall 36) by an unusually fine series of skulls and skeletons. The Ichthyosaurs, or fish-lizards were a type of marine reptile having a fish-like body and tail, a short neck, a long, pointed snout, enormous eyes and paddles somewhat like those of a seal. They attained a length of twenty-five to thirty feet. A model exhibited on the floor shows something of their outward appearance.

A second form of marine reptile common to this period is that of Plesiosaurs. These were more slender and graceful animals than the Ichthyosaurs. Some forms had a very long neck. The body was short and armed with stout, paddle-like legs which were used in swimming. In the long-necked Plesiosaurs the head was broad and snake-like; in the short-necked types it ended in a slender snout similar to that of the Ichthyosaurs. A model of one of the long-necked types exhibited on the floor of Hall 36 will give some idea of the general proportions of some of these animals.

Cretaceous Period.—Models (Hall 59) much enlarged from the original, illustrate the forms of Foraminifera, whose shells make up the vast deposits of chalk which characterize this period.

Sponges are shown in many forms. Some of these served as nuclei for the formation of flint nodules. Several large nodules of this kind are shown from Ireland.

Echinoids are illustrated by *Ananchytes*, *Hemiaster*, *Holaster*, *Linthia*, *Toxaster*, etc.

The Crinoids of the period are magnificently illustrated in a large framed slab placed on the wall of Hall 36. This slab is

7½ x 4 feet in size and is covered with the bodies of Crinoids, 200 nearly complete individuals being shown.

Pelecypods and Gastropods are illustrated by many specimens, mostly of modern types, such as *Ostrea*, *Exogyra*, and *Gryphæa*, which were Oysters of many and curious shapes, and *Pectens*, *Vola*, etc., which were Scallops.

Among bivalve molluscs the family of Rudistæ is unique, and characteristic of this period. In shells of this family one valve is enormously enlarged, and somewhat funnel-shaped; the other valve is small and acts as a lid. *Hippurites*, *Spherulites* and *Radiolites* belong to this family. *Inoceramus* sometimes reached enormous size.

Among Cephalopods are shown specimens of *Nautilus* of modern types and members of the Ammonite family which took on various and intricate forms. The series of *Placenticerus*, an ammonite with coiled shells often two feet in diameter, is especially worthy of note. The specimens are chiefly from the Bad Lands of South Dakota. Many varieties of shape are shown from straight shells to hook-shaped, partly uncoiled, spirals, etc. The names of the genera often indicate characteristic forms, such as: *Baculites*, rod-shaped; *Hamites*, hook-shaped; *Helicoceras*, an open spiral; *Scaphites*, boat-shaped; *Turritites*, tower-shaped.

Fossil plants which were the first of modern types are illustrated by leaves of *Sassafras*, *Populites*, or poplar, *Betulites*, or birch, *Viburnum*, *Ilex*, or holly, *Magnolia*, etc.

Turtles of the period are represented by the shell of a large fresh water form, *Basilemys*. This was found in the latest Cretaceous beds of Montana.

Fishes of the period are seen to be of modern types. A number of these from Lebanon, Syria, and some American forms are exhibited.

Other vertebrates of the Cretaceous period are represented by specimens of Dinosaurs, Plesiosaurs, Pterodactyls and Fishes. They are of different types from those of the Jurassic.

Cretaceous Dinosaurs are illustrated by a fine skull and partial skeleton of *Triceratops* and a restoration of the skeleton of *Hadrosaurus* (Hall 36). *Triceratops* was a unique armored land reptile of gigantic proportions and the specimen shown is one of the largest of its kind. It was collected in eastern Mon-

tana by a special Museum expedition in 1904. Parts of the skeleton of the same individual will be found in a wall case adjoining.

Hadrosaurus, illustrated by a restoration, is a large biped reptile found in the Cretaceous deposits of New Jersey. The animal walked entirely upon its hind legs, only using the smaller forward pair when resting or feeding.

Mosasaurs were a new type of marine reptile which appeared with the Cretaceous period. They were short-necked, round-bodied, long-tailed animals, with pointed snouts. The skeletons of these animals are found in large numbers in the chalk beds of western Kansas; also in England and Belgium. They are represented in the collection chiefly by a complete skeleton of *Platy-carpus* from Kansas. (Hall 59.)

Plesiosaurs were a second type of marine reptile which, as has been mentioned, appeared in the Jurassic period and continued to the close of the Cretaceous. The specimen of *Elasmosaurus* shows the shoulder and pelvic girdles in connection with a complete paddle. (Hall 59.)

Pterodactyls, or flying reptiles, represent one of the strangest forms assumed by reptilian life toward the close of the Mesozoic era. They were very slight and active creatures, somewhat bat-like in general appearance, but withal distinctly reptilian. The head was armed with a stout, bird-like beak, the bones were hollow and the wing-bones were long and supported a membrane which connected with the legs, thus forming the organ of flight. In powers of flight they doubtless equaled any of the existing birds. The group is represented by a splendid skeleton of *Nyctosaurus* from the chalk beds of Kansas. This is the most complete specimen known. (Hall 59.)

Tertiary Period, or Age of Mammals.—Tertiary plants and invertebrate fossils shown include leaves of *Flabellaria*, a palm which grew in the Eocene epoch near Green River, Wyoming. Also, leaves of *Acer*, or maple, and other trees of modern genera are shown.

Such remains, with others that are found, indicate that a subtropical climate, like that of Florida, prevailed at this period over the northern United States. Even so far north as Greenland, the climate was so mild that cypress and cedar trees grew in profusion.

Nummulites.—These are abundant and characteristic fossils of this period. They are shells of a Rhizopod, which in Europe and Africa formed limestones many thousand feet in thickness.

A representative series of mollusc shells is shown. In both the univalves and bivalves a close resemblance to modern shells will be noticed. Most of the genera are identical with living forms. Such are *Venus*, *Cardita*, *Arca*, *Tellina*, *Meratrix*, etc., among Pelecypods, and *Natica*, *Turritella*, *Cerithium*, *Strombus*, *Fusus*, *Murex*, etc., among Gastropods.

Vertebrate fossils from the Eocene, or first stage of the Tertiary period, are represented by a series of fishes from the Green River shales and a cast of the large horned mammal, *Dinoceras mirabile*. (Hall 60.)

The fishes from the Green River shales include a great number and variety of bony fishes, or *Teleosts*, of modern types. Such familiar forms as the perch, the herring, and the ray are included. (Hall 59.)

Mammals of the Oligocene stage, or second subdivision of the Tertiary period, are represented by a great number and variety of forms, most of which were collected by special expeditions sent out by the Museum. (Hall 59.) These are mostly modern types of mammals. Among those represented are the primitive cats, dogs, squirrels, rabbits, camels, tapirs, horses and rhinoceroses. There are also shown a number of the older types of mammals which had their origin in the first Tertiary stage and have no modern representatives. Among these are *Hyænodon*, *Oreodon*, *Elotherium*, *Anthracotherium*, *Titanotherium*, *Hyracodon*, and *Metamynodon*. The collection includes a mounted skeleton of the sabre-tooth cat, *Dinictis*, a representative series of skulls of the primitive dogs, *Cynodictis* and *Daphænus*, of the three-toed horse, *Mesohippus*, the cursorial rhinoceros, *Hyracodon*, the more typical rhinoceros, *Aceratherium*, the large suilline, *Elotherium*, and the great horned ungulate, *Titanotherium*. The series of *Titanotherium* skulls is especially fine.

Mammals from the Miocene, or third stage of the Tertiary period are represented by collections from two localities, the Deep River beds of Montana, and the Loup Fork beds of Nebraska and Wyoming. They include the following forms:

A skull of the primitive bear *Amphicyon*, skulls and skeletons of smaller carnivores, and skulls, feet and legs of three-toed horses. Also a mounted skeleton and series of skulls of *Pro-merycochærus*, a successor to *Oreodon* of the last epoch; skulls of *Merycochærus*, *Merychys* and other members of the Oreodont family, and skulls of *Oxydactylus* and *Procamelus*, members of the camel family. A complete skeleton of *Oxydactylus* is also shown.

Another fossil from beds of this age shown is *Dæmonelix*, or Devil's Corkscrew, a curious spiral form found in great abundance in the sandstone strata of western Nebraska. Its exact nature is problematical. Some think that it represents the remains of aquatic plants. According to another theory natural casts of ancient gopher burrows form the fossil. The series shown is thoroughly representative, and includes specimens of supposed stages of development of the form. (Hall 60.)

Other Tertiary forms represented include:

Restoration of *Colossochelys atlas*, a huge turtle which lived in India during the Tertiary period. (Hall 60.)

A restoration showing the jaws of *Carcharodon*, and within these, for comparison, the jaws of a modern shark. The *Carcharodon* was probably 50 to 70 feet in length. (Hall 60.)

Quaternary Period.—Vertebrate fossils of the Quaternary period are represented in the collection by remains of the mastodon, mammoth, bison, rhinoceros, Irish deer, New Zealand birds, cave bear, and cave man, as well as by a large series of casts and restorations. The largest of the specimens is the skeleton of the mastodon from southern Michigan. This was an elephant-like mammal, differing from the elephant in having a more elongated body, shorter and stronger limbs, flatter cranium and less complex molars. The grinding surfaces of the molars were more or less tubercular, in contrast to the ridges which characterize the teeth of the elephant. Hence comes the name, mastodon, *nipple tooth*. The animal probably had no hairy covering to enable it to endure a rigorous climate as did the mammoth. In addition to the skeleton from Michigan a skull and tusks from Yorkville, Illinois, are shown. (Hall 59.)

The skeleton of the Irish deer is from Limerick, Ireland. It is that of a large Post-Pliocene deer, the bones of which are occasionally found in marl beneath peat beds in Ireland and

England. The antlers of this animal have a spread of seven feet, and its height was nearly eight feet. (Hall 60.)

Another remarkable nearly complete skeleton shown (Hall 61) is that of *Castoroides*, a beaver-like animal much larger than the modern beaver. The skeleton shown is the most nearly complete one known of an individual of this size. Remains of the animal are very scarce. In the same case several large extinct mammals are represented by casts. These representations include: Skull of *Diprotodon*, an extinct member of the kangaroo family, skull of *Toxodon*, a short-legged and cumbrous quadruped from South America, skull and forelegs of *Sivatherium*, a gigantic four-horned antelope from India, and skull of *Zeuglodon*, an extinct whale. In the next case remains of the huge extinct birds peculiar to New Zealand are shown. The specimens include a complete skeleton of *Dinornis* and several groups of leg bones which rival in size those of a horse. The eggs of these birds, remarkable for their great size, are illustrated by casts. An excellent skull of the cave bear is shown in an adjoining case, also a human skull from a cave in the island of Crete. This skull is covered with a stalagmitic deposit showing it to be very ancient.

Hall 62.

METEORITES.

The collection of meteorites includes representatives of about 300 distinct "falls" or "finds," the specimens of which have an aggregate weight of 8,533 pounds (3,873 kilograms). These are grouped in three classes, viz., Stone meteorites, Iron-stone meteorites, and Iron meteorites. Under each of these divisions the specimens are placed in chronological order, and labels show the locality, date of fall or find, and weight of each specimen. The specimens are in large part not the individual stones, but fragments of them, it being usual when a meteorite falls or is found, to break it up and distribute the pieces among museums and collectors in order to provide material for study.

In the five large cases occupying the floor of the hall are shown some meteorites of exceptional size and importance. Of these, the iron meteorite of Quinn Canyon, Nevada, is the largest, weighing nearly two tons (3,275 lbs.). It is also remarkable for the symmetry of its form which is that of a cone and is due

doubtless to erosion during its passage to the earth. Other large meteorites shown in these cases are those of Long Island and Brenham, Kansas, Canyon Diablo, Arizona, and Toluca, Mexico. Of these the Long Island meteorite is remarkable as the largest stone meteorite known. As exhibited it is in several hundred pieces all of which once formed a single mass, the weight of which was about 1,300 lbs. When the mass fell it struck a ledge and thus was broken into the pieces shown. The characteristic pittings of the surface of meteorites are well shown on this specimen. Of the Brenham, Kansas, meteorites, two large and two small individuals and ten sections are shown. One of the large individuals weighs 465 and the other 345 lbs. The total weight shown is about 1,000 lbs. The sections show the characteristic structure of meteorites of this class, viz., a sponge-like mass of iron, the pores of which are filled by the yellow magnesium silicate, chrysolite. The distribution of this silicate is irregular, some parts of the masses being wholly metal.

Of the Canyon Diablo meteorite nine individuals and five sections are shown. The largest of the individuals weighs 1,013 lbs., and is one of the largest ever obtained from the locality. The next smaller individual shown, weighing 265 lbs., is remarkable for the perforation about one inch in diameter passing entirely through it. Of the sections, several are etched and show the characteristic figures of the meteorite. These figures are broad and irregular. The small projecting particles, about the size of a grain of wheat, are cohenite, a carbide of iron little attacked by the acid used in etching and hence standing in relief. In addition are seen larger nodules of oval form which are sulphide of iron, often surrounded by graphite or cohenite.

Of the Toluca meteorites sixteen individuals and seven sections are shown. The largest individual weighs 90 lbs. Another individual shows shaping for use as a hammer. Such use of these meteorites was frequent in early times. The etched sections show the typical figures of this meteorite, with laminae about 2 mm. in width and of a regular network pattern.

In the wall cases are shown the smaller specimens of the collection, also casts of meteorites. The casts are placed in the bays, the meteorites on the shelves above. In the three cases first in order from the entrance from Hall 61, beginning at the left, are

shown the specimens of stone meteorites or aerolites. These specimens are in part individuals and in part fragments. They are arranged in chronological order passing from left to right. Specimens of about one hundred and fifty falls are shown. These include 660 individuals of the Forest City, Iowa, fall, about twenty individuals of Pultusk, Poland, and large masses from Farmington, Kansas, Saline, Kansas, Homestead, Iowa, Bluff, Texas, Estacado, Texas, etc. The rare carbonaceous meteorites are well represented by specimens from Orgueil and Alais, France, and Mighei, Russia.

Following the stone meteorites are shown the iron-stone meteorites, of which about twenty-five distinct falls are represented. These contain more iron than the stone meteorites and thus pass toward the iron meteorites. The iron varies in quantity from coarse flakes or nodules scattered among the stony minerals to sponge-like masses in which the stony portions are held. Complete individuals of the Crab Orchard, Tennessee, and Admire, Kansas, meteorites are shown, while other falls are represented by sections. In the same case are shown specimens of terrestrial iron which has a composition resembling that of meteoric iron. Santa Catharina, Brazil; Ovivak, Greenland; and Awarua, New Zealand, are among the localities thus represented.

Following the iron-stone meteorites are placed the iron meteorites, about one hundred and thirty falls of which are represented. The specimens are chiefly sections and most of these are polished and etched in order to show the characteristic figures. Especially well represented falls are those of Kenton County, Kentucky, Rodeo, Mexico, Indian Valley, Virginia, and Colfax, North Carolina.

The casts in the bays of the cases show the form, size, and surface characters of the meteorites represented. As the meteorite itself is usually cut up and distributed these casts afford the only record of such characters. Meteorites of remarkable form thus represented are those of Babb's Mill, which is cigar-shaped, those of Kokstad and Hex River, South Africa, shaped like a large lower jaw, and Charlotte and Boogaldi which are drop or pear-shaped. A conical shape is also common, the apex of the cone having been the front side in falling.

On the north wall of the hall is a large map showing the distribution of known meteorite falls in the United States.

Halls 63 and 64.

SYSTEMATIC MINERALOGY

This collection numbers about 15,000 specimens and illustrates the different species of minerals obtained from various localities of the world. The arrangement is in accordance with the system of Dana in the following order: Elements, sulphides, chlorides, fluorides, oxides, carbonates, silicates, phosphates, sulphates and hydrocarbons. The smaller specimens are placed in the floor cases, the larger in the wall cases. The series begins with the elements at the left of the entrance from Hall 62, then follows down this side of the hall and up the other and then passes to Hall 64. The order is also indicated on each specimen by the number placed at the left on its label. This shows its number in Dana's system. The specimen labels show the name and composition of the species, the Museum catalogue number, and the locality. Beginning with the case of elements at the left of the entrance from Hall 62, the specimens of native sulphur are remarkable for their size and brilliancy and the large crystals of stibnite from Japan are also worthy of special note. The next wall case contains a remarkable specimen of millerite from Iowa, and a fine display of fluorite from Cumberland, England. In the floor cases in this group the specimens of gold, galena, pyrite, sylvanite and cerargyrite are especially noteworthy. Some of the minerals in this group, especially realgar and proustite are covered with black boxes in order to protect them from the fading effects of light. These boxes can be raised, for examination of the specimens, by pressing a button placed under the edge of the case.

In the floor cases following, the series of twin quartzes from Japan, of Placerville, California, quartzes, of golden quartz from Colorado, chalcedony from Wyoming, precious opal from Australia, cuprite from Arizona, hematite from Elba, manganite from Michigan, and rutile from Georgia, are noteworthy. The adjoining wall cases contain among other specimens a large and fine series of quartz crystals from several localities, also a large group of amethyst from Thunder Bay, and a remarkable series of agates from South America. Passing to the east side of the hall a series of calcites of exceptional completeness and beauty is shown. These include a superb series of English calcites and

large wine-colored calcites from Joplin, Missouri, with still larger ones of violet color from the same region. Other remarkable specimens of carbonates in the wall cases include blue smithsonite from Greece, aragonite from Sicily, and azurite and malachite from Arizona. In the floor cases containing carbonates, smaller specimens of calcites are shown, most of which are remarkable for their brilliancy and perfection. The rhodochrosites from Colorado are of rare beauty of color. The series of cerusites is excellent, and some remarkable azurites and malachites are shown. The series of silicates begins with the feldspars and is then followed by pyroxenes and amphiboles. A series of beryls following includes emeralds, aquamarines and other gem stones. The varieties and localities of garnet are next displayed and next a superb series of phenacite, diopside and topaz. Tourmaline is fully represented, the best specimens being from Maine, California, and the Island of Elba. Then follow the zeolites, a group of hydrous silicates named from their easy fusibility before the blowpipe. The specimens in the adjoining wall cases contain a remarkable series of the richly colored amazon-stones of Colorado, garnets of large size and various coloring, large crystals of beryl, a mass of lapis-lazuli weighing about 200 pounds, a splendid group of epidote from Alaska, and large and fine specimens of tourmaline. Passing to Hall 64, the first wall case at the left contains a complete series of the varieties of mica, following which are the hydrous micas, the serpentines, talcs and clays, and the minerals containing the rarer elements, such as columbite, samarskite, etc. Following these in the wall cases on the north side of the hall are the phosphates, arsenates, borates, uranates and sulphates. Among these the vanadinites from Arizona, and olivenites, conchalcites and tyrolites from Utah, are of exceptional beauty and rarity. The turquoises from Arizona, autunites from South Dakota, barites from England and anglesites from Utah are also noteworthy. The systematic collection terminates in the wall cases on the east wall in the last case, especially noteworthy being the specimens of wulfenite from Arizona, amber from Prussia and jet from England. A collection of pseudomorphs illustrates how one mineral may be replaced by another. Then is exhibited a collection of radioactive minerals with photographs made by the specimens themselves. Large gold nuggets found in Australia and California

are next represented by full-sized models. In the floor cases of the hall several hundred specimens of cut gems and ornamental stones are shown. These include topazes, amethysts, emeralds, tourmalines, moonstones, rock crystal, amber, etc. The specimen of carved amber is especially remarkable as a piece of lapidist's work. The series also includes a number of jasper vases and trays from the Urals and pieces of polished serpentine and onyx. A complete series of models of the famous diamonds of the world, illustrating their size, form, and color, makes a part of the exhibit. The Chalmers crystal collection, which includes about 250 specimens from United States localities and is the most complete collection of the kind ever made, occupies one case.

Hall 65.

STRUCTURAL AND DYNAMICAL GEOLOGY.

The specimens in this hall for the most part represent phenomena met with in the study of the earth's crust, and illustrate phases of rock structure and formation. Entering from Hall 64, in the first case at the left are shown large slabs with ripple-marked surfaces. One of the largest of these shows also cross ripples. Large surfaces exhibiting fossil mud cracks are also shown. In the next case the different results of glacial action are chiefly illustrated. The series includes glaciated pebbles and boulders from glacial regions of Switzerland and Mexico, also from Chicago and Rochester, New York. Among the most interesting of the specimens are a series of boulders of copper found for the most part about the southern end of Lake Michigan which were brought by glacial movement from the copper-bearing regions about Lake Superior. The largest of these boulders weighs 375 pounds. Rock surfaces, planed and striated by glacial movement, are also shown. These are from both ancient and modern glaciers. Specimens illustrating the effect of erosion by wind and water, also stages and forms of rock weathering are shown in this case. The next two cases are largely devoted to concretions and the collection there exhibited is perhaps the most complete one of these varied forms to be seen in any museum. Various forms of lime concretions, barite concre-

tions, clay stones, sand and limonite concretions make up the bulk of the collection. A related structure called orbicular, found in eruptive rocks, is illustrated by large slabs from California, North Carolina, and Sweden. A number of geodes are shown illustrating the forms and size of these bodies. The next case is largely devoted to septaria formed from concretions by drying and shrinking and a subsequent filling of the cracks with some other substance. Several of these shown are of large size, one being nearly three feet in diameter. Polished sections are also shown. The next case illustrates cave formations and cave life. Stalactites and stalagmites and other cave formations chiefly from Indiana caves are mounted in natural positions so as to illustrate the formation and characters of typical limestone caves. The forms of life inhabiting such caves are also shown. The next case is devoted to specimens of individual stalactites and stalagmites of large size or perfection of form; it also contains a series of fulgurites, one of which is nine feet in length. On the floor of the hall is a collection of basalt columns from the Giant's Causeway, Ireland, and the Rhine valley. These are grouped so as to illustrate the stair-like arrangement which often characterizes cliffs of basalt. There is also on the floor of the hall a case containing a large number of crystals of selenite from Wayne County, Utah. In this exhibit the crystals are arranged in the geode-like form in which they occur at the original locality.

Hall 66.

LITHOLOGY.

The chief collections of this hall illustrate the varieties of rocks. About 2,000 specimens are shown, most of them being of the size 3 x 4 x 1 inch. The specimens are classified under the heads of eruptive, aqueous, and metamorphic rocks.

Entering from Hall 65, in the first case at the left of the entrance are shown *granite* and its varieties, such as *granitite*, *graphic-granite*, etc. These are coarse-grained rocks having quartz, potash-feldspar, and one or more minerals of the mica, amphibole, or pyroxene groups as essential constituents. Then follow *granite-porphry*, *quartz-porphry*, *vitrophyre*, *felsophyre*, etc., which are like the preceding in composition, but more or

less porphyritically developed. Following these are *rhyolite*, *neva-dite*, *pumice*, *obsidian*, etc., which are amorphous volcanic rocks, having high percentages of silica, usually more than 70 per cent. Then follow *diorite* and varieties, holocrystalline rocks having plagioclase feldspar and hornblende or black mica as essential constituents, *andesites* and *dacites*, amorphous or porphyritic rocks composed of soda-lime feldspar, black mica, hornblende, and in the case of *dacites* quartz, then *porphyrites* of various kinds.

The next group begins with *gabbros* and *norites*, which are coarse-grained rocks consisting of a basic soda-lime feldspar, with a diallage or other pyroxene. *Diabases*, rocks having plagioclase feldspar and augite as essential constituents follow, then come *basalts*, *dolerites* and *melaphyres*. The latter are usually found in the form of dykes and intrusive sheets and are popularly known as trap rocks. *Pyroxene rocks*, *diallagite*, etc., which are basic rocks composed largely of pyroxene, come next, and the group ends with *peridotite* and varieties, including *lherzolite*, *picrite* and *dunite*. These are highly basic rocks, composed chiefly of olivine, but often having chromite and other iron oxides present.

Rocks of the *syenite-nephelinite* series are placed next. The *syenites* are holocrystalline rocks, having dominant orthoclase and subordinate ferro-magnesian minerals. These are followed by *trachytes*, which are of the same composition as *syenite* but of porphyritic or felsitic texture. Then follow *nepheline* or *elaeolite syenites*, in which nepheline accompanies the feldspar; *phonolites*, which are like the above but of porphyritic or felsitic texture and *tephrites* and *basanites*, rocks having nepheline or leucite and lime-soda feldspar as essential constituents, usually porphyritic in structure, with a more or less amorphous ground mass. *Kersantite*, *leucite basalt*, *leucitite*, *nepheline basalt* and *nephelinite*, which are rocks containing leucite or nepheline in place of feldspar, and these usually associated with augite, end the series.

Then follow aqueous rocks. Those formed as chemical precipitates are placed first. These include *hematite*, *limonite*, *calcareous tufa*, *oolitic* and *pisolitic limestone*, *onyx*, *serpentine* and its varieties, *talc*, or *steatite*, including *verde antique marble* and *ophite*, *gypsum*, *alabaster*, etc. Then follow rocks formed as

sedimentary deposits, and fragmental in structure. The principal varieties of these are arranged in this order: *Sandstone*, *conglomerate*, *breccia*, *quartzite*, *shale*, *clay*, *tufa* or *tuff*, *coquina*, *chalk* and *limestone*.

Then follow metamorphic rocks. These are divided into stratified or bedded, and foliated or schistose. The first class includes *crystalline limestones*, *marbles* and *dolomites*. They are made up chiefly of the mineral calcite, and are formed from the remains of molluscs, corals and other animals. These produce limestone first and this is changed by the action of heat to the crystalline condition. In some cases the original fossils remain intact, as illustrated in many of the polished slabs. Following the *marbles* are placed the *crystalline schists*, which are rocks of variable composition, but characterized by a pronounced schistose structure. Here are included *argillite*, *clay-slate*, *eclogite*, *quartzite*, *phyllite*, *paragonite schist*, *chlorite schist*, *mica schist*, and others.

Last in the series appear the *gneisses*, a class of rocks essentially like the granites in composition, but differing from them in structure, in that the constituents are arranged in approximately parallel bands or layers. Varieties shown depend upon the prevailing mineral.

In addition to the systematic collection above described some special collections, illustrating rocks of certain areas, are shown, such as rocks of the copper and iron-bearing regions about Lake Superior, rocks of Manhattan Island, lavas of well-known volcanoes, including Vesuvius, Mauna Loa, and the extinct volcanoes of central France, and lavas and other products of the volcanoes of the Valley of Mexico.

Some large specimens illustrating special rock structures or types are shown in the wall cases adjoining the principal collection. These include: Specimens from North Wales showing slaty cleavage, with leaves six feet long and one-sixteenth of an inch thick; various specimens illustrating porphyritic structure; a series of specimens illustrating vein structure and faults; basalts from ancient volcanic outflows showing jointing, and a series of dendrites.

Halls 76 and 77.

GEOGRAPHIC GEOLOGY.

The purpose of this collection is to illustrate in a vivid and realistic way the surface configuration of the earth. The chief feature of the exhibit is a series of relief maps which reproduce on as natural and representative scales as practicable, the topography and structure of selected portions of the earth's surface. A part of the series shows only topography and sculpture, while another part shows geological structure as well as topography. To some extent the topography is shown on one map and the geological structure on another, so that both elements are represented with the greatest distinctness. The portions of the surface selected to be represented are usually such as to portray some typical form of surface sculpturing or of volcanic accumulation. Some, however, represent natural or political divisions.

In addition to the relief maps, there are models showing geological structure or illustrating methods of development. Some of these are dissected so as to show the more intimate structure of the formations. There are also exhibited globes, wall maps, and other geographic material. The following is a list of the principal features:

Hall 76.

Entering this hall from the West Dome and passing around to the right, the maps against the wall will be found in the following order:

Relief map of Kentucky showing topographical and geological features and location of principal coal fields.

Relief map of the United States showing limits and theoretical curvature of the ancient ice sheet at the stage of the Glacial period following the main epoch, modelled on a section of a globe $16\frac{1}{2}$ feet in diameter. Scale, 1 inch equals 40 miles.

Relief map of Missouri showing topographical and geological features and principal mining districts.

Relief map of New Jersey showing topographical and geological features.

Model of Henry mountains and vicinity, Utah, showing geological formations and effects of erosion.

Geological and relief map of the Henry mountains showing effects of erosion.

This is on a larger scale than the preceding map and shows only a portion of the same territory.

Same as the above, ideally restored before erosion took place.

Model showing Henry mountains and vicinity ideally restored before erosion took place.

This is on the same scale as the first of the series.

The foregoing series of four maps illustrates the formation of laccoliths or dome-like mountains produced by the intrusion of lava.

Relief map of Yellowstone National Park, showing canyons of the Yellowstone and Madison rivers, etc. Horizontal and vertical scale, 1 inch equals 1 mile, or 1 : 63,360.

Relief map of the Yosemite Valley from surveys made by Captain of Engineers, George M. Wheeler, U. S. A. Scale, 1 inch equals 1,000 feet.

Relief map of Eureka District, Nevada, colored to show geological formations. Scale, 1 inch equals 16,000 feet.

Relief map of the island of Porto Rico. Horizontal scale, 1 inch equals 4 miles. Vertical scale, 1 inch equals 2 miles.

Relief map of the Hawaiian Islands. Horizontal scale, 1 inch equals 4 miles. Vertical scale, 1 inch equals 2 miles.

Relief map of the Niagara river. Horizontal scale, 1 inch equals 1 mile. Vertical scale, 4 : 1. The entire course of the Niagara river is shown.

Relief map of Niagara Falls and vicinity on a larger scale than the preceding. Horizontal and vertical scale the same, 1 inch equals 500 feet. This map, besides exhibiting the familiar features of the Falls and Gorge, also makes plain the ancient shore of Lake Erie and the old channel leading from the Whirlpool.

Relief map of the United States and the Gulf of Mexico, modeled on a section of globe 16½ feet in diameter. Horizontal scale, 1 inch equals 40 miles. Vertical scale, 1 inch equals 8 miles. This map is colored to show average annual rainfall and lines of equal temperature.

Relief map of the Grand Canyon of the Colorado and the cliffs of southern Utah, colored to show geological formations.

Horizontal scale, 1 inch equals 2 miles. Vertical scale, 1 inch equals 5,000 feet.

Mounted on easels and occupying the floor of the hall will be found the following:

Contour map, in relief, of the Washoe, Nevada, mining region, with 50 foot contours. Scale, 1 : 20,000.

This form of map illustrates how a relief map may be constructed from a printed contour map. By filling the contours here shown the ordinary relief map is obtained.

Relief model of Leadville and vicinity, showing geological structure. Scale, 1 inch equals 800 feet; or 1 : 9,600.

Relief map of the Ice Spring craters, a group of extinct volcanoes near Fillmore, Utah, illustrating the successive formation and partial abolition of craters and lava fields. Horizontal and vertical scale, 1 : 1,000.

Relief map of Mount Taylor, New Mexico, showing geological formations. Scale, 1 inch equals 1 mile.

Relief map of the Uinta and Wasatch mountains, colored to show geological formations. Horizontal scale, 1 inch equals 4 miles, or 1 : 253,440. Vertical scale, 1 : 126,720.

Relief map of the high plateaus of Utah, colored to show geological structure. Scale, 1 : 1,680,000.

Two relief maps of Mount Shasta, one showing topographical, the other, geological features.

Relief maps of the Chattanooga District, one showing topographical, the other geological features. Note how, by folding and erosion, the formations originally overlying one another have been exposed so as to succeed one another laterally.

Relief map of Massachusetts, from maps of the United States Geological Survey and the Topographic Survey of Massachusetts. Horizontal scale, 1 inch equals 4 miles. Vertical scale 1 inch equals 4,000 feet.

Relief map of Connecticut from maps of the United States Geological Survey and the Topographic Survey of Connecticut.

Relief map of the Caucasus mountains.

Relief map of the world on Mercator's Projection. Horizontal scale, 630 miles to 1 inch. Vertical scale, 78 times the horizontal.

Relief map of Palestine. Horizontal scale, 1 inch equals 6 miles. Vertical scale, exaggerated 5 times.

There are also exhibited in a case in the hall three maps illustrating special phases of topography as follows: Map of a portion of the Catskill mountains, showing "stream robbing," map of a portion of the valley of the Illinois river near Ottawa, Ill., showing the work of a young stream, and a map of a portion of the Missouri River Valley near Marshall, Mo., showing a typical flood plain. All these maps are on the horizontal scale of an inch to a mile and with either no vertical exaggeration or one of twice the horizontal.

A number of large geological photographs are exhibited on a stand in the hall.

There is also exhibited a model on a large scale of the Chandler iron mine, Ely, Minnesota. It illustrates how the underground workings of a large mine are carried on. Two shafts (shown at the rear of the model) run from the surface downward. At levels 60 feet apart, horizontal galleries run from the shaft and connect at intervals with other passages. From the two main galleries, sloping ways, not shown in the model, lead upward to passages at higher levels which do not connect with the shaft. Here as the ore is excavated it is thrown through chutes to the tramways of the main galleries, and there taken by ore cars to the shafts and raised to the surface. The timbering is to prevent the top and sides from caving.

Upon the wall is a large painting representing a section of the Soudan mine of Tower, Minnesota.

Hall 77.

Passing into Hall 77, and turning to the right, maps will be found against the wall in the following order:

Relief map of the Isthmus of Panama, showing the proposed course of the canal.

Map of the Isthmus of Panama.

Model showing methods of irrigation on steeply and gently sloping fields.

Relief map of the drainage basin of the Arkansas river in Colorado, showing the relations of the catchment basins to the reservoir sites and irrigable lands. The entire area drained by the Arkansas river from its source in the High Rockies to the plains of eastern Colorado is shown.

Relief map of Europe. Horizontal scale, 85 miles to 1 inch. Vertical scale, 45 times the horizontal.

Relief map of Asia. Horizontal scale, 216 miles to 1 inch. Vertical scale, 39 times the horizontal.

Relief map of Africa. Horizontal scale, 184 miles to 1 inch. Vertical scale, 53 times the horizontal.

Relief map of North America. Horizontal scale, 140 miles to 1 inch. Vertical scale, 39 times the horizontal.

Relief map of South America. Horizontal scale 147 miles to 1 inch. Vertical scale 30 times the horizontal.

Relief map of the United States. Horizontal scale, 85 miles to 1 inch. Vertical scale, 36 times the horizontal.

Geological map of the State of New York.

Relief map of the State of New York. Horizontal scale, 1 inch equals 12 miles. Vertical scale, 5 to 1. The former bed of Lake Iroquois is shown, also the plateau-like character of the southern part of the state.

Relief map of New York City and vicinity. Horizontal scale, 1 inch equals 1 mile. Vertical scale, 3 to 1. The relations of land and water which have given New York its great commercial importance are well shown.

Physical map of the British Isles.

Relief map of Palestine. Horizontal scale, $\frac{3}{8}$ of an inch equals 1 mile. Vertical scale, $3\frac{1}{2}$ times the horizontal.

Geological map of the State of Illinois.

Series of four maps showing the successive stages in the recession of Lake Chicago, following the Glacial period, and the development of the Chicago plain. Former beach lines, spits and islands are well marked by the topography.

Relief map of northeastern Illinois, including Cook, Du Page, Will, and eighteen adjoining counties. The course of the Chicago Drainage Canal is shown.

Relief map of the region of extinct volcanoes in Auvergne, central France; geological and topographical.

Relief map of the State of Nebraska. Horizontal scale, 1 inch equals 5 miles. Vertical scale, 1 inch equals 2,000 feet.

On tables or in cases occupying the floor of the hall will be found the following:

Harvard geographical models, showing respectively the effect of submergence and elevation of a coastal region.

Ideal relief of a complete glacier.

Ideal relief illustrating the formation of valleys by erosion.

Ideal relief of a volcanic island.

Ideal relief of a steep coast and dune coast, showing the two principal types of sea coasts as they appear at ebb tide.

Relief map of Carmel Bay, California, showing a submarine valley.

Geological relief map of Vesuvius and Monta Somma.

Relief map of the island of Teneriffe.

Geological relief map of Mount Aetna.

Geological relief map of Blair, Bedford, and Huntingdon counties, Pennsylvania. A portion dissected to show geological structure.

Relief map of a part of Mount Desert Island, Maine. Scale, 1 to 40,000.

Relief map showing irrigation system at Ontario, San Bernardino county, California.

The relief map of the moon exhibited in the alcove at the entrance to the Department may also properly be considered a part of this collection.

A complete series of the topographical maps issued by the U. S. Geological Survey can be consulted on application to the Curator.

ECONOMIC GEOLOGY.

It is the purpose of the collections shown in this Division to illustrate modes of occurrence in nature of the minerals and ores which have economic importance, to show the localities from which they are obtained, the processes used in their extraction and treatment, and their application to human arts and industries. The collections may conveniently be classified into five groups, which can be most readily inspected in the order named:

Building stones and quarry products, Hall 67.

Clays and sands, Hall 68.

Carbon minerals, including coals, petroleum, etc., Halls 69, 70 and 71.

Ores and products of the precious metals and lead, Hall 72.

Ores and products of the base metals, Hall 79.

Salts of the alkalies and alkali earths, Hall 78.

Hall 67.

MARBLES AND BUILDING STONES.

This hall contains a collection of the best known foreign and domestic marbles in the form of polished slabs. The names given on the labels are those by which the stones are commonly known, and in general refer to the color and markings of the stone rather than to the composition or the locality where it is quarried. Besides the more prominent groups in this collection which are mentioned, there are various smaller series and individual specimens of interest which will be encountered. The series of marbles from the United States includes all the most widely used American marbles. These are principally from Vermont, Georgia and Tennessee. The Vermont marbles are fine textured and range in color from pure white through gray to black. The coarsely crystalline, brilliant marbles from Georgia run from white to pink. It must not be thought from the appearance of this case that colored marbles such as appear in the collection from foreign localities do not exist in the United States. Deposits are known but for various reasons remain unworked. A collection of the mottled red dolomites, the "Winooski Marbles," which are quarried in the vicinity of Swanton, Vermont, presents a large number of peculiar patterns.

A collection of Norwegian and one of Greek marbles illustrates the various breccia patterns of marbles, as nearly all forms, from a plain marble conglomerate through various phases of alteration until the brecciation is wholly obliterated, are present.

The series of French marbles shown is exceptional in size and in beauty and variety of the individual marbles.

Examples of many of the marbles used in the ornamentation of houses and public buildings may be recognized in this case. The names upon the specimen labels of this series are in large part descriptive, so that the collection serves to illustrate the class names dependent upon color and markings which are applied to the more ornamental varieties of marbles from all countries.

A series of marbles from Great Britain presents a variety of patterns of agreeable texture as well as some unusual markings.

Japan is represented by polished marble spheres of various sizes.

A series of marbles from Africa and Asia includes the well known ivory-colored Numidian marbles.

A series of travertines including some large polished specimens comprises the varieties commonly known as Mexican onyx, onyx marble and stalagmite marble. The clear translucent specimens represent the material as originally deposited. The opaque red-brown effects are produced where air has had long access to the material in the ground and has caused an oxidation of the iron contained in the stone.

The green and red serpentines or serpentine marbles, which after the true marbles are the most generally used of the ornamental stones, are abundantly represented.

Especially noteworthy are the curiously mottled red and dark green serpentines from Lizard Point, Cornwall, and the dark colored variety from Saxony which is turned on a lathe to form various ornamental objects. All of these green serpentines are now commonly known as verde antique, although the name was formerly applied only to those of the shade of green possessed by the Greek specimen, E 504. The ophite from New York is a granular mixture of calcite and serpentine.

A number of polished slabs of granite and eruptive rocks are shown. Owing to their hardness and the consequent expense of working, these stones are not so frequently polished as the marbles, but, as illustrated by these specimens, when polished they often present very beautiful effects.

A systematic collection of common building stones is exhibited in the form of four-inch cubes showing different kinds of finish on different faces. The series is classified according to the commercial groups of limestones, marbles, sandstones and granites, and in the nearest of these classes are placed such building stones as lava, diorite, conglomerate, etc., which do not strictly belong to either.

Hall 68.

CLAYS, SANDS, AND SOILS

The arrangement of cases in this hall divides it into two alcoves on either side of a central passage. The space to the

right upon entering from Hall 67 is occupied by a clay collection and a collection of mineral paints, the space to the left by clays, soils, sands and cements.

The key to the arrangement of the clays is given by a synoptic collection which occupies the entire length of two cases along the north wall. In this series are displayed typical specimens of each of the twenty-nine classes of clays of Orton's classification. Their relations to each other and to the rocks from which they are derived are expressed by a method of grouping and by a number of lines connecting the various groups. If these lines and the associated specimens be considered as a kind of genealogical tree of the clays the meaning of this series will be evident. Each specimen of clay in this series has received in order a class number printed upon the label in Roman numerals. As a similar numeral is placed upon the labels of all other clays shown in this hall, the nature of any clay shown may be determined in a moment by referring to the specimen in the synoptic collection with the same class number. After looking over the synoptic collection the visitor should inspect the series illustrating the effects upon their useful properties of the impurities commonly present in clays. The greater part of the space devoted to clays is occupied by specimens arranged according to industrial values. These are arranged in three series, each subdivided and numbered according to the synoptic collection. Each class of specimens is accompanied by a descriptive label. Each specimen is accompanied by a carefully burned briquette of the same clay which illustrates the color, texture, shrinkage, vitrification and other properties of the clay in question when burned. The three collections are:

1. The red-burning clays, which are red, pink and yellow when burned and chiefly used for brick, tile, coarse pottery and other common uses. With these are placed the clays of similar properties which burn to a greenish yellow from the presence of lime.

2. The buff-burning clays, which burn to a buff color and include fire clays and most potters' clays.

3. The white and ivory-burning clays, which burn white or nearly so. Here are placed the kaolins, porcelain and china clays, paper and pipe clays, and other comparatively valuable clays.

A variety of useful minerals which resemble clays, either in composition, appearance or use, are grouped in a separate collection. Fuller's earths, now used chiefly for purifying fats and oils, talc, mineral soaps and various other minerals of minor importance are included.

A collection of mineral paints comprises examples of those mineral substances which are used as pigments after some very simple treatment, such as grinding, washing or gentle calcining. The larger number of these as displayed are: (1) the earths and the ochres, which are clays colored with oxides of iron or bituminous materials, and (2) the metallic paints, which are iron ores ground or roasted.

That part of Hall 68 not occupied by clays contains the sands, soils and cements. Numerous specimens of sand illustrate the varieties adapted to different uses, such as molding sands for metal casting; fire sands for infusible furnace hearths and furnace bricks; glass sands for the manufacture of glass, sand for sand-lime brick, etc. These suggest some of the qualities a sand must possess to be adapted to any particular use. Another series contains hydraulic limestones, cement rocks, common limestones, clays and marls suited to the manufacture of cement. All stages in the manufacture of Portland cement are illustrated.

The composition, nature and varieties of soils are illustrated by a number of small groups showing:

The composition of soils;

The principal classes of soils;

The plant foods which occur naturally in soils. (For foods added to soils, i. e., fertilizers, see Hall 78.)

The formation of soil from an eruptive rock and from limestone is illustrated by two complete series showing the original rock and final product together with the intermediate products. A large number of soils from all parts of the world, arranged according to common classifications, illustrate the great variety of appearance and character which soils assume. Another series is arranged according to the more elaborate classification of the U. S. Department of Agriculture.

Hall 69.

COALS OF THE UNITED STATES.

Here one may study the distribution and extent of the coal fields of the United States, also the kinds of coal produced by each and the available means of transportation.

On a large plate-glass map in the center of the hall, scale ten miles to one inch, the coal fields of the United States as developed in 1892 are indicated by areas in black, and the principal railroads connecting them are also represented.

In cases adjoining are shown specimens taken from these different fields, the exact locality of each being indicated by figures on the labels corresponding to those on the map. The order of numbers is the same as the alphabetical order of the states. The specimen labels show the uses of the coal, the names of the operators of the mines, the means of transportation, the markets, and the analysis of the specimens. Other data will be given to anyone desiring to obtain them, on application to the Curator.

Hall 70.

COALS AND HYDROCARBONS.

This hall contains a series of the carbon minerals, beginning with the diamond, and passing through graphite and the coals (anthracite, semi-anthracite, semi-bituminous, bituminous and lignite) to bitumen and asphalt.

The occurrence of diamonds is illustrated by diamonds in the "Blue Ground" or matrix in which they occur at the De Beers mines, Kimberley, South Africa, a series of the diamond-bearing gravels of Brazil, and one illustrating the diamond-bearing rocks of Arkansas.

Graphite is represented by one series of amorphous and one of crystalline graphites together with the artificial material made in the electric furnace.

Asphaltums form a series of specimens of diverse characters, from the hard, glassy untaite to the soft, semi-liquid malthas. With them are placed the oil shales from which kerosene may be distilled and the ozocerites or natural paraffins.

The coals and lignites represented are as follows:

Lignites, chiefly from the western United States, South America, England and Roumania;

Bituminous coals, from the United States.

Since the greater part of the collection of United States coals is shown in Hall 69, in Hall 70 the bituminous coals exhibited are principally from foreign countries. The larger representation among these is given to the coal fields of England and Wales, and Westphalia and Saarbrücken, Germany. With the latter series the associated rocks are shown.

Anthracite coals, chiefly from Pennsylvania and Colorado, are shown; also cannel coals from various parts of the world.

The grading and cleaning of coal by washing as performed in Germany.

A section of a coal seam five feet in thickness, from the Bore Hole seam, Duckenfield and Merthyr collieries, New South Wales.

Peat and its uses are represented by several varieties of raw peat and stages in the process of making fuels of several kinds from it. These include the old-fashioned air-dried peat fuel, peat briquettes, peat coke and charcoal. The several stages of the manufacture of textile fabrics and paper from peat are illustrated and various other forms of utilization of peat, some of which are decidedly unique.

Large blocks of asphalts and coal are shown apart from the systematic series of specimens.

Hall 71.

PETROLEUM AND ITS DERIVATIVES.

This hall contains a very complete collection made by the Standard Oil Company to illustrate modes of occurrence of the mineral oils of the United States, the methods used for distilling and refining them, and the products obtained. It contains specimens of crude oil from the majority of the pools in the United States; specimens of various oil-bearing sands and minerals of the oil strata; models of oil refineries, and a complete series of the products of petroleum. By following the order given below,

the visitor will find illustrated: (1) The natural history of petroleum; (2) its manufactured products, and (3) the uses or applications of these.

The specimens of crude petroleum are arranged to show gradations of color, this being seen to vary from black, through shades of dark green and brown to amber, the greenish-brown being most common. Even oils of the same color, however, may differ notably in specific gravity and composition.

Tubes filled with drillings from the successive strata passed through in search for oil, illustrate the material through which oil wells are drilled in the Pennsylvania oil fields. One of these represents a huge producer in the MacDonald field. Both these and other specimens of oil-bearing rocks show that sands, gravels, porous sandstones and limestones are the natural home of petroleum.

The minerals and fossils of the oil-bearing strata of Pennsylvania and Ohio are represented by a varied series of specimens.

The distribution of the oil fields of the United States is illustrated on a small relief map, upon which the oil fields are outlined and to which tubes of characteristic oils from the various regions are affixed.

The products of one barrel of petroleum are arranged in a group according to the order in which they are obtained. These are (1) naphtha, (2) burning oils, and (3) residuum. The processes and products of further distillation of the latter will also be seen. The products include machine oils, vaselines, paraffin and coke. The products vary in character and amount according to the nature of the crude petroleum, hence the series shown illustrates only a single petroleum.

Much of the space in this hall is occupied by various finished products ready for sale, these being chiefly illuminating and lubricating oils with, however, a variety of other useful articles. These products are classified into groups which include:

1. Cylinder oils of many grades. These are the heavier, more sluggish, lubricating oils.

2. Special grades of lubricating oils. These include spindle, sewing machine, screw-cutting and engine oils. They are light-bodied and quick-feeding as compared with the cylinder oils.

3. General heavy oils, including miners' oil, leather oil, and various engine oils.

4. A collection of the by-products of petroleum, including paraffin wax, crude, semi-refined and refined, with illustrations of its use for candles, matches, tapers, etc.; axle grease, lantern oil, harness oil, "miners' sunshine," for miners' lamps; vaseline products, such as cerates, pomades, soap and face paints.

5. Special grades of illuminating oils. These oils are designed to give the best light obtainable from kerosene.

6. High test illuminating oils.

7. Illustrations of some of the uses to which petroleum products are put, including waxed paper for wrapping purposes, water-proof coating for explosives, varnishes, wood stains and fillers, solvent for rubber cement, electric light carbons, and electrodes.

A series of Russian petroleums which is exhibited here presents some features differing from the American.

Hall 72.

PLATINUM, GOLD, SILVER, AND LEAD.

The collections in this hall comprise platinum, gold, silver, and lead ores. Besides the typical ores many unique occurrences are represented here. In the examination of these, as well as ores of other metals, it should be remembered that the mineral or metal is frequently present in such minute quantities that it cannot be seen by the naked eye or even with the aid of an ordinary magnifying glass. Ores of the precious metals are commonly, however, associated with certain mixtures of common and otherwise valueless minerals known as gangue minerals, and by a careful observation of such associated minerals and of the neighboring rocks, the skilful observer may frequently recognize the presence of valuable metals. Opportunity is given by the numerous examples shown in this hall to study the slight indescribable variations in the appearance of a mixture of gangue minerals, which often indicate the presence or absence of the precious metals. It should be said, however, that all indications of this kind are often more or less deceptive and the only positive proof of presence or absence of gold or silver is

to be found in actual trial by assay. The above observations do not apply, however, to the lead ores, which are readily recognized by one having acquaintance with the lead-bearing minerals.

If the visitor enters from the West Dome and passes around Hall 72 to the left, the gold, silver and lead collections may be inspected in the cases along the walls in a geographical order. This order begins with northwestern North America, passes eastward through Canada, then south along the Appalachians and then westward through the Mississippi Valley to the Cordilleras, completing the series of ores of Canada and the United States. The ores of Mexico then follow, then those of South America, Africa, Australia and Europe. The gold, silver and lead ores are displayed together in this series and often are even intimately mixed in the individual specimens as may be seen from the numerous cases in which the labels read "gold-silver ore" or "silver-lead ore" or even "gold-silver-lead ore."

The wall case nearest the entrance to the West Dome contains a series of specimens showing typical associations of gold with other minerals, as they are found in mining. A similar series of silver-bearing minerals presents examples of those minerals which contain silver as an essential constituent and those minerals commonly closely associated with silver in the mines. A third series illustrates the lead-bearing minerals and the more ordinary types of the association of these lead-containing minerals with others in the lead ores. Below these synoptic series is a group of auriferous quartzes representing the ores of three widely separated regions of Alaska. The next section of this case is occupied by Canadian ores of which there are two series. One consists principally of silver-lead ores from the Kootenai and adjacent districts of British Columbia; the other includes the ores of the Height of Land in Ontario. The more prominent of these are the silver ores of Cobalt with their associated arsenic and cobalt minerals and the gold quartz ores of Porcupine. The third section of this case contains a series of ores of the Appalachian Mountains. These include the gold ores which were first exploited in the United States. With the gold ores are examples of lead ores some of which have been exploited from colonial times to the present day.

The next case, which is the first upon the south wall, con-

tains the lead ores of the Mississippi Valley. These represent the group of nearly silver-free lead ores from which a large part of the lead produced in the United States is derived. The larger number of specimens in this series represent the more important localities in Missouri, Kansas and Wisconsin, while a lesser number adequately represent the lesser production of various localities in Iowa, Illinois and Kentucky as well as several regions of minor importance. The gold and silver mining districts of Colorado are represented by more than 500 specimens, which fill the remaining two and one-half wall cases against the south wall. They are grouped according to mining districts and illustrate the great variety of the ores of this state.

The ores of Nevada occupy one section of the case which stands against the southern end of the west wall. The series contains ores from many parts of the state. The more prominent groups are a series of about fifty specimens from the Comstock Lode and a series of the ores and rocks of the Goldfield and Tonopah districts.

Another section of the same case contains a very diversified series of ores of both gold and silver from Utah. These include the brilliantly colored ores of Mercur and the peculiar fossiliferous sandstone from Silver Reef.

With the ores from Utah is placed a collection of gold ores from the Black Hills, South Dakota, which presents a good example of the great variety of gold ores which may occur in a limited area. Compare, for example, the ore from the Homestake mine with that from the Holy Terror, which again is wholly different from that of the Golden Reward mine. In Hall 79 may be seen ores of yet different characters from this region, some carrying tin, tungsten, etc.

The section of this case which is nearest the entrance to Hall 71 is occupied by a series of ores from western Montana and Idaho, another from Washington and a third from Oregon.

Another case upon the west wall contains ores of California and Arizona. Of these California is represented by a series of typical gold-bearing quartzes, and the series from Arizona includes sufficient silver-copper and gold-copper ores to present somewhat the appearance of a collection of copper ores. With

the ores from the Tombstone region are a series of the rocks of the district among which the ores occur.

The cases along the north wall contain ores of New Mexico, Mexico, South America and Australia.

The series of ores from New Mexico presents chiefly lead-silver ores, among which the galena from the Hillsboro region, and the "carbonate" lead-silver ore and galena of the Magdalena Mountains, are prominent. Ores of other classes, including those of silver-copper from the northern part of the territory and various types of gold-silver ores from the Gallinas Mountains are also represented.

The series of Mexican ores includes representative specimens of ore from all the gold and silver mining states of that republic, accompanied, in the case of the more important districts, by specimens of the country rock. The collection is especially interesting as showing the association of the ores with eruptive rocks such as are characteristic of most of the richest silver deposits of the world.

The series of ores representing South America is composed chiefly of specimens from Colombia, Ecuador, Brazil, and Venezuela. The collection of Colombian ores is especially complete and includes typical specimens of ores, gangues and rocks from practically all the mining districts of that country. This region was the ancient "El Dorado," or land of gold, from which came the first important yield of gold in the New World, and of which many wonderful stories were circulated.

The collections representing the ores of Australia consist principally of silver-lead and silver-copper ores. Many of the specimens are too large for the serial cases, and should be sought in the large center cases and in the West Dome.

A wall case upon the east wall contains the ores of Europe and ores from other parts of the Eastern Hemisphere.

Of these the series from Great Britain consists of both lead-silver and gold ores. The lead-silver ores illustrate well some of the common associations of galena. Galena is commonly associated with pyrite, but here we find it mixed with blende, a zinc ore which is very troublesome to the lead smelters. Specimens from the Welsh mines which contain much blende are marked "poor ground." A good specimen of fluorite shown here, illustrates another common associate of galena in the Eng-

lish mines, as do also the specimens of calcite and galena. Some of these ores, as for example that of Snail Beach, are from mines formerly worked by the Romans. Note the general absence of "carbonates," and the fresh, undecomposed appearance of the specimens. This is also true of the Spanish and German ores. Carbonate and disintegrated ores occur near the surface where air and atmospheric waters have acted and formed them from the sulphides. These mines having been long worked, most of the superficial ores have been removed, so that now only the sulphide ores occurring at great depths are mined.

Gold ores from Great Britain are represented by specimens from a single Welsh mine. This series from the New Morgan mine, Dolgelly, Wales, is worthy of special attention both on account of its completeness and of the character of the ore. The gold is nearly all free, and much of it is visible to the eye. Specimens of ores from various parts of the mine are shown, also specimens of the country rock.

The silver ores of Greece are represented by a unique series from Laurium, including slags left by the ancient smelters which are now mined and smelted anew. The mines of this locality had been operated by the Greeks from before the time of Themistocles up to the first century, A. D. Owing to the imperfect methods used, however, the slags produced retained appreciable quantities of metal. A modern company, collecting these slags and using them as ores, extracts sufficient lead and silver to yield a profit.

A series of lead-silver ores from Germany is especially instructive, as it shows the characteristic structure of veins. The different minerals are arranged in bands or layers and the metaliferous layers alternate with those of quartz, barite, or fluor-spar.

African localities are represented by the banket of the Transvaal, and ores from Rhodesia.

Three rows of table cases run the length of this Hall. They contain large specimens of ore which could not well be displayed in the smaller wall cases and a number of special collections.

The large specimens, which include types of all the ordinary varieties of gold, silver and lead ore, serve to give a truer idea

of the appearance of these ores than do the smaller specimens of the systematic collection.

In one table case placer gold deposits are represented by a collection of auriferous sands and gravels principally from Alaska and California. All placer specimens are separated from the general collections and included in this single series.

Series of specimens and models illustrating phases of the extraction of metals from their ores occupy some of these cases and a part of one wall case.

Series of metallurgical products illustrate the extraction of gold, silver, and lead from their ores. Out of a multitude of processes used two of the more complex methods are illustrated in this manner: On one side of the case is placed the ore, and lines are drawn from it to specimens of the materials formed from it by the first operation of extraction. From each of these specimens lines are likewise drawn to specimens of the substances formed from them in subsequent operations, and so on until the final products are shown. It is thus possible for the visitor to follow readily each step of the operation. The methods shown illustrate the treatment of very complex ores as practised in the Hartz Mountains, Germany.

Several of the more ordinary metallurgical methods are represented by models of the plants. Thus there is a model of a twenty-stamp mill which is represented at work upon ore from the Treadwell mines of Alaska.

Also the well known cyanide process of gold extraction is represented by a model of a cyanide plant treating an ore suited to this method.

A model of a blast furnace is also shown representing an ordinary method of smelting ores which contain lead and silver. A portion of one side of this furnace is shown removed to permit a view of the interior. Around the model are grouped on one side those materials which are fed into it and on the other, those products which flow from it.

The preliminary treatment of ores by concentration is represented by a model of a Hartz jig which is separating a pulverized ore into waste rock, rich silver ore and rich gold ore.

A table case contains a series of nearly all the known alloys of gold and silver with other metals. It contains polished plates of each alloy with specimens of the materials of which it is com-

posed placed beside it. The color of rings or other articles of jewelry may be compared here with gold plates of the several degrees of fineness.

A collection illustrating the methods of saving gold and silver practised by Tiffany and Company, New York, also occupies a table case. It includes wash water, concentrates from an exhaust blower that collects the dust of the shops, pieces of flooring of the shops, and shoes worn by workmen. Beside each of these are placed buttons of gold and silver obtained from articles of size similar to those shown.

PLATINUM.

The platinum collections are installed in a floor case in this Hall. They include a series of specimens illustrating modes of occurrence of platinum from over twenty localities, including Washington, Oregon and California, the United States of Colombia, and the Ural Mountains. In all of these specimens the metal appears in the form of flattened grains often associated with iridium, osmium, palladium, gold, copper, and chromite. The grains are usually found in river beds or placer deposits. A complete series of rocks and soils bearing platinum, from the Demidoff Platinum mines, Nizhni Tagilsk, Ural Mountains, is shown, as well as a series of concentrates produced by washing these in order to separate the metal. Some unusual uses of platinum are illustrated as follows: Russian platinum coin, for a time used as money; coins struck in platinum and gilded, which passed for gold in Portugal and Spain during the past century, and imitation gold dust made of platinum grains plated with gold.

Hall 80.

WEST DOME.

Beneath the center of the dome stands a statistical column giving the bulk of each product of the mines of the United States, in 1892, for one second of time. Multiplying this by the number of seconds in a year (31,536,000) will give the annual product. In four niches in the walls are pyramids of ore, containing respectively gold and silver ores, tin ores, iron ores, and copper ores.

In addition twenty large specimens of ores are shown here.

Hall 79.

Frederick J. V. Skiff Hall.

ORES OF THE BASE METALS.

The collections in this hall comprise ores of iron, copper, tin, zinc, nickel, manganese, mercury, and antimony, together with various metals and metalloids of minor importance. The ores of each metal are grouped together.

Under each group are placed type specimens of the different ores of the metal arranged in order of their richness. Each of these is accompanied by a group of the materials of which the specimen is composed, so arranged as to show plainly the composition of the specimen. With the type specimens and making up the bulk of the collection are shown specimens of ore from different localities arranged in geographical order. Specimen labels show the mineral of the ore and the amount of metal contained, where this is known. It should be remembered that many of the ores produce more than one metal, in which case the specimen is placed in the group of the predominating metal.

Entering the hall from the West Dome, the visitor should keep to the left, following along the walls until the starting point is reached, when the large specimens along the center of the hall may be examined.

Upon the walls are three relief maps of the United States illustrating respectively the distribution of copper, zinc, and iron ores. The location of an ore deposit is represented by a specimen of the actual ore placed in proper position on the map. As the mountains are represented in relief upon these maps, the relationship of the different kinds of ore to the relief of the land becomes evident and may be profitably studied.

COPPER.

Entering the hall from the West Dome, the copper ores are to the left. They fill six wall cases and the two adjacent floor cases. The first wall case contains the copper-bearing minerals arranged in the order of their richness.

On the lower shelves of this case is a collection of the copper ores of the Appalachian Mountains.



Ores of the Base Metals.

The following wall case contains a collection of native copper and silver and the minerals which are associated with the copper of northern Michigan. The crystallized copper and the calcites are especially noteworthy.

The two following wall cases, in the northwest corner, contain copper ores from the western United States, chiefly the Rocky Mountains. The copper ores of this region usually carry gold or silver, and many localities producing a very considerable output of copper are represented among the gold ores of Hall 72.

Immediately in front of these cases is a table case with large specimens of the copper ore from Keweenaw Point, northern Michigan. In these ores the copper exists as nodules of free metal, which may be seen projecting from the enclosing rock matrix.

An adjoining table case contains large specimens of Arizona and Utah copper ores including typical specimens of the "porphyry coppers."

Returning to the wall cases the visitor may inspect next foreign copper ores contained in two cases. Those of Great Britain, chiefly from Cornwall and Wales, have been worked from the time of the Phœnicians. Those from Germany, which also represent mines of great antiquity, should be studied in connection with zinc, silver, and lead ores from the same mines.

Canadian, Mexican and South American copper ores occupy considerable space. A series of Bulgarian ores and one of the copper ores of Haiti present the brilliant blues and greens of the carbonate ores. African and Australian localities are represented chiefly by sulphide ores.

ZINC.

The six cases along the wall from the last of the copper ores to the entrance to Hall 63 contain the zinc ores, which will be encountered in a geographical order which is the reverse of that of the copper ores; that is, the foreign ores come first and the American after. Three immediately adjacent floor cases contain the larger and choicer specimens. With the zinc ores are placed the ores of the allied but little used metal, cadmium.

The wall case nearest the copper ores contains foreign zinc ores, of which the most important represented in the collection are the English and Welsh, the Greek and the Spanish. The original "black jack" of the Welsh miners is here represented and may be profitably compared with the ordinary yellow and brown blendes, which are often miscalled black jack in this country. Immediately in front of this case are two floor cases, one of German zinc-lead ores, which should be studied in connection with the German ores of other metals, shown elsewhere. The other floor case contains choice examples of the zinc ores of Laurium, Greece, which have long been famous for their varieties of color and richness of lustre, making them very attractive to the eye. They are chiefly the carbonate, smithsonite.

Additional Spanish zinc ores occupy the bay of another wall case, the upper part of which contains the zinc ores of Arkansas. The great purity and richness of the American zinc ores as compared with the foreign, is at once apparent, even on casual inspection, and this high quality will be noted in all the succeeding cases which contain American ores. In this case there is a collection of the final, intermediate, and by-products of the smelting of zinc ores as carried out at La Salle, Illinois. Following the Arkansas ores are two cases of zinc ores from Missouri, the principal zinc producing state. Included with these are the Kansas ores, which form a continuation of the same deposits.

With the Missouri ores are shown ores from the similar deposits of Wisconsin and western Illinois. These ores appear darker than those of Missouri, owing to the enclosure of bituminous matter. Another visible difference is in the frequent flat or tabular form of the Wisconsin ores and the presence of larger quantities of sulphides of iron. Large specimens of Missouri ores are in an adjacent floor case.

Following the Missouri zinc ores come those of the southeastern and south-central states. The Virginia and Tennessee ores are not essentially different from those of the ordinary type of zinc ores, while the deposits of southern Illinois, Kentucky, and New Jersey are decidedly unique.

With the specimens from New Jersey there is a collection of those zinc-bearing minerals which occur in sufficient abundance to be of value as ores.

The three cases across the entrance to Hall 63 from the zinc ores, contain ores of mercury and of various metals and metalloids of lesser importance.

MERCURY.

The first case to the right of the entrance from Hall 63 contains a series of ores bearing mercury and cinnabar, with the rocks associated with them, from many localities. Mercury ores from Alaska, California, Russia, Mexico, and the United States of Colombia, are shown.

The larger number of specimens represent the well-known Spanish mines. A large iron flask, sealed with a leaden seal, represents the package in which mercury is ordinarily sold.

The following case contains additional ores of mercury and a series of tungsten ores and chromium ores.

The third case from the entrance from Hall 63 contains ores of metals and metalloids of minor importance. These include ores of bismuth, molybdenum and vanadium. The uranium ores which also yield radium are placed here as well as the ores of the rare earths which yield the materials for the manufacture of incandescent gas light mantles.

Following the ores of the rare earths is a case containing ores of arsenic, antimony and aluminum.

ARSENIC, ANTIMONY AND ALUMINUM.

Specimens of stibnite, the common antimony ore, are shown from various localities in Japan, California, New South Wales, United States of Colombia, and Greece. Nearly all these specimens carry an appreciable percentage of gold. With the stibnites are examples of rarer oxidized ores of antimony, valentinite, etc. Ingot antimony and products of smelting stibnite are also shown.

Arsenic ores shown here are largely the sulpharsenide of iron, leucopyrite. Much of the arsenic of commerce comes as a by-product from gold or other ores. One such by-product is the arsenical flue dust from treating the silver-lead ores of Laurium, Greece, in which distinct crystals of the oxide or "white arsenic" are plainly visible.

This wall case also contains a series of minerals carrying

aluminum in such form and quantity that it may be profitably extracted. These include the present universal aluminum ore, beauxite, and some minerals from which aluminum may be smelted in the near future.

The adjoining case contains ores of tin.

TIN.

Tin ores from South Dakota, New South Wales, Mexico, and Alaska, together with a nearly complete collection of the ores and rocks of the well-known tin mines of Cornwall, which have been worked from the beginning of history, are shown.

The process of reduction of tin ores to metal is illustrated by specimens from the Redruth Smelting Company of Cornwall.

Other examples of tin ore may be seen in the West Dome.

Following the tin ore is a case of nickel and cobalt ores.

NICKEL AND COBALT.

A series of specimens of nickel and cobalt-bearing minerals is arranged in the order of their richness.

A collection of nickel and cobalt ores from the important deposits of these metals is shown. The most important ores are two: (1) the sulphide of iron, pyrrhotite, which, in some localities, carries minute inclusions of the sulphide of nickel, pentlandite; (2) the apple-green silicate garnierite.

Nickel and cobalt ores from Canada, New Caledonia, and Norway, also nickel and cobalt ores from Oregon, Missouri, and other minor localities, are shown. In the floor case opposite are larger examples of nickel ores.

Following the nickel and cobalt ores is a case of manganese ores.

MANGANESE.

A collection of minerals carrying manganese in commercially available quantities, is shown, also ores of manganese from many important mining districts. Especially to be noted are the ores from Santiago de Cuba, which are typical, and those from New Jersey, which are unique in mineralogical character. Polished specimens of rhodonite from England, illustrate an occurrence utilized both as manganese ore and for ornament.

In the two adjacent floor cases are large specimens of manganese ores.

Upon an adjacent base is a large specimen of Brazilian manganese ore which weighs 3,300 pounds.

IRON.

Iron ores fill five wall cases and two floor cases.

Foreign Iron Ores.—The case following the manganese ores contains iron ores of Europe, Australia, South America and Mexico. A full collection of iron ores and surrounding rocks of the Cerro Mercado or Iron Mountain, of Durango, Mexico, shown here, illustrates a valuable occurrence of an important but little understood type of iron-ore deposit. Large specimens of a specular hematite from the state of Minas Geraes, Brazil, in the lower portion of the case, illustrate a micaceous hematite of world-wide distribution. Many of the ores in this case are from deposits almost unknown to the world at large.

The adjoining case contains a complete collection of the ores and surrounding rocks from two iron ore deposits of eastern Russia. Better known ores represented here are those from England and Sweden. German ores are represented by fibrous hematites and limonites and the well crystallized "sparry" siderite.

Domestic Iron Ores.—Following the foreign ores is a case of iron ore from the Lake Superior region. The ores in this case are from the most important iron ore mines of the world. It is to the proximity of these remarkably rich and pure ores that Chicago owes its present importance in the iron and steel industry. The ores are arranged in the cases under the several "ranges" as the iron mining districts around Lake Superior are termed. While similar in many respects, differences between the ores of the several ranges may be noted even in the small specimens here shown. Specimens of a local magnetic iron sand are worthy of attention as coming from the immediate vicinity of Chicago.

The cases following the ores of the Great Lakes region contain iron ores of the Eastern States. These are here represented largely by limonites and hematites from Virginia and the important southern districts near Birmingham and Sheffield, Alabama. Magnetic ores from New York, New Jersey, and North Carolina represent another important class of eastern ores.

The last wall case contains types of iron ores. Each of the mineralogically different ores of iron appears here in many forms, giving rise to numerous sub-classes of iron ores.

Opposite the wall cases of iron ores, two floor cases contain larger specimens of various ores, of which the magnetites and hematites of Sweden are especially noteworthy.

The visitor should now proceed along the center of the hall and examine the large specimens showing the appearance of large masses of ore as actually met with in the mines.

The first specimen is a mass of zinc ore (smithsonite), weighing five tons, from Marion county, Arkansas, showing botryoidal forms not unusual in ores which are, like this, of secondary origin.

Passing this, the tall case to the left contains bornite, a copper ore from Griqualand, South Africa. The iridescent tarnish which characterizes this ore is exceptionally well shown in this specimen.

To the right stands another tall case containing a mass of red hematite from the Hart mines, Laramie county, Wyoming, one of the most largely used of western iron ores.

Passing these two cases, a case standing in the center of the hall is next encountered. This contains a collection of the green and blue copper ores, malachite and azurite, from the Copper Queen mine of Bisbee, Arizona, a locality which has long been famed for the beauty of its ores.

Beyond this are two cases, of which the one to the left contains a large block of lead-zinc ore from Laurium, Greece, while that to the right contains the green nickel and magnesium silicate, garnierite, which is a well-known nickel ore from New Caledonia.

Passing these, the last specimen, directly opposite the entrance to Hall 63, is a mass of nickel and copper ore weighing six tons, taken from 175 feet below ground in the third level of the Stobie mine, Sudbury, Ontario.

Hall 78.

SALTS OF THE ALKALIES AND ALKALINE EARTHS.

These include besides salt and similar compounds such minerals as asbestos and mica. Here belong also the borates, phos-

phates, etc., which occur in nature chiefly in combination with lime or soda. Besides the alkali and alkali-earth compounds, sulphur and abrasives may be found in this hall as well as various minerals of special or limited use.

The series of abrasive and polishing materials exhibited includes specimens of corundum, emery, garnet, and quartz. These are the more important minerals used for rapid grinding and are illustrated by specimens from many localities. The rocks and minerals associated with the emery are characteristic and should be examined in connection with the emery itself.

For more delicate work and for polishing are shown specimens of pumice, tripoli, siliceous chalk, and similar materials, which are in general softer than the rapid grinding materials.

Agate, hematite, and flint are shown as examples of burnishing materials used to produce a very high polish on metallic surfaces.

Whetstones are represented by specimens of great variety in mineralogical composition ranging from a siliceous, fine-grained shale to gneiss and mica schist.

The great variety of substances adapted to grinding and polishing is well illustrated here.

Artificial abrasives are represented by carborundum, artificial corundum, and several substances of lesser importance.

Borax minerals and products form one large series. The minerals shown are borates of lime and soda. Other boron compounds such as tourmaline, while of fairly common occurrence, are not sufficiently rich in borax to be of economic value as a source of this material and do not appear in this series. Boron compounds of use in the arts and in medicine are illustrated by boric acid and the several forms of borate of soda or common borax. A boride of iron shown is representative of a series of boron compounds of recent introduction to the metallurgical industry.

A large series of the compounds of the alkaline earths, that is, of lime, baryta, and strontia includes materials of varying values and properties. With them are placed also the compounds of magnesia.

Fluorite, which is characterized by the frequent occurrence of large crystals and brilliant colors, is here illustrated principally by the duller and more massive specimens of industrial

value. This mineral is mined in large quantities for use as a flux and in the compounding of glazes, enamels, opaque glass, and similar materials. Minor uses and the chemical industries also consume considerable quantities.

Magnesite, the carbonate of magnesium, is represented by a small number of specimens, as it occurs in but few places, in which, however, it is extensively mined for its use as fire-resisting material, tiles, artificial marble, and even carbonic acid. Native epsom salt, sulphate of magnesia, from several localities, is also shown. Barite, the sulphate of barium, is represented by a series of specimens from many localities. The large series of crystals of this mineral shown is exceptional, as the massive form is usual in deposits of economic value. This material is largely ground for paint. The carbonate of barium, witherite, and the sulphate of strontia, strontianite, useful for colored fire and for sugar refining, are included here.

Common salt is represented by a large series of specimens both of the crude salt and of the forms in which it is prepared for the market in different parts of the world. A large series of African salt is included here.

Lithia compounds are represented by a large group of its ore, lepidolite, with an associated bright red tourmaline, rubellite, and also by its other common ore, spodumene, from various localities.

Miscellaneous soda-bearing minerals are represented by a series of specimens including natural carbonate of soda of several varieties from different localities, and natural sulphate of soda. The fluoride of soda and aluminum, cryolite, and its uses, is represented by a complete series of specimens showing all stages of manufacture from the crude mineral to ordinary and caustic soda, alumina and alum.

An unusually large and complete collection is that of the "Stassfurt salts" which are soluble compounds of potash and magnesia from which nearly the whole of the world's supply of potash is drawn. With these are shown the more important potash compounds which are made from them.

Native alum from various localities and alunite from which alum is extracted represent another class of minerals of some economic importance.

Nitrates are represented by several varieties of the soda nitre of Chili and by cave earths from caves in various parts of the world.

Mica is represented by a series of specimens mainly from American and Russian quarries. Besides thin plates of mica of the best quality, specimens of low grade material enable the visitor to note the difference between the ordinary micas and the more valuable kinds. The rocks in which mica occurs are also shown.

Asbestos is represented by two series, one of crude mineral and one illustrating its uses. These specimens are of asbestos as mined and are not confined to the commercially valuable material. Consequently all stages between a merely compact but somewhat columnar tremolite and the finely fibrous, flexible asbestos of the best quality may be traced through these specimens.

Phosphates are represented by a large series of specimens classified as mineral phosphates, rock phosphates, and guanos. The principal localities represented are Tennessee, Carolina, Florida, Russia, Spain, Venezuela, and Cuba.

Gypsum is represented by a separate collection of specimens from many parts of the world, including the coarser kinds mined for land plaster, plaster-of-Paris, wall plaster, etc., and the finer varieties, selenite, alabaster, and satin spar, quarried for ornamental purposes.

Native sulphur and those metallic sulphides from which sulphur is regularly extracted form a single collection. With these specimens is a series illustrating the various forms in which sulphur reaches the market.

Processes for the manufacture of soda are illustrated by three collections. One shows the Leblanc process, all stages of which are illustrated by specimens of the raw, intermediate, and final products. The relations of the various products to each other are indicated by connecting lines.

The ammonia process is fully illustrated by a series of the raw materials, intermediate and final products being so arranged that the process may be followed step by step. The electrolytic process is illustrated in the same manner.

Hall 32.

H. N. Higinbotham Hall.

GEMS AND JEWELS.

The collection of gems and precious stones that, during the World's Columbian Exposition, attracted so much attention at the Tiffany pavilion in the Manufactures Building, and in the gallery of the Mines and Mining Building, occupies the central cases in this hall. It is one of the most complete collections in existence, for it contains nearly every known gem or precious stone, in fine cut examples, as well as crystals, cleavages or rolled grains, always of gem value. Many of the objects in the collection are of historical interest and world-wide reputation.

CASE 1.—Handsome objects made of rhodonite, jasper, and varieties of rare gem stones found in the Ural Mountains, Asiatic Russia. Prominent objects are a rhodonite jewel casket, rhodonite ink stand, two rhodonite coupes of rare markings, with jasper bases. Rhodonite is a favorite stone with the Imperial family of Russia.

Three fruit pieces of realistic effect made at Ekaterinburg, Asiatic Russia, composed of the following hard and rare gem stones found in the Ural Mountains: Raspberries of rhodonite, blackberries of amethyst, white currants of chalcedony, plums of onyx and sard, mulberries of citrine, black currants of onyx and red currants of sard. The bases are of Kalkansky jasper and the leaves of precious serpentine.

A composite bust of Empress Eugenie; feathers, opals and red jasper; hat, sard; hair, sard; face, chalcedony; collar, bloodstone; beads, yellow jasper; dress panel, lapis-lazuli; body, sard.

Cane of solid silver, inlaid with discs of turquoise from Kurdistan, southwest Asia.

Florentine mosaic of marble, malachite, etc., representing the "Fall of Rome."

CASE 2.—Engraved diamond bust of King William II. of Holland, executed by DeVrees, of Amsterdam. The work required all of his spare time for five years. The specimen was first shown in 1878, at the Paris Exposition.

A diamond crystal adhering to common boart, from Kimberley, South Africa.

A model of the Dewey diamond, weight 23 1-2 karats, found in 1855, near Manchester, Virginia.

Diamond (round boart), weight 41 9-32 karats. This variety is extremely hard, shows a radiated structure if broken, and is peculiar to Brazil.

Cut and uncut specimens of black diamonds from Bahia, Brazil.

A collection of over fifty diamonds in their natural state, and a crystal in matrix from South Africa.

Gem. gravel containing ruby, sapphire, zircon, tourmaline, quartz, etc., from Ceylon river beds.

A collection of fifteen rubies from the Ural Mountains, North Carolina, and Georgia.

Cut and uncut specimens of various colored sapphires, found on the banks of the Missouri river sixteen miles from Helena, Montana.

Uncut specimens of sapphires from Ceylon, Siam, India, and Asiatic Russia.

Richly colored chrysoberyls and alexandrite, from Ceylon and the Ural Mountains.

Six star sapphires, from Ceylon, the largest of which weighs 134 karats.

A 99 and a 66 karat yellow sapphire (oriental topaz), a 59 karat blue sapphire, also yellow, pink, white, and other colored sapphires. Spinels, fine red, blue and other colors.

The Chilton doubly-terminated emerald crystal in a matrix of black limestone, from U. S. Colombia.

Emerald crystal six inches in length and about a half inch in diameter, remarkable for its length, from Alexander county, North Carolina.

CASE 3.—Blue topaz of fine cutting and exquisite luster, from the Ural Mountains, also topazes from Brazil, Ceylon, and Colorado.

The 331 5-8 karat Hope aquamarine, the 134 karat Stoneham aquamarine and other fine examples of sea-green, sea-blue, also yellow and pink beryl from Maine, California, Russia and Brazil.

Turquoise from many localities. Also turquoise beads made by the Indians of Santo Domingo, New Mexico.

CASE 4.—An exceedingly fine collection of quartz and quartz cuttings, notably:

A large jewel casket composed of twenty-six engraved crystal slabs, mounted in jeweled and enameled silver; style, seventeenth century; original in Ambras collection, Vienna.

Screen, "The Finding of Moses," engraved on a thin section of rock crystal 9 3-5 inches in diameter, believed to be the largest section of its kind in existence.

Tazza of quartz, engraved to represent a marine festival.

Large crystal sphere, from the summit of Mt. Antero, Colorado, one of the largest crystal balls ever polished.

A group of crystal balls mounted on a stand of metallic leaves, the whole representing fruit and foliage.

A quartz crystal, scratched so as to show the method of slicing quartz in the manufacture of spectacle lenses.

A series of fourteen specimens of crystal intended to show the various steps in the cutting of a brilliant.

Fine examples of cut crystal from Asiatic Russia; seal having a Turkish inscription on one end and a Russian on the opposite; a frame of the seventeenth century; chandelier pendant, eighteenth century, French cutting; a head of a horse and a bust of Ivan Tourgenieff.

A cut crystal, from Mexico, the finest specimen of aboriginal work of this kind ever found in that country.

CASE 5.—Zircons of various colors. A dark golden smoke color, round brilliant, weight 41 5-8 karats, Kandy, Ceylon. Also one weighing 46 1-2 karats from the same locality.

Tourmalines of many colors, from Brazil and Maine.

Fine specimens of phenacite from the Ural Mountains and Colorado.

Rubellites from Brazil, one weighing 21 karats.

Green garnets, Ural cutting, cushion shaped.

Precious garnets; Navajo Nation, New Mexico, Bohemia, and Kimberley, South Africa.

Rare specimens of peridot from the Levant.

Rare specimens of almandite.

Essonites from Maine and Ceylon.

Spodumene, yellow, Minas-Geraes, Brazil.

Carbuncles, Sirian, Pegu, Burma.

Spessartites from Virginia.

CASE 6.—Rock crystal from Madagascar, Brazil, and Ural Mountains. A beautiful collection of the doubly-terminated quartz crystals, loose and in the matrix, commonly known as Little Falls diamonds, from Herkimer county, New York.

Gold-bearing quartz from California, crystallized gold from Colorado, gold nuggets from placer mines, Kittitas county, Washington, large gold nugget from the Klondike.

CASE 7.—Agate sections. Natural color, transparent, from Uruguay, South America.

Wood opal from Colorado.

Opal in matrix, from Queensland, Australia.

Amethyst geodes from Uruguay.

Agates of Uruguay, grotesquely cut to resemble owls and human faces.

CASE 8.—Opals in the natural state, also engraved and polished, from Russia, Queensland, Mexico, and the State of Washington, also the famous Sun God opal from the Hope collection, which is said to have been known in a Persian temple for three centuries. Opalized bone and shells from Australia. Honduras opal.

Fine specimens of tiger-eye, jasper, mocha stones, moss agates, sardonyx, chrysoprase, agates, and chalcedony.

The finest specimen of hydrolite known (the bubble of symmetrical shape being two and one-half inches in diameter) together with numerous beautiful and rare specimens of agate and chalcedony, cut and uncut, from many parts of the world.

CASE 9.—Cut amethysts from Brazil, France, Ireland, Ceylon, Hungary, and Russia; believed to be the finest collection in existence.

Uncut amethysts from Mexico, North Carolina, and Russia.

Thirteen cut and two uncut specimens of rose quartz from Albany, Oxford county, Maine.

Spanish topazes, a fine series. In the "Spanish topaz" the original coloring of the carbon in the smoky quartz has been changed by the action of heat to the rich hues so much admired.

Cut and uncut smoky quartz from North Carolina, Colorado, Ural Mountains, and Switzerland.

CASE 10.—Sections of a boulder of jade from the western coast of Australia; jadeite from Burma.

Fluorite from Derbyshire and Cumberland, England, one group being encrusted with calcite crystals. Antique carvings of lion's feet in marble, from Rome, Italy.

Porphyry from Finland and Egypt.

Thulite from Norway. Landscape marble from England.

Brilliant slab of labradorite.

CASE 11.—Fine collection of crystallized Amazon stone from Pike's Peak, containing several unique specimens of twin crystals; moonstones from Ceylon; sunstones from Norway.

Interesting cut specimens of iolite, wollastonite, titanite, kyanite, prehnite, andalusite and chlorastrolite.

Gems cut from the so-called "minerals of the rare earths," samarskite, gadolinite, allanite and euxenite; also fine groups of diopside; a series of cut fluorites; moldavite, supposed by some to be of meteoric origin.

Ancient Mexican mirror of iron pyrite.

Antique Persian figures of lapis-lazuli; lapis-lazuli from Bolivia, South America.

CASE 12.—Obsidian fragments and obsidian arrow points and ornaments. Malachite and azurite.

A collection of jade ornaments from China, Mexico, and New Zealand.

A collection of pearls from Japan, Australia, Algiers, Singapore and California; pearl oyster shells, fresh water mussels, etc.

Collection of amber, precious coral, pink coral ornaments, mummy eye, etc.

Amber with vegetable enclosures. A circular amber bead from Mexico, believed to be the first known appearance of amber as an ornament in ancient Mexico. It was used as an incense in the Aztec temples.

CASES 13, 14, 15, 16, 17 AND 18.—These wall cases contain the Tiffany collection of Indian jewelry, and form the most complete series of the kind ever exhibited. Many of the pieces are very old, and of rare forms. They consist of rings, armlets, bosom ornaments, surah holders, ornaments for the forehead, hair, ear, waist, ankles, upper arm, etc., and altogether illustrate the remarkable variety of the ornaments and objects of

the jeweler's handicraft practised in India for more than 2,000 years. The collection is divided into three sections.

First: Objects made from pure unalloyed gold, as worn by the higher caste only, containing diamonds, rubies, emeralds, sapphires, pearls, garnets, rock crystals, etc., and embellished with rich red and green enamels peculiar to the Indian work.

Second: Collection of silver jewelry, consisting of many large and beautifully wrought pieces, worn by a lower caste.

Third: Base metal jewelry, worn by the lowest caste only.

CASE 13.—Contains forty-seven pieces of Delhi jewelry, consisting principally of necklaces and head ornaments of gold set with diamonds, pearls, rubies, emeralds, garnets, turquoises, and crystal, and characterized by the great number of pearls used, and the frequency of small emerald pendants as decorations.

A gold necklace with yellow and green sapphire pendants. A pair of ear-rings of red and green enamel and pearls from Goa.

Two heavily wrought gold and silk necklaces from Muttra.

CASE 14.—Contains upwards of fifty examples of jewelry from Bombay, which is remarkable for the few gems used and the great delicacy and artistic feeling shown in the gold work; also, fourteen pieces of Rajputana jewelry which resembles the jewelry of Delhi, but is heavier and less delicate.

Thirteen pieces of jewelry, consisting of surah holders, necklaces, armlets, and nose rings from Baddhi. The jewelry from Baddhi is distinguished by the number of small gems used, one surah holder containing 492 rubies and 82 diamonds.

Four gold head ornaments from Bijapore.

One string of gold beads from Gwalior.

CASE 15.—Considerable space is occupied by talisman necklaces and other pieces of jewelry from Jeypore, which show an abundance of enameling. There are also fifteen beautiful specimens of jewelry from Kathiawar, principally necklaces, which resemble those of Delhi, though containing less enamel.

There are also several necklaces from Brahma, and eleven gold belts and necklaces from Amritsar.

CASE 16.—Devoted entirely to a collection of forty-seven pieces of gold jewelry from Gujarat which is characterized by the large quantity of gold and small number of jewels used.

CASE 17.—A collection of silver jewelry which contains many beautiful designs and fine examples of the ingenuity displayed by the oriental silversmiths in joining together the simple parts which united make a symmetrical whole.

The silver-work is from the cities of Gujarat, Rajputana, Amritsar, the Deccan District, Lahore, and Bombay.

CASE 18.—Examples of silver jewelry, and jewelry of base metal worn by the lowest caste. The latter while quite heavy is artistically designed, the ornamentation differing from that employed in silver and gold work.

Jewelry of base metal mostly from the state of Gwalior.

CASE 19.—Antique jewelry from Bulgaria. Thibetan jewelry. The latter includes breast ornaments made of gold, silver and turquoise, and a large collection of finger rings and necklaces.

CASE 20.—Additional examples of Thibetan jewelry, chiefly breast ornaments and necklaces. Collection of Egyptian jewelry, mostly gold. Collection of Etruscan jewelry. Pompeiian necklace.

CASES 21 AND 22.—Silver and enameled jewelry from Algiers, Africa.

CASES 23 AND 24.—Remarkable collection of aboriginal American jewelry, found in various parts of Colombia and Ecuador, South America. The collection consists for the most part of objects used for personal adornment. It exhibits surprising ability of workmanship in metals and knowledge of alloying.

Alcove 105.

CASE 25.—Coins of gold, electrum, silver, bullion, potin, aluminum, nickel, bronze, copper, brass, iron, tin, lead, glass, porcelain, and paper, illustrating the metallurgy of coinage.

CASE 26.—Collection illustrating folk lore of precious stones. A large number of specimens showing gems and other mineral or organic substances to which healing or talismanic virtues were ascribed.

ALCOVE WALLS.—Shield of steel and gold (5 feet by 8 feet) upon which are illustrated scenes in the Norse legend of Frithiof and Ingeborg.

Bronze group: Lafayette and Washington, by Bartholdi, the eminent French sculptor.

Department of Botany and Plant Economics.

This department occupies the galleries of the North, South, East (in part) and West Courts of the main building, and may be reached by any of the four flights of stairs near the central rotunda, or by stairways at the ends of the east and west courts.

The intent of this guide is to call attention, in a general way, to the salient points in the Economics of Botany as here installed. No attempt is made to catalogue the contents of the cases, as the labels for each family, group and specimen are full and explanatory. It will be understood that the installation of this great subject is but barely begun despite the fact that it is represented at the present writing by over 300 fully installed cases. Systematic Botany: many whole families; North American Forestry; the great alliances of the fungi, mosses, lichens, algæ (sea weeds), and liver-worts; and many other groupings have not as yet been given place in the installations because of lack of time, space or material.

ARRANGEMENT.

On account of the rapidly increasing collections, and installations, it is impossible at the present time to keep up a purely systematic arrangement of the cases. Those visitors who wish to view the families of plants in systematic order will find references made under each of the family headings, in this guide, to other cases that contain further material in the family.

Location of the Cases.

The cases are plainly numbered in the center of the sash above the glass, and may be found as follows:

Cases.	Location.
Nos. 1 to 99.....	Encircling the central rotunda.
Nos. 100 to 199.....	Galleries of the North Court.
Nos. 200 to 299.....	Galleries of the East Court.
Nos. 300 to 399.....	Galleries of the South Court.
Nos. 400 to 510.....	Galleries of the West Court.

The Pine Family (*Pinaceæ*).

(See also cases 446, 447, 448, 449).

CASE 1. This case is devoted to an illustrative collection of the fruits (*cones*) of various types of Pines. Observe the pyramidal form characteristic of the as yet unopened cones of the pine, represented by those of the Aleppo Pine (*Pinus halepensis*), and the Larch Pine (*Pinus Laricio*); note also the large opened cones of the Sugar Pine (*Pinus Lambertiana*) and the Georgia Pine (*Pinus palustris*); the characteristic egg-shaped, few-scaled form of the Weeping or Funeral Cypress (*Cupressus funebris*); the closely knit narrow-scaled form of the firs, as shown in the cone of the Red Fir (*Abies magnifica*); the hard woody-scaled fruits of the Virginia Pine (*Pinus pungens*) and the Western Pitch Pine (*Pinus Coulteri*); and the small sprawling-scaled, globe-shaped, nut producing fruits of the Mexican Piñon (*Pinus edulis*).

CASE 2.—This case exemplifies seed types and several utilizations of members of the family. Note the three distinct forms of seeds: the nut-like seeds of *Pinus edulis*, the winged seed of the Mountain Pine (*Pinus montana*), and the peculiar elongated form of the edible seed of the Candelabra Pine of Chili (*Araucaria imbricata*). Note the general characters distinguishing the wood of this family as shown in the center of the case; Red Cedar (*Juniperus virginiana*), White Fir (*Abies concolor*), Cypress (*Taxodium distichum*), Douglas Spruce (*Pseudotsuga mucronata*), the Yellow Pine (*Pinus mitis*), the Sugar Pine (*Pinus Lambertiana*), and the Hemlock (*Tsuga canadensis*). The large block of inner bark of the California Red Wood (*Sequoia sempervirens*) indicates the great thickness to which the bark grows, while the walking stick made from it signifies its strength. Instructive examples of the utilization of pine bark as textile material are shown in the Giant Cedar bark of Vancouver Island (*Thuja plicata*).¹ Native uses of pine resins are exemplified in the Ceylon fishing torches formed by wrapping the resin of *Pinus longifolia* in the shredded leaves of the Talipot palm. Three medicinal uses of the Pines are exemplified in specimens of the ground bark of the Hemlock (*Tsuga canadensis*), the

¹ See also Case 17.

White Pine (*Pinus strobus*), and the young tips of the Savin (*Juniperus Sabina*).

CASES 3 AND 4.—Lower portion. These cases display the Russian method of collecting the oils and resins of the European Pitch Pine (*Pinus sylvestris*). This method consists in stripping off the bark from a large portion of the circumference of the tree and scraping off the exudation. This is continued for a period of five years. Note the original package of pitch scrapings as sold in the native markets; the resin, colophony and "pek," as well as the various products of tapping and of distillation exhibited on the top shelf of these cases. Upper portion. Note the various products of turpentine orcharding from *Pinus palustris* in Georgia, as shown in tubes on the bottom shelf of the top of these cases.

CASE 5.—A temporary installation of the more interesting woods of Palestine many of which are mentioned in the Bible. The Oaks (*Quercus pseudococcifera* and *Q. ægilops*), Pine, Olive (*Olea europæa*) and Plane Tree (*Platanus orientalis*).

CASE 6.—Various pine resins: Mexican "resina" from *Pinus Montezumæ*, Japanese "Chan" from *Pinus densiflora*, "Khasia" from *Pinus khasya* of British India, turpentine from the Indian *Pinus excelsa*, and "trementina" from the Mexican *Pinus teocote*. Amber, a fossilized resin from prehistoric pines, from the newly discovered beds on Staten Island, New York, and an ancient Roman necklace of amber from excavations in Sicily are also exhibited in this case; note also particularly fine natural amber nodules, and a clear, cut piece showing the inclusion of a Caddis fly, from Germany.

CASE 7.—This case contains a complete series of trunks of the Georgia Pine (*Pinus palustris*) showing the destructive method of "boxing" for turpentine and the appearance of the trees in the orchard from the first year's boxing to the fifth year's burning off. This "bleeding" of the trees does not, however, decrease the lumber value, provided the trees are cut soon after the tapping is concluded.

CASE 8.—Base of a Seacoast Pine (*Pinus maritima*) showing the Portugese method of boxing the trunks and collecting the resin. By this method the trees are not substantially injured and the yield of turpentine products, though less each

season than under the American method, is perpetual.

CASE 9.—Illustration of the conversion of Spruce pulp from *Picea mariana*, into fibre ware. Note the pulp boards and the examples of the processes necessary to render the pulp impervious.

CASES 10 AND 11.—Upper portion. Exemplification of the conversion of Black Spruce (*Picea mariana*) into the common newspaper stock of today. Note the yellow appearance given to paper by exposure to light. Compare with this the Swedish product from the Norway Spruce (*Picea excelsa*).

CASE 10.—Lower portion. A temporary installation of Japanese wood chip yielded by *Tsuga Sieboldiana* and *Cryptomeria japonica*.

CASE 11.—Lower portion. Vegetable standards and talismans: The wheat of Troyes—Troy weight; the pea of Bayonne; *avoir du pois*; the carat, a seed of the St. John's Bread (*Ceratonia siliqua*); Sesame, the seed of the gingelly oil plant (*Sesamum indicum*); mustard seed, the symbol of insignificance; Damabo (*Rhynchosia cyanosperma*) the weight for gold dust on the African gold Coast; and others.

CASE 12.—Lower portion. Observe the various Japanese utilizations of thin shavings of Hiba (*Thujopsis dolabrata*) and the chip work and twine made from this species.

CASE 13.—Note the paper pulp trees of Japan: Momi (*Abies firma*), Tohi (*Picea Alcockiana*) and Tsuga (*Tsuga Sieboldii*), also paper stock manufactured from the wood fiber.

CASES 14 AND 15.—These cases are devoted to specimens illustrating the conversion of the leaves (needles) of the Georgia Pine (*Pinus palustris*) into textile products; Pine Needle Bagging, Matting, "Hair," Oakum and Antispasmodic Cigars, and the by-products into antiseptic tow and soap.

CASE 16.—Is devoted to various interesting uses of the Giant Cedar (*Thuja plicata*), the inner bark of which is shown as used for making mats, bags, baskets, capes and blankets. The bark is dyed a brownish red with a decoction of Alder bark, or black with iron. Observe Japanese ropes made of the wood of Hinoki (*Thuja obtusa*), and Akamatsu (*Pinus densiflora*). Roof thatching of the bark, and veneer strips of the wood of Sugi (*Cryptomeria japonica*).

CASE 17.—Further uses of giant cedar bark; a branch of the common cedar of eastern North America (*Juniperus virginiana*); and a series of specimens illustrative of the manufacture of lead pencils from the wood.

The Olive Family (*Oleaceæ*).

CASE 18.—Note that the Olive, the Ash, and the garden Syringa and Privet belong to this family. Note the wood of the Japanese Olive, Hira-gi (*Olea aquifolium*), and the true Olive of the Mediterranean Region (*Olea europea*). Observe Ibota wax or Ibota-ro an insect wax on the Japanese Ash (*Fraxinus pubinervis*), and Clarincillo a similar wax from Mexico. Note the orange-red dye-flowers of Harsinghar (*Nyctanthes arbor-tristis*). Observe a fruiting branch of the Olive, a fine series of Olive oils and Castile soaps from Olive oil.

The Milkwort Family (*Apocynaceæ*).

CASE 19.—Stems, fruit and fiber of the wild hemp plant of the American Indians (*Apocynum cannabinum*). The various forms of African and Congo Rubber from the Rubber Vine (*Landolphia owariensis*). Note starch, called "Danish" by the Bahama Negro, a product of the tubers of *Echites umbellata*.

The Gentian Family (*Gentianaceæ*).

CASE 19.—Note the various medicinal bases from this family; the North American Buck Bean (*Menyanthes trifoliata*), the American Columbo (*Frasera carolinensis*); and the American Centaury (*Erythrea centaurium*).

The Strychnine Family (*Loganiaceæ*)

CASE 19.—A family having many very poisonous members containing strychnine. Note the Dog Buttons, seeds of *Strychnos nux-vomica*, and the gourd of Guianian Arrow Poison, Woorari, of which *S. toxicaria* is one of the principal ingredients. Note also the Yellow Jasmine (*Gelsemium semper-virens*) of the southern United States.

CASE 20.—Model of the Indian Corn plant (*Zea Mays*) from a New York State specimen, and above it two large landscapes fashioned from various colored corn husks and "silk."

The Basswood Family (*Tiliaceæ*).

CASES 21 AND 22.—A large series of specimens illustrative of the extensive use of Linden Bast (*Tilia europea*) by the peasantry of Russia; note sandals, bags, harness, ropes, boxes, etc. Jute (*Corchorus capsularis*) and its conversion into cordage and textiles.

The Mallow Family (*Malvaceæ*).

CASES 23 AND 24.—Various bast fibers from members of this family: the Ceylonese Anoda (*Abutilon asiaticum*), the American Abutilon (*A. avicenne*); the Indian Anodagaha (*A. indicum*) and the Antillean Maholtine (*A. periplocifolium*). Hollyhock fiber (*Althea rosea*) from Italy. Kapukinissa fiber (*Hibiscus angulatus*) from Ceylon; Okra, Vendai or Bاندakka fiber (*Hibiscus esculentus*) from the commonly cultivated Gumbo plant, the fruits of which are eaten as a vegetable; Napiretta fiber (*H. furcatus*) from Ceylon; Rose Mallow fiber (*H. moscheutos*) from Louisiana; Majagua fiber from Venezuela, the bast of *Paritium tilaceum* called Bellipapatti in Ceylon; Suriya the fiber of *Thespesia populnea*; Tapkote (*Urena sinuata*) a flax-like fiber of India; and the excellent Aramina fiber (*Urena lobata*) of Brazil, which forms a good substitute for jute.

CASES 25 AND 26.—The Cottons (*Gossypium*) of the world and various utilizations of the seed, oil, stem and lint. Note Cotton root extract used in medicine; stem-fiber utilized for coarse bagging; table oil, butter and lard substitute, soap, glycerine, etc.; Celluloid and its imitative character for use in lieu of glass, linen, tortoise shell, jade, onyx, ebony, ivory, etc.

CASES 27 AND 28.—An object illustration of the picking, ginning, and cleaning of cotton and the steps necessary in the extraction of Cotton Seed Oil from the seed.

CASES 29 AND 30.—The steps necessary in the rendering of cotton absorbent for use in surgical practice. Illustration of each process necessary in the conversion of cotton lint into thread. Above—the various types of cotton cloth and cotton laces. (Compare with Linen in Cases 81 and 82.)

Various Monographic Series.

CASES 31 AND 32.—Upper portion. Note the beginning of an installation intended to exemplify the methods adopted by plants for the natural dispersion of their seeds. The installation at this date takes up only dispersion by the wind (*Aerovectence*). Lower portion.—The Plants of the Bible; a long series of Biblical plants with quotations referring to each and descriptions of their characters.

CASES 33 AND 34.—A temporary installation of some of the finer blends of Ceylon tea (*Thea sinensis*). The case illustrating tea may be found in the west gallery, north side, No. 484.

CASES 35 AND 36.—Upper portion. A series of odd woods showing peculiar arrangement of the wood-cells in geometric forms and various concentric lines.

CASE 35.—Lower portion. Observe a monographic assemblage of the ingredients of Ceylon Curry Powder, also a similar assemblage of the ingredients of Betel Chewing substances.

CASE 36.—Lower portion. Peculiar aboriginal food stuffs: The nuts of the Western Black Oak (*Quercus Emoryi*) from which the Apache Indians make meal and bread; the fruits of the western Black Walnut (*Juglans californica*) from which the Apaches make a sort of soup; note also a pulp and seed mass from a species of cactus (*Opuntia*) called by these Indians Nanulcage. (See also Case 38.)

CASE 37.—Lower portion. A temporary installation of various forms of chocolate. The case illustrating the chocolate plant and its products is (No. 43) two cases further to the south.

CASE 38.—Some peculiar foods eaten by various peoples. Japanese Woon or Tengusa, a dried sea-weed (*Gelidium corneum*), and Siamese Agar Agar (*Encheuma spinosa*). Jamaica Flowers (*Hibiscus sabdariffa*) eaten or made into a cooling drink by the Mexicans. Mowha the flowers of an Indian tree (*Bassia latifolia*) eaten like figs to which their taste is comparable; Piñones, the toasted kernels of the Edible Pine (*Pinus edulis*) largely eaten by the Indians of the southwest United States and Mexico; Cassava Bread from the root of the *Manihot apii*; Kow Kliep cakes, made of rice flour and teel seed

(*Sesamum orientale*) as eaten in Siam; and Klowlow Niew, a thin cake made of starchy meal from a Siamese tuberous root; exact source at present unknown.

CASES 39 AND 40.—Upper portion. A series of varnish, incense and medicinal gums from various countries. Lower portion. Pharmaceutical collection of various gums; showing fracture, guttation and other physical characters necessary to their proper understanding.

CASE 41.—Lower portion. Various rubbers from different species and plant families. These gums will be found in duplicate in the families to which they belong.

CASE 42.—Lower portion. Various gums, especially Chiclé (*Achras sapota*) from which the greater part of the commercial chewing gums are made. (See also case No. 492.)

The Chocolate Family (*Sterculiaceæ*).

CASE 43.—A life-size reproduction of the flowering and fruiting trunk, and a branch of the chocolate tree (*Theobroma cacao*) of South America. Note the enlarged model of a sterculiaceous flower with its peculiar organization for cross fertilization; also the reproduction of an opened fresh chocolate pod and the arrangement of the seeds. Chocolate Fruits and Beans, chocolate nibs, shells (Cocoa), butter, and confection. Note the Swizzle sticks (*Myrodia turbinata*) used by the natives in preparing chocolate as a beverage; also native forms of prepared chocolate.

The Silk-Cotton Family (*Bombacaceæ*).

CASE 44.—Right half. Note the seed and bast fibers yielded by species of this family; and the characteristic pod of *Adansonia digitata*. Observe the Natural Oakum, the inner bark of the South American *Ochroma lagopus*; this substance can be used as oakum, for caulking ships, without any treatment. Note the silky coma of the seeds of various species of *Eriodendron* and *Ceiba* useful as stuffing for upholstery.

The Madder Family (*Rubiaceæ*).

(See also Case 496.)

CASES 45 AND 46.—The coffees of the world. A large series of typical coffee (*Coffea arabica*) from the various coffee

producing districts of both hemispheres. Note the sub-series showing by specimens the process of harvesting, cleaning and separating the berry. A series of the Coffee standards of this country. A series of Coffee extracts. A series of sophisticants and adulterants; Soja beans, split peas, Job's tears, rice, barley, wheat, chicory, etc., toasted for this purpose. A series of mock coffees and coffee substitutes, sometimes termed Health Coffees.

The Tea Family (*Ternstroemiaceæ*).

CASE 47.—A representative series of Japanese Teas (*Thea sinensis*). See also Cases 33 and 34 for Ceylon Teas, and Case 484 for various tea products.

The Holly Family (*Ilicineæ*).

CASE 48.—A long series of the different forms of Maté or Paraguay Tea (*Ilex Maté*) so largely used as a beverage by the peoples of temperate South America.

The Bean Family (*Leguminosæ*).

(See also Cases 57 to 62 and 466 to 473 inclusive.)

CASES 49 AND 50.—The most important varieties of Beans (*Phaseolus* and *Vicia*). A large series of this important nitrogenous food seed.

The Sumac Family (*Anacardiaceæ*).

CASE 51.—An interesting family having many useful and several poisonous members scattered in all climates of the globe. Among them note the Sumacs (*Rhus*), of which the red-fruited species are innocent and the yellow, papery fruited species poisonous. The Japanese Lacquer plant (*Rhus vernicifera*) which yields the poisonous juice so largely used in Japanese art. Note the berries and their resemblance to those of our Poison Sumac of the swamps (*Rhus vernix*), and Poison Ivy (*Rhus radicans*) of the sand lots and dune regions. Note Japanese Wax, Mokuro, from the seeds of the Lacquer tree (*Rhus vernicifera*) and Ju-ro yielded by those of *Rhus suaveolens*. Note the Cashew (*Anacardium occidentale*) an edible fruit (?) with an acrid, poisonous, nut-like seed borne outside; and the Mango (*Mangifera indica*) one of the delicious fruits of the tropics. Note also that Pistach Nuts (*Pis-*

tacia vera) belong to this family, as well as the several fine gums that exude from wounds made on various species.

The Cyrilla Family (*Cyrillaceæ*).

CASE 52.—A small family with but little of economic interest among its members. Note the wood of the Leatherwood (*Cyrilla racemiflora*) of the southern United States.

The Bittersweet Family (*Celastraceæ*).

CASE 52.—A family of vines or shrubs usually with bright-colored arillaceous fruits of which the Wax Work or Bittersweet Vine (*Celastrus scandens*) is a type. The root of this species is shown as used in medicine. Observe also the root-bark and trunk-bark of the Wahoo or Burning Bush (*Euonymus atropurpureus*) and the fruits of the Bahamian *Elæodendron xylocarpum*.

The Maple Family (*Aceraceæ*).

CASE 52.—Note the character of the woods of this family and the winged seeds of the several species. One of the important utilizations of the period is exemplified in the wooden plates, so extensively used by pastry-cooks, market men, and for picnic purposes. Note Maple Sugar and syrup from the vernal sap of the Sugar Maple (*Acer saccharum*). Note also the use of the wood in the manufacture of type and engraver's blocks.

The Laurel Family (*Lauraceæ*).

CASES 53 AND 54.—The principal products of this important family of mostly odorous plants are those exemplified in this installation. Observe the various products of the Camphor Tree of China and Japan (*Cinnamomum camphora*), and the method of securing this substance. Note that our common Sassafras belongs to the same natural grouping that includes Cinnamon (*Cinamomum zeylanicum*), and Cassia Bark and Buds from *Cinnamomum cassia*. The principal edible fruit of the family is the tropic Alligator Pear (*Persea gratissima*). Note the various odorous substances yielding oils utilized in perfumery: Puchuri or Sassafras Nuts of Brazil (*Nectandra Puchury-minor*), Benzoin from *Laurus Benzoin* and others.

The Daisy Family (*Compositæ*).

(See also Cases 504 and 505.)

CASE 55.—While this great family does not yield utilized products at all in proportion to its large representation in the vegetable world, yet some of them are worthy of mention. Note the various specimens representing Chicory (*Cichorium intybus*) the roots of which serve to sophisticate coffee. Note also the new Colorado Rubber (*Parthenium incanum*), a product of the prairie. Fiber produced from the stalks of the common Burdock (*Arctium lappa*). Various medicinal plants; principally Arnica (*Arnica montana*), Tansy (*Tanacetum vulgare*), Yarrow (*Achillea millefolium*) and Wormwood (*Artemisia absinthium*).

The Castor Bean Family (*Euphorbiaceæ*).

(See also Cases 480 and 481.)

CASE 56.—A large family of mostly poisonous plants with milky juice and peculiar beetle-like seeds of which those of the Castor Oil plant (*Ricinus communis*) are typical. Note the extensive series of these oil seeds and oil expressed from the same. Note also the Purging Nut (*Jatropha curcas*). Observe the various forms of meal, flour, and starch of Tapioca, Farinha, Mandioca, and Cassava, from the root of the principal tropic American food plant *Manihot apii*. Note also the forms of Cassava "bread" from this source. Observe Ceara Rubber from *Manihot Glaziovii* and Para Rubber from *Hevea brasiliensis*.

The Bean Family (*Leguminosæ*).

(See also Cases 49 and 50 and 466 to 473 inclusive.)

CASE 57.—Note Indigo the product of *Indigofera anil*; Tamarinds, the fruit of *Tamarindus indica*; the odorous Tonka Bean (*Dipterix odorata*) with its vanilla-like aroma; Cutch, an extract of *Acacia catechu*; Kudzu Starch from the seed of the Japanese *Pueraria Thunbergiana*; African Cam or Dye Wood (*Baphia nitida*); a number of tan barks and fruits from various species of Acacia, and notably the Tropic American Divi-divi (*Cæsalpina coriaria*). Note also the various oils ob-

tained from members of this family, especially the Copaiba Oils from *Copaifera* sp.

CASE 58.—Observe fibers yielded by members of this family: Sunn Hemp by *Crotalaria juncea*, Colorado River Hemp by *Sesbania macrocarpa*, and the Indian Kachnar by *Bauhinia tomentosa*.

CASES 59 AND 60.—Various products of the Bean Family. A complete series illustrating the sources of Licorice, the roots of *Glycyrrhiza glabra*. Algaroba, yielded by *Hymenaea courbaril*, a fossil and recent product utilized in varnish making. Note Chiga starch from the seed of *Campsiandra comosa*; and the characteristic wood in this family.

CASES 61 AND 62.—Various seeds of the Bean Family. Note the wide geographic range of the common Bean (*Phaseolus vulgaris*) and its many color forms. (See also Cases 49 and 50.) Note also that clover, peas, lentils, chick-peas, and vetches belong to this family. Note Fenugreek (*Trigonella foenumgræcum*) the seed that gives the peculiar flavor and odor to Curry Powder (See Case 35), and a fine illustrative series of Gum Arabic the exudation of *Acacia arabica*.

The Rose Family (*Rosaceæ*).

CASES 63 AND 64.—Various seeds and products of the family. Note the family resemblance of the Almond (*Amygdalus communis*) to the "stone" of the Peach (*Amygdalus persica*). Note the tube of Ottar of Roses the oil of the Bulgarian Rose (*Rosa centifolia*). The physical appearance of this costly oil changes daily with the variations in temperature within the case; it solidifies entirely at 57° Fahrenheit. Note the rosary made of the dried "hips" of our common wild rose (*Rosa canina*) thus originating the name "Rosary"; the native candle made of the kernels of the Pigeon Plum (*Chrysobalanus icaco*); the preserved rose petals and dried prune roll of Bulgaria.

Wood Structure.

CASE 65.—A model showing in enlarged detail the structure of the wood of (*Pinus strobus*), with fully explanatory labels.

The Nettle Family (*Urticaceæ*).

(See also Case 460.)

CASES 66 AND 67.—Ramie, the silk-like fibre of *Boehmeria nivea* illustrated by a series of specimens ranging from the stalks to imitation silk objects.

CASE 68.—The Hemp plant (*Cannabis sativa*) and its utilization shown in process steps from the stalk to cordage; Hemp seed and oil; and Gunjah, the dried flowering tops of the Hemp plant as grown in India where they are smoked like tobacco or macerated into Bhang, a highly narcotic intoxicant. Note also Hashish a dark green extract of the tops used as a hypnotic-narcotic and habit drug.

The Mulberry Family (*Moraceæ*).

(See also Cases 87 and 461.)

CASE 69.—Various products of this interesting family. Note the large photograph of a tropic Rubber Tree (*Ficus sp.*) and the peculiar method of rooting downward from the branches, a characteristic feature in this genus. Note the bark of the Paper Mulberry (*Broussonetia papyrifera*) and Japanese paper manufactured therefrom. Observe milk from the Cow Tree (*Brosimum galactodendron*) and Vegetable Cheese made from the same. Note flour and meal from the Bread Fruit Tree (*Artocarpus incisa*); and Central American Rubber from *Castilloa elastica*. Observe Strung Figs from Italy and Preserved Figs from Smyrna both the fruit of *Ficus carica*. Note also Hops the dried strobiles of *Humulus lupulus*; Shellac from *Ficus bengalensis*; and Fustic a yellow dye wood (*Chlorophora tinctoria*).

The Potato Family (*Solanaceæ*).

(See also Cases 497, 498, 499.)

CASES 70 AND 71.—In the table portions are shown a number of forms of manufactured Tobacco (*Nicotiana*) for chewing or smoking.

CASES 72 AND 73.—In the table portions are exhibited a few forms of tobacco leaves and various other tobacco examples.

In the top of these cases are temporarily installed four frames showing in translucent examples, papers made from

Sugar Cane refuse (see Case 107), from the Paper Mulberry (see Case 69) and from the stalk and pith of Indian Corn or Maize (see Case 126). These frames are intended to be reinstalled against windows at some future time.

The Flax Family (*Linacæ*).

CASES 74 AND 75.—Contain specimens of Flax straw, hackled flax and Flax tow from the chief flax growing regions of the world.

CASE 76.—An old hand flax-brake and two bromide enlargements showing the method of using this implement. Note also the old hackel or heckel used to clean the broken flax and partly straighten the fiber.

CASE 77.—A homemade loom built in 1802, used in the early part of the last century for weaving such fabrics as are shown in Cases 83 and 84.

CASE 78.—Two spinning wheels. The larger, which is known to be over 116 years old, was run by hand power and illustrates the older method of spinning with the aid of the distaff; the smaller one is a more modern, foot-power wheel.

CASES 79 AND 80.—The table part of these cases contains a monographic series of specimens descriptive of the process of securing linen yarns from flax straw. The upright portion is devoted to photographs illustrating the old and the new methods of producing linen.

CASES 81 AND 82.—Specimens of the principal kinds of linen thread of Irish and American manufacture. A series of specimens illustrating the manufacture of linseed oil and oil-cake from the flax seed. Specimens showing the various types of linen cloths and typical linen laces.

CASES 83 AND 84.—American Homespun Linen. Specimens illustrating the early American home manufacture of linen thread and cloth. Note the crude attempt at Damascene. For the finest work in this line see Case 89.

The Clove Family (*Myrtacæ*).

(See also Cases 488 and 489.)

CASES 85 AND 86.—These cases are devoted to an exemplification of various species of Australian Gum Trees (*Eucalyptus*)

their woods, oils, and gums. The woods are hard and enduring, coming into many utilizations; their oils medicinal and utilized in the arts; and their gums (*Kinos*) valuable as tanning substances.

The Mulberry Family (*Moraceæ*).

(See also Cases 69 and 461.)

CASE 87.—Laos paper manufactured by the Siamese from the bark of Khoi (*Streblus asper*), showing the different processes and results, from the bark itself to the peculiar accordion-like Siamese books. Note the black books made from this paper treated with the charcoal of Ton Sanoh (*Aeschynomene indica* of the Bean Family) and used in the native courts of law, being written upon with a cream-colored steatite pencil; which see. Note also fibers and cordage from various species of fig. (See also Case 69.)

The Elm Family (*Ulmaceæ*).

CASE 88.—Note the various seeds of the Elms (*Ulmus*) and compare them with those of the Proteaceæ. Note the utilization of the mucilaginous inner bark of the Slippery Elm (*Ulmus fulva*).

The Protean Family (*Proteaceæ*).

CASE 88.—A family of peculiar plants having their highest development in Australia. Their leaves and fruits show relationship to the Oaks and Elms though they are very characteristic in their differences. Note the peculiar fruits of the various species of *Banksia*, especially those of *Banksia serrulata*, and observe that the leaves are oak-like, the fruit-body chestnut-like, the fruit-cells *Hakea*-like, and the seeds Elm-like. Note the peculiar fruits of the *Hakea* Bushes (*Hakea* sp.); the heavy, woody, pear-like fruit of *Xylomelum pyriforme* and its small seed cavity; and the prettily marked wood of the Honeysuckle (*Banksia integrifolia*).

The Flax Family (*Linaceæ*).

CASE 89.—A framed napkin of finest Irish Damascene linen made for the Royal table of Queen Victoria. This exemplifies

one of the extreme utilizations of flax as further represented in Cases 74 to 84 inclusive.

The Smartweed Family (*Polygonaceæ*).

CASE 90.—Note that Buckwheat (*Fagopyrum esculentum*), Rhubarb (*Rheum rhaponticum*), and Dock (*Rumex crispus*), belong to this family association. Observe the kite made crudely of a single dry leaf of the Sea Grape (*Coccolobis uvifera*).

The Wormseed Family (*Chenopodiaceæ*).

CASE 90.—The Sugar Beet (*Beta vulgaris*), showing all the steps in the extraction of sugar from the Beet by 23 distinct specimens representing the result of each process. Of the sugar product of the world (13,957,269 tons) that from the Beet exceeds that from Sugar Cane by over 500,000 tons.

The Poppy Family (*Papaveraceæ*).

CASE 91.—The poppy (*Papaver somniferum*) the principal economic plant of this family is represented by a number of specimens showing various interesting products of the plant; Opium, Morphine, Codeine, the capsules from which opium is extracted, the oil of the seed, etc. Note that the Bloodroot (*Sanguinaria canadensis*), formerly used as a red paint (*Puccoon*) by the Indians; Celandine (*Chelidonium majus*) of the gardens, used in medicine; and the Dutchman's Breeches (*Dicentra canadensis*) belong also to the Poppy family.

The Mustard Family (*Cruciferæ*).

CASE 91.—Note, from the specimens of seed, how widely Mustard (*Sinapis nigra*) is cultivated in various parts of the world for the oil of the seed. Note also that the Cabbage (*Brassica oleracea*), the Turnip (*Brassica napus*), the Radish (*Raphanus raphanistrum*), and the Horse Radish (*Cochlearia armoricana*) are all members of this family of acrid plants.

The Oak Family (*Fagaceæ*).

CASES 92 AND 93.—Various products of the Cork Oak (*Quercus suber*). Observe the bark, or cork peelings of successive periods, and the increase in density and thickness as a result.

Note the finer grades of corks, their velvety surface and lack of holes and cracks; note also the skill with which cork can be carved as shown in the "Cork Picture" of the Doge's Palace, Venice. The utilization of waste cork is also exemplified in many ways.

CASES 94 to 99.—Not yet installed.

Grass Family (*Gramineæ*).

CASE 100.—A fine example of Japanese Bamboo Basketry. This basket is made of the most prized, smoke-stained bamboo, carefully selected as to color. Note the beauty of the band designs, the uniformity of the weave and the symmetry of the whole fabric.

CASES 101 AND 102.—A complete collection of the principal bamboos of Japan. This series was collected and presented to this Museum by the Imperial Japanese Forestry Commission.

CASES 103 AND 104.—An exposition of the major utilized bamboos of Japan. Note the section showing the partitions that, while giving strength to the stems of this giant grass serve to render them readily utilizable as drinking cups, casks, water buckets and bottles, cuspidors, flower pots, vases, and many other containers. Note the brown, smoke-stained bamboo, Susudake (*Bambusa senanensis*) one of the most valued forms; the square bamboo, "Shikaku-take" (*Phyllostachys* sp.), highly valued for ornamental work; the black bamboo "Madake" (*Phyllostachys nigra*), used for screens, fans, and constructive work; the highly elastic "Gomadake" another variety of the same species; and "Yadake" (*Phyllostachys bambusoides*) the original arrow-making bamboo of feudal times.

CASES 105 AND 106.—Various utilizations of grass fibers. Note the utilization of Canebroke (*Arundinaria tecta*) as a fiber-producing grass; the various broom-roots (*Aristida* and *Epicampes*) utilized, as the name indicates, for small brooms and brushes; and the aromatic roots of the India "Khus-khus" (*Andropogon muricatus*) so extensively made into fans and screens which give off a fragrant and cooling odor when sprinkled with water during the heat of the day. A pampas grass fly broom "Escobilla" from Mexico. Observe the interesting Kaya paper, of Formosa, made from *Imperata arundinacea*.

CASES 107 AND 108.—Sugar Cane (*Saccharum officinarum*). Bagasse paper manufactured from the refuse canes after the extraction of the juice. Note the native sugars of Peru, Mexico, and Java; the various muscovados and raw sugars; the brown crystal sugar of Peru; the beautiful white crystal sugar of Egypt; rum; alcohol, and vinegar. (Compare beet sugar in Case 90.)

CASES 109 AND 110.—Various grains. Note the great variety of grass seeds used as food, and the processes necessary to convert the four principal cereals into food form.

CASES 111 AND 112.—The wheats (*Triticum sativum*) of the world. Note the great variety of Russian wheats.

CASES 113 AND 114.—Sorghum (*Sorghum saccharatum* and *S. halepense*). Note the Kaffir Corn of Africa; Egyptian Corn, and the "long sweetening" or Sorghum Molasses of the Virginias, Millet (*Panicum miliaceum*). Note the "Rapoko" or "Munga" of Africa and the beautiful millets of Russia. Rice (*Oryza sativa*): note the "Paddy" or unhusked rice of Japan, the whitened rice, red speckled rice, glutinous rice and "puffed rice."

CASES 115 AND 116.—The Ryes (*Secale*) and Barleys (*Hordeum*) of the world.

CASES 117 AND 118.—The standards of Maize or Indian corn (*Zea mays*) as utilized in governing the sales and shipments of the popped grains: each bottle contains the same number of Case 118 note Maize as grown in various countries of the world. Observe the very large grains of the Andean corn of Ecuador, grown at an altitude of 9,600 feet, and the very small grains of Korea.

CASE 119.—The types of Pop Corn (*Zea everta*); note the shape of the kernel and the amount of horny substance. Note the popped grains; each bottle contains the same number of grains thus showing the expansion of the various types.

CASE 120.—Sweet Corn (*Zea saccharata*); the specimens show the various standard types of this favorite fresh-food corn.

CASE 121.—The types of Dent Corn (*Zea indentata*) the principal fodder, meal, and starch corn. Note that each variety is shown in a manner displaying all of its characteristics of shape, size, grain, tip, butt, and cob.

CASE 122.—Types of Flint Corn (*Zea indurata*) are also

shown in the right of the case, together with some of the fancy-colored corns of this country.

CASES 123 AND 124.—The Oats (*Avena*) of the world, note the full series of Russian oats and those of Illinois.

CASES 125 AND 126.—Various products of Maize (*Zea mays*); Meal, flour, hominy, cones, grits, and farina. Note the series illustrating the distillation of whiskey; corn feathers (chaff) as a resilient stuffing for cushions. The right of the case is occupied with a full series showing the manufacture of paper from the shives and pith of the cornstalk.

CASES 127 AND 128.—The history of the utilization of Maize as a food. Note the prehistoric corn of the Peruvians, mummy corn, cliff dwellers' and mound builders' corn; the corn "compass" of the Hopi Indians, and the starchy Maize of various colors grown by the southwestern United States tribes of the present day. Note also the various native maize "breads," Mexican "guarditas," "tamales," "tortillas," and Hopi "Piki."

CASE 129.—The utilization of the husks of maize ears as a textile base, and Klickitat Indian bag made from them. Note the use of the pith of cornstalks, compressed into briquettes, as an obtunder for naval vessels. Note also the full series of products and by-products in the manufacture of corn sugar (glucose); oil, rubber, starch, syrup, glucose, "sugar," dextrine, amyline, etc.

CASE 130.—Various utilizations of corn husks. The development and utilization of the "cob" of maize for the manufacture of corncob pipes.

The Palm Family (*Palmeæ*).

(See also Cases 453 to 457 inclusive.)

CASES 131 AND 132.—The creeping palms. Note the full plant of Rattan (*Calamus rotang*) 125 feet long. These rattans often grow to a length of from 200 to 400 feet, spreading over trees and twining in every direction. Note the various grades of rattans used for "cane" work. Note the great fruit of the Ivory Nut Palm (*Phytelephas macrocarpa*); its nuts and their use in simulation of bone buttons.

CASES 133 AND 134.—The natives of Oceania claim that there are as many uses of the Coco as there are days in the

year. Some of these uses are illustrated in this Case and in Cases 135 to 138. Various utilizations of the wood, the leaf and the midrib of the Coconut Palm (*Cocos nucifera*). Note the broad board, the house rafter, and eave spout fashioned from this wood; also the brooms, baskets, and ekels from the leaf.

CASES 135 AND 136.—Coir, the fiber surrounding the nut of the Coco Palm, and its utilization for the manufacture of ropes. Note the rope 300 feet long tapering from four inches in diameter to little over a half inch. Coir rope makes the best of all cables for anchoring ship craft, as it is very elastic, acting like a spring, as well as very durable in sea water.

CASES 137 AND 138.—Sections of a coconut tree showing the character of the growth; note the fibrous bundles of the interior and the dense tissue of the exterior. Note further uses of coir in the weaving of mats and bagging, and the coconut leaf skirt of a Sandwich Islander.

CASE 139.—A very large coconut trunk from Trinidad: note the thinness of the bark in proportion to the diameter of the tree.

CASES 140 AND 141.—The utilization of the nut of the Coco palm. Note the various sections of the fruit, showing the proportion of the cavity to the "meat" and "shell" of the nut, and that of the nut to the "husk"; the various uses of the nut meat, and of the mature and immature "shell." Note also sugar, oil, candles, butter, soap, meal, copra, wine, etc.

CASES 142 AND 143.—The Saw Palmetto (*Sabal serrulata*) one of the "Fan Palms" of the southeastern United States. Note the use of cross sections of the "trunk" as brushes; the utilization of the leaf fiber for the same as well as for upholstery material; and that of an extract of the rootstalk for tanning.

CASE 144.—The Cabbage Palmetto (*Sabal palmetto*) in its similar utilization to the preceding species.

CASE 145.—The Bermuda Palm (*Sabal Blackbourniana*) showing the beautiful leaf and its utilization.

CASE 146.—A series representing the Coco de Mer or Double Coconut of the Sechelles Islands (*Lodoicea sechellarum*) the largest and heaviest of all known fruits.

CASE 147.—Not installed at this writing.

CASES 148 AND 149.—The black palms. Fiber and rope of the Brazilian Piassaba (*Attalea funifera*), with brushes made of the same; flower spathe, fiber and wood of the Black Sugar Palm of Ceylon (*Borassus flabelliformis*); fiber and cordage from the Wine Palm of Ceylon (*Caryota urens*); Javanese Jaggery Sugar from the Jaggery Palm (*Arenga saccharifera*); stripped leaves of the Talipot Palm (*Corypha umbraculifera*) and a Cinghalese book made from the natural leaves of this species; and fiber, cordage, and mat made of the fiber of the Japanese Shuro (*Chamaerops excelsa*).

CASES 150 AND 151.—Devoted to an exposition of various fruits of the palms and their utilizations. Dates, the fruit of the Date Palm (*Phoenix dactylifera*) a noble tree, forty to eighty feet high, invaluable to the desert people of Northern Africa whose most important wants it supplies. Fruits of the Betel Palm of the Indies (*Areca catechu*) a favorite masticatory among the natives. (See also monograph on Betel Chewing, Case 80.) Note wax obtained from the Brazilian Wax Palm (*Copernicia cerifera*). Note also the various sectioned fruits of the Palms and the diverse disposition of the kernels. Palm Oil soap and candles obtained from the African Oil Palm (*Elaeis guineensis*).

Hat Palm Family (*Cyclanthaceæ*).

CASE 152.—Note the split leaf of the Panama-hat "Palm" (*Carludovica palmata*) and the prepared "Jipijapa" for hat making. This is not a true palm but a connecting link between the Palms and the Aroids.

Pondweed Family (*Pontederiaceæ*).

CASE 152.—A small family of water plants no member of which has so far been utilized in the arts or industries of the world.

The Rush Family (*Juncaceæ*).

CASE 152.—Note the "Grass matting" or Rush matting manufactured from the stems (*culms*) of the common rush (*Juncus effusus*).

The Calla Family (*Araceæ*).

CASE 152.—A large family of water-loving plants typified by the common Calla "lily" of the gardens. Note the root of the

Jack-in-the-pulpit (*Arisaema triphyllum*), the Skunk Cabbage (*Spathyema foetida*) and the Sweet Flag (*Acorus calamus*) used in medicine; also starches obtained from the Elephant's Ear (*Colocasia esculenta*).

The Pineapple Family (*Bromeliaceæ*).

CASE 153.—Note the photograph showing the habit, of a large number of the members of this family, of growing upon the branches of trees after the manner of parasites; they are, however, air plants, simply anchored on the trees. Note the "Tumbariche" of Mexico the fruits of *Bromelia pinguin*, small acid "pineapples" used for making a refreshing drink. Note the fiber of various species of Pineapples (*Ananassa*), and that of the Old Man's Beard (*Tillandsia usneoides*) the well known Spanish Moss of the Southern States utilized extensively as a stuffing for mattresses and other upholstery.

The Lily Family (*Liliaceæ*).

CASES 154 AND 155.—Various liliaceous fibers; Bow string Hemp (*Sansevieria guineensis*) with cordage, and an ornamental screen mat of the Ceylonese *S. zeylanica*; the Bear Grass of the southwestern United States (*Yucca filamentosa*) and its fiber; also the fibers of the Spanish Bayonet (*Yucca aloifolia*), Texas Bear Grass (*Dasylyrion graminifolium*) and New Zealand Flax (*Phormium tenax*) with their utilizations. Note the utilization of the woody tissue of the Spanish Needle Plant (*Yucca gloriosa*) as splints for surgeons' use; that of the pithy interior of the West Indian Dagger Plant (*Yucca aloifolia*) for razor strops; and a soap made from the pith. Note Sarsaparilla from Brazil (*Smilax Spruceana*) in original bale. Note that onions and garlic belong to the lilies, and the specimens of Ramps (*Allium tricoccum*) the highly odoriferous wild onion used by the mountain people of the Virginias. Observe the medicinal sources of *Trillum*, *Colchicum*, and *Polygonatum*, as well as the fine specimens of Dragon's Blood (*Dracaena draco*), Soccotrine Aloes (*Aloe succotrina*), and Squills (*Scilla maritima*). Note the peculiar Oil of Garlic (*Allium sativum*); a soap made from a species of *Yucca* in Ecuador; and a Japanese starch obtained from the root of the Dog's-tooth Violet (*Erythronium dens-canis*) used in the manufacture of high-grade confectionery.

The Amaryll Family (*Amaryllidaceæ*).

CASES 156 AND 157.—A leaf model and the fiber of the Yucatan Sisal Hemp or Mexican Grass (*Agave sisalana*) and its conversion into hammocks, binding twine, rope, etc., also as a substitute for Manila Hemp (see Case 160). The fiber of *Agave heteracantha* and its utilization in brush making. Note the beautiful mantilla of Fayal lace (*Agave americana*) as grown in the Canary and Madeira Islands. Observe the various products of juice of the Mexican Pulque Plant (*Agave americana*), honey, whiskey, gin, vinegar, rum, wine and alcohol.

The Sedge Family (*Cyperaceæ*).

CASES 158 AND 159.—The utilization of these common "ditch grasses" in the manufacture of mats, matting, and baskets. Plants of Papyrus (*Cyperus Papyrus*), from Sicily, with modern made papyrus and strips of the pith utilized for making the same; also stalks used in lieu of firewood. The books-of-the-dead in the Egyptian Hall of this Museum were made from this species.

The Banana Family (*Musaceæ*).

CASES 160 AND 161.—This case represents, substantially, the genus *Musa* (the bananas), and their fiber. Note the fine series of Manila hemp (*Musa textilis*) from the Philippine Islands; models of the Banana fruit (*Musa sapientum*) and the Plantain (*Musa paradisiaca*); dried bananas used as a confection in Jamaica; and banana meal, flour and starch, particularly valued as an infant food.

The Yam Family (*Dioscoreaceæ*).

CASE 162.—Note the true Yam (*Dioscorea sativa*) and starch from the same. Also starch from *D. alata* and *D. trifida* of Venezuela. These yams are largely used in lieu of potatoes in the countries in which they grow. (The sweet potato, often called "Yam," is a morning glory tuber, not a true yam.)

The Iris Family (*Iridaceæ*).

CASE 162.—The members of this family have been but little utilized outside of horticulture; note, however, Orris Root (*Iris florentina*) and Blue Flag Root (*Iris versicolor*) from our bogs and ditches.

The Pepper Family (*Piperaceæ*).

CASE 162.—Note that white pepper is a product of the same plant as black pepper, the former having had its outer husk removed; both are the fruits of the East Indian Pepper Plant (*Piper nigrum*). Observe the full fruiting spikes of Long Pepper (*Piper longum*); and Cordoncilla and Matico (*Piper angustifolium?*) of Guatemala. Observe also Cubebs (*Piper cubeba*) and refer to Case 80 for the use of the Betel Pepper (*Piper betel*) in Betel chewing.

The Orchid Family (*Orchidaceæ*).

CASE 162.—The commercial types of the Vanilla bean (*Vanilla planifolia*) used as a flavoring substance in cookery and confectionery; also Salep (*Orchis mascula*), and Crawley Root (*Coralorrhiza odontorrhiza*) used in medicine.

The Indian Shot Family (*Cannaceæ*).

CASE 162.—A small monotypic family principally utilized in horticulture where it is characterized by the Canna. Note the shot-like seeds of *Canna indica* and a necklace formed of the same.

The Arrowroot Family (*Marantaceæ*).

CASE 162.—Arrowroot flour and starch from *Maranta arundinacea* and *Maranta indica*, and the Venezuelan Lairen Starch from *Calathea allouia*.

The Ginger Family (*Zingiberaceæ*).

CASE 163.—Note the peculiarities of the flowers and roots of this family as indicated in the colored plate. Turmeric (*Curcuma longa*), an East Indian Dye-root; also used as a condiment. (See Curry Powder Ingredients in Case 35.) Ginger, the well-known condiment obtained by powdering the roots of the Oriental *Zingiber officinale*; note also Bleached Ginger, Candied Ginger, Jamaica Ginger and Oil of Ginger from the same source. Grains of Paradise, the seeds of the pungent African *Amomum melegueta*, these also are known as Guinea grains or Melegueta Pepper. Observe the various forms of Cardamoms: the Wild Cardamom (*Amomum zanthioides*) and the cultivated Cardamom (*Elettaria cardamomum*).

The Willow Family (*Salicaceæ*).

CASE 164.—Observe the character of the fruits of the willow (“Pussy willows”), and the beautiful examples of Japanese Chip work from the Doro (*Populus suaveolens*), a Poplar peculiar to Japan. Note also the Japanese method of preparing match-sticks from the same species.

The Australian Oak Family (*Casuarinaceæ*).

CASE 165.—Note the character of the fruits of this family and their likeness to those of the Birch Family; note also the beautifully marked Forest Oak shingles (*Casuarina torulosa*) from Australia.

The Wax Berry Family (*Myricaceæ*).

CASE 165.—Note the bluish-green wax obtained from the fruits of the Wax Myrtle (*Myrica cerifera*), also hand dipped tapers, made of the same, highly valued on account of their fragrance while burning. Note also the compressed leaves of the Sweet Fern (*Comptonia asplenifolia*) used in medicine.

The Birch Family (*Betulaceæ*).

(See also Case 458.)

CASE 165.—Observe the woods and seeds of various members of this family: The Wild Hazel Nuts of this country (*Corylus rostrata*), the similar Cob Nut or Filberts of Europe (*C. avellana*), and the large, thin-shelled, improved nuts of California. Note the fruits of the Alder (*Alnus*) and their likeness to those of *Casuarina* on the left. Note the papery bark of the Paper Birch (*Betula papyracea*) utilized by the North American Indian tribes for canoe building and covering summer dwelling places; note also a hornet’s nest fashioned of this bark.

The Walnut Family (*Juglandaceæ*).

(See also Case 458.)

CASE 166.—Devoted to the fruits and nuts of this family. Pecan nuts (*Hicoria pecan*) showing the finer strains of the orcharded trees in Texas; Hickory Nuts of several species *Hicoria minima*, *Hicoria ovata* and *Hicoria alba*; Butternuts (*Juglans cinerea*) and Walnuts (*Juglans nigra* and *Juglans texensis*);

and the English Walnut (*Juglans regia*) from the hard-shelled natural nut, through many fine thin-shelled grades, to the highly specialized form of California.

The Oak Family (*Fagaceæ*).

(See also Cases 92, 93, 459.)

CASE 167.—The Cork Oak (*Quercus suber*) from Portugal. A very fine and costly decortication of a young tree with three branches. This specimen is considered one of the best examples of dextrous cork peeling ever produced.

CASE 168.—The wood of three species of Japanese oak, Ichigashi (*Quercus gilva*), Akagashi (*Quercus acuta*) and Shirakashi (*Quercus glauca*). Note the fruits (acorns) of various species of oak and their variation of form; also the three species of chestnuts; the Common Chestnut (*Castanea dentata*) the Chinquapin (*Castanea pumila*) and the Spanish Chestnut (*Castanea vulgaris*), also Polente meal and candied chestnuts from Italy. Note that the Beechnut (*Fagus americana*) also belongs to this family.

CASES 169 to 199 not installed at this writing.

DENDROLOGY.

(CASES 200-299 are uninstalled at this writing; they will occupy the galleries of the East Court and contain a comprehensive series of monographs of our North American Trees.)

CASES 300 AND 301.—Russian Oaks (*Quercus pedunculata*) and Ash (*Fraxinus excelsior*) in large and typical trunk and plank specimens.

CASES 302 AND 303.—Russian Birch (*Betula alba*), Poplar (*Populus tremula*) and Elm (*Ulmus campestris*) with sections showing the character of the growth of these species.

CASES 304 AND 305.—Russian Pine (*Pinus sylvestris*).

CASES 306 AND 307.—Russian Spruce Fir (*Picea excelsa*) with various deals and sections of the same.

CASES 308 AND 309.—Formosan woods showing the bark and finish of the various species. Note the similarity of the species to those of Japan. Observe the Ebony (*Diospyros utilis*); the Bischoffia; the Jassamine (*Murraya exotica*); and the Poon (*Calophyllum inophyllum*).

CASES 310 TO 315.—Japanese construction timbers in squares and planks. Note the perfection and beauty of grain in the whole series, especially in the Pine (*Pinus densiflora*); the Arbor Vitae (*Thujaopsis dolabrata*); the Cedar (*Cryptomeria japonica*) that gives the peculiar "Japanese odor" to articles that have been packed in cases made of the wood; the Fir (*Abies firma*); the beautiful red Larch (*Larix leptolepis*); the chestnut (*Castanea dentata*); and the Elm-like Keyaki (*Zelkova keyaki*).

CASES 316 AND 317.—Japanese cabinet timbers. Note the great beauty of all the specimens, but especially the Todo matsu (*Abies sachalinensis*); the Katsura (*Cercidophyllum japonicum*); the Hinoki (*Chamaecyparis obtusa*); the Inu-enju (*Cladastris amurensis*); and the Hari-giri (*Acanthopanax ricinifolium*).

CASES 318 AND 319.—Pyramidal forms showing the growth of seven important Japanese coniferous trees from the base to the apex. The elements of each pyramid show the yearly cubic growth; the total cubic growth; and the perpendicular and horizontal growth in a decade.

CASE 320.—A carved doorway of Vermillion wood (*Pterocarpus indicus*) from the Andaman Islands.

CASES 321 TO 324.—Forty species of Japanese woods, each showing the natural and varnished color and the bark, these are accompanied by Japanese lithographs of the structural characters of the species. The most strikingly beautiful woods here shown may be said to be CASE 321, Araragi (*Taxus cuspidata*), Kaya (*Torreya nucifera*), Kara Matsu (*Larix leptolepis*), and Momi (*Abies firma*); CASE 322, Kuro Matsu (*Pinus Thunbergii*) and Kiri (*Paulownia imperialis*); CASE 323, Toneriko (*Fraxinus Bungeana*), Kuri (*Castanea vulgaris japonica*) and Shide (*Carpinus laxiflora*); CASE 324, Ichi-gashi (*Quercus gilva*), Akagashi (*Q. acuta*), Chan-chin (*Cedrela chinensis*) and Kusu-no-ki (*Cinnamomum camphora*).

CASES 325 AND 326.—Japanese construction timbers. Note the natural beauty of the toko posts (which enter into the construction of all ceremonial tea rooms), especially the Biro (*Livistonia chinensis*), Shide (*Carpinus laxiflora*), Shirakuchi (*Actinidia arguta*) and Yashio-tsutsuji (*Menziesia purpurea*).

CASES 327 AND 328.—A case illustrating the utilization of the bamboo (*Phyllostachys mitis*) in construction. While this gigan-

tic grass can in no wise be classed as a "wood," yet in its utilization it may be considered among timbers.

CASES 329 TO 332.—Ornamental Japanese cabinet woods. Note the great beauty of grain in the five panels of Sugi (*Cryptomeria japonica*): Yuku-sugi chocolate brown from submergence in bog water, wavy sugi and "watered" sugi; note also the rich red-brown Kuwa (*Morus alba stylosa*), the beautiful "old gold" figured Kiwada (*Phellodendron amurense*), the wavy Keyaki (*Zelkova keyaki*), and the oddly marked Tochi (*Aesculus turbinata*).

CASE 332.—Korean woods. Note that these woods are of the same species as those of Japan.

CASES 333 AND 334.—A circular table top cut from a single board of Padouk (*Pterocarpus indicus*), the tree yielding this board must have been about 10 feet in diameter. Note the carved Blackwood stands (*Dalbergia latifolia*) from Bombay, India.

CASES 335 TO 338.—Cabinet woods of British India. Among the 89 species shown here the most striking may be considered to be: CASE 335, Khovia (*Acacia catechu*), Haladwan (*Adina cordifolia*), Kendu (*Diospyros melanoxylon*) and Shivan (*Gmelina arborea*); CASE 336, Koroï (*Albizia procera*), Dhoura (*Chloroxylon swietenia*), Sisham (*Dalbergia latifolia*); Tiwas (*D. ougeinensis*) and Nana (*Lagerstroemia microcarpa*); CASE 337, Padauk (*Pterocarpus indicus*); Bibla (*P. marsupium*), Sagum (*Tectonia grandis*) and Sandal (*Santalum album*); CASE 338, Moka (*Schrebera swietenioides*), Kindal (*Terminalia paniculata*), and Jamba (*Xylia dolabriformis*). Note also the trunk of Japanese Boxwood, Tsuge (*Buxus japonica*).

CASES 339 TO 342.—Woods of Johore. Over 200 species: each specimen showing the natural and finished appearance of the wood and the bark.

CASE 342.—Woods of Ceylon. Twenty-one species of Ceylonese woods in excellent examples. Note the beauty of the white Jalotang (*Dyera Neamgayi*); the strong fibered, red, Kapur (*Dryobalanops camphora*); the dense, dark red Rassak (*Vatica rassak*); and the beautifully lined Rungas mango (*Melanorrhoea Wallichii*).

CASES 343 AND 344.—The destructive distillation of wood. These cases illustrate the products obtained through distilling waste Birch, Beech, Maple and Ash wood to obtain wood alcohol and pyroligneous acid.

CASES 400 TO 405.—The woods of Australia. Note the great size, strength and beauty of color in these fine specimens from the Australian forests. CASE 400, Colonial Pine (*Araucaria Cunninghamii*), Negro-head Beech (*Fagus Cunninghamii*) and Bog Onion or Australian Mahogany (*Dysoxylum Fraserianum*); CASE 401, Red Bean or Kidgi-kidji (*D. Muelleri*), a rich red, rose-wood-like wood; CASE 402, the white Flindosa or Cudgerie (*Flin-dersia australis*), the pink She-beech (*Cryptocarya sp.*); CASE 403, a beautiful plank, 4 feet wide, of the "White Beech" or Bin-burra (*Gmelina Leichhardtii*); CASE 404, note the deep color and fine grain of the Australian Cedar (*Cedrela toona*) and Red Mahogany (*Eucalyptus resinifera*), and the great strength and hardness shown in the specimen of Iron bark (*Eucalyptus paniculata*); CASE 405, note the three Australian Gum woods (*Eucalyptus viminalis*, *rostrata* and *tereticornis*), and the beautifully mottled Beefwood or Honeysuckle (*Banksia integrifolia*).

CASES 406 AND 407.—These cases are devoted to five fine planks of the Brazilian Pine (*Araucaria brasiliana*) exemplifying its variation in color and grain.

CASES 408 AND 409.—Brazilian timbers; note the beautifully mottled and marked specimens of Laurel (*Nectandra sp.*), the Arkwood (*Tecoma leucoxyton*), the brilliant vermilion Macaca Uba (*Tecoma sp.*), and the Rosewood (*Dalbergia nigra*).

CASES 410 TO 415.—A large series of the timber trees of the State of Paraná, Brazil, showing the plain and varnished condition and the bark characters of each species. The striking species are: Sassafras (*Mespilodaphne sassafras*) in Case 410; Canilinha Roxa (*Nectandra sp.*) and Quassia (*Quassia amara*) in Case 411; milkwood (*Pao de Leite*) and Corteza Branca (*Bignonia uliginosa*) in Case 412; Congonha (*Ilex congonha*), Marmelleiro Bravo (*Casearia ulmifolia*) and Murteira (*Eugenia lucida*) in Case 413; Araça Piranga (*Psidium acutangulare*) and Canjuza (*Styrax leprosum*) in Case 414; and Cataia (*Myrsine sp.*), Caciperoroca, and Quina vermelha (*Exostemma floribunda*) in Case 415.

CASES 416 TO 429 contain a very characteristic series of the timbers of Paraguay. These are in ample specimens displaying the finished and unfinished wood and the bark.

CASE 416.—Note the beautiful, yellow wood of the Quirandy (*Zanthoxylum sp.*).

CASE 417.—Note the Lignum Vitae or Palo Santo (*Bulnesia sarmienti*) noted for its interlacing tissue, forming wood that is very hard indeed to split or splinter.

CASE 418.—Note the two beautiful red woods Cedro na Pyta (*Trichilia canjerana*) and Quebracho (*Quebrachia balansæ*), the latter of which yields a very valuable tanning kino.

CASE 419.—Observe the peculiar form and structural beauty of the Ivira Pepe Colorado (*Holocalyx balansæ*), a red dye-wood belonging to the Bean Family.

CASE 420.—Note the clear yellow wood of Rabo de Macaco, an unidentified member of the Bean Family and the rose colored, hard wood of Ivira Pyta (*Peltophorum Vogelianum*).

CASE 421.—All the specimens in this case are of more than ordinary interest; the dye-wood Guayacan (*Caesalpinia melanocarpa*), the clean, clear, yellow Abati Timbabi (*Hymenaea stilbocarpa*), the dark striped red wood, Curupay (*Piptadenia rigida*) and the similarly marked and colored Curupay Ata (*P. cebil*).

CASE 422.—Note the two bright rose-pink woods Curupay Mi (*Stryphnodendron* sp.) and Curupay Na (*Piptadenia rigida*).

CASE 423.—Note the beautiful, clear white wood of the Palo Blanco (*Calycophyllum multiflorum*) and the two dark red Mesquites: Algarobo negro (*Prosopis nigra*) and Algarobo rojo (*Prosopis* sp.).

CASE 424.—Note the clear, white, firm wood of the white Quebracho (*Aspidospermum quebracho-blanco*).

CASE 425.—The clear, clean, yellow wood of the White Lance-wood, Palo de Lanza Blanco (*Myrsine Grisebachii*) and the greenish-brown, hard and firm Lepacho Negro (*Tabebuia flavescens*) are the most striking specimens in this case.

CASES 426 AND 427.—These cases contain several striking and interesting woods, among them the only South American willow (*Salix Humboldtiana*); the Southern Coconut (*Cocos australis*) and the Mora (*Maclura Mora*) one of the valuable South American dye-woods, similar to fustic.

CASES 428 AND 429.—These cases display several tree cross sections which illustrate the density and slowness of growth of several species. Notable in Case 428 is the peculiar cross section of the Ivira Pepe Morati (*Holocalyx balansæ*) and the bright rose-colored wood of Quebracho Rubia, a form of *Quebracho balansæ*. In Case 429 are notable the wood of a great Elder tree

(*Sambucus sp.*) and the very interestingly color-marked Urunday Para, an anacardiaceous species.

CASE 430.—Forty species of woods from the West Indian Island of Trinidad. A series of highly colored and striking woods, among which the following are prominent: Logwood (*Haematoxylon campechianum*), the well known dye; Black Poui (*Tecoma serratifolia*), Red Cedar (*Cedrela odorata*) from which the odorous cigar boxes are usually made; Balsam (*Copaifera officinalis*) the tree yielding balsam of copiava; the deep red Roble (*Platymiscium polystachyum*), and Purple Heart (*Copaifera pubiflora*) a strikingly beautiful deep purple wood.

CASE 431.—A series of thirty-five highly interesting woods from British Guiana, very similar to those from Trinidad. Notable specimens are the orange-red Wallaba (*Eperua falcata*) almost indestructible on account of being surcharged with a natural oil; the yellowish-red Simri (*Hymenaea courbaril*), which yields well known Algaroba varnish resin; the Cedar-like Kurana (*Proteum altissimum*), and Kumara (*Dipterix odorata*) the tree that yields the odorous tonka bean.

CASES 432 AND 433.—Seventy-five of the principal woods of the United States of Colombia. The most attractive of the species displayed are: The bright red Moradillo (*Mimusops Kauki*); Granadillo (*Brya Ebenus*); the bright yellow Guayacan (*Guaicum officinale*) and Naranjillo (*Bravaisia sp.*); the Spanish Cedar (*Cedrela odorissima*); and the yellowish-rose Cumula (*Viburnum sp.*)

CASES 434 AND 435.—These cases contain a very complete and highly authenticated series of the useful woods of Venezuela. The strikingly beautiful species may be considered to be: the black Guayacay (*Guiaicum sp.*); Caobano (*Brunellia comocladifolia*); the brilliant red dye wood Braziletto (*Caesalpinia sp.*); the very deep red Pau d'Arco (*Tecoma sp.*); and the brownish-black Ebano (*Caesalpinia Ebano*).

CASES 436 TO 441.—Contain a long series of the woods of the Island of Jamaica. This highly interesting series, botanically speaking, must yet be redressed before the attractive characters of the specimens will become apparent. The great peculiarity at present evident is the strange names that have been given to the trees such as "Milk," "Potato," "Flora," "Big Family," "Beef," "Rosin," "Slug," "Pigeon," "Soap," "Yoke," "Snoop," "May Pot-

ter," "Cog," "Salt," "Dago," "Parrot," "Dog," "Fiddle" and "Sarah."

CASES 442 AND 443.—A series of specimens illustrating the testing of timber strength, resistance and elasticity.

The Snakeroot Family (*Aristolochiaceæ*).

CASE 444.—A small family of low herbs and high climbing vines having peculiar trumpet-shaped flowers. Note the singular ribbon-like arrangement of the bundles of wood tissue in the ruptured stem of the Dutchman's Pipe vine (*Aristolochia siphon*), and the peculiar characteristic fruits of the same; note the end section of the yellow dye wood Kalaa, of Siam (*Aristolochia sp.*); note the medicinal roots and stems, all of which are aromatic, tonic and adjuvant and form native remedies for snake-bites.

The Pokeweed Family (*Phytolaccaceæ*).

CASE 444.—The Pokeberry (*Phytolacca decandra*) of North America used as a magenta stain for wood implements, and as an anti-fat remedy. The root is a valuable remedial agent in glandular swellings and in rheumatism.

The Olac Family (*Olacaceæ*).

CASE 444.—Note the West African Oil Nuts (*Heisteria sp.*) and the Casca de Ameixa (*Ximinia americana*), the wood is used as a substitute for sandalwood.

The Sandalwood Family (*Santalaceæ*).

CASE 444.—Section of a sandalwood log showing the character of the tissue and growth; sandalwood sawdust (*Santalum album*) utilized in joss sticks and sachet powders; and Chandan Oil (*Dalbergia Hupeana*), a remedial oil of India.

The Waterlily Family (*Nymphaeaceæ*).

CASE 444.—Note the characteristic fruits of the American Lotus (*Nelumbo lutea*) with the seeds half buried in pits; Lotus seeds eaten by the lotophagi of Siam and Corea; yarn dyed a golden brown with the roots of the British Waterlily (*Castalia alba*) and sections of the tuberous roots of the American Lotus eaten by the Osage Indians.

The Buttercup Family (*Ranunculaceæ*).

CASE 445.—Note the peculiar characteristic fruit of the Virgin's Bower (*Clematis virginiana*) and the various medicinal agents yielded by acrid poisonous members of the family, viz., Aconite (*Aconitum napellus*), Hellebore (*Helleborus niger*), Golden Seal (*Hydrastis canadensis*), Black Cohosh (*Cimicifuga racemosa*) and others. Note that several members yield yellow dyes, such as Hydrastis, and Ispariak (*Delphinium sulphurica*) a yellow rug dye of Turkestan.

The Barberry Family (*Berberidaceæ*).

CASE 445.—The botanical relationship of this family to the Buttercups is shown in the yellow dye products as well as the physiologic action of its drugs. Note May Apple Root (*Podophyllum peltatum*), Blue Cohosh (*Caulophyllum thalictroides*), and Barberry Bark (*Berberis vulgaris*), all well known hepatic remedies; yarn dyed yellow with the latter substance, and Rasaut (*Berberis aristata*) an Indian leather dye.

The Moonseed Family (*Menispermaceæ*).

CASE 445.—Note the consanguinity of this family with the last two in its production of hepatic remedies and yellow dyes. The British India Tree Tumeric (*Coscinium fenestratum*) a yellow dye and stomachic tonic; Pareira (*Cissampelos Pareira*) a tonic and antidote for snakebites; Pareira Brava (*Chondodendron tomentosum*) used for the same purposes in Brazil; Calumba Root (*Jaetorrhiza palmata*) the valuable tropic antidyenteric; and yellow Parilla (*Menispermum canadense*) the hepatic stimulant and tonic of North America.

The Pine Family (*Pinaceæ*).

(Cases 446 to 449, also Cases 1 to 17.)

CASES 446 to 447.—Note the tissue similarity in the various woods yielded by this family of which these cases contain over 60 from various parts of the world. Note the readiness with which the wood splits as seen in the "bundle veneers" of the Japanese Hinoki (*Thuja obtusa*), Momi (*Abies firma*) and Hiba (*Thuja dolabrata*).

CASE 448.—Japanese pine chips, braid and twine products

manufactured by shaving Hinoki (*Chamaecyparis obtusa*), Yazomatsu (*Picea ajanensis*), Hiba (*Thujopsis dolabrata*) and Sugi (*Cryptomeria japonica*).

CASE 449.—The fruits (carpology) of the pines. (See also Case 1.) Note the globular cones of the South Sea Pines (*Agathis Moorei*, *A. vitiensis* and *A. robusta*) and their similarity to those of the Palestine Cedar of Lebanon (*Cedrus Libani*) and to the Candelabra Pine of New Caledonia (*Araucaria Cookii*). Note also the peculiar cones of the Sandarac Trees of New South Wales (*Callitris verrucosa*, *C. robusta*, *C. Macleayana* and *C. Muelleri*).

The Yew Family (*Taxaceæ*).

CASE 449.—Note the similarity of the wood of the Yew (*Taxus sps.*) to that of the pine and spruce; also that the yews produce a berry instead of a cone as seen in the Kaya (*Torreya nucifera*) and Maki (*Podocarpus chinensis*) of Japan.

The Cycad Family (*Cycadaceæ*).

CASE 450.—Note that these peculiar, starch-yielding plants bear a connective similarity between the pines, the yews and the palms, as expressed in their cone-like fruits, palm-like leaves and nut-like seeds. The so-called Sago Palm (*Cycas circinnalis*), which yields sago starch, belongs here, also the Florida Coontie Starch plant (*Zamia floridana*).

The Cat-tail Family (*Typhaceæ*).

CASE 450.—Note the baskets, ropes, mats, etc., manufactured from the leaves of the common Cat-tail Flag (*Typha latifolia*) of North America.

The Grass Family (*Gramineæ*).

(See also Cases 100 to 130, inclusive.)

CASE 451.—The utilization of grass stems and fibers. Note the Shepherd's pipe of Sicily made from a reed (*Arundo donax*); reed arrows from the Solomon Islands made of the straight stems of a Plume Grass (*Arundinaria sp.*); straw hat braids from Rye (*Secale cereale*); and Vegetable Horsehair yielded by Esparto Grass (*Stipa tenacissima*).

CASE 452.—Basketry material from grasses: wool yarns dyed

light green and brown by the roots of the British Plume Grass (*Phragmites communis*). The various world-wide cereal food grains. Note also the old English confection Barley Sugar.

The Palm Family (*Palmeæ*).

(Cases 453 to 456 and 131 to 151.)

CASE 453.—Various basketry, hat and broom fibers extracted from leaves of palms.

CASE 454.—Utilization of the wood of palms, bows of the wood of the Sugar Palm (*Arenga saccharifera*) of the Solomon Islands.

CASE 455.—Palm hat and mat leaves. Note Cogollo, the principal hat palm of the west coast of South America (*Oreodoxa regia*).

CASE 456.—Palm rope fibers. Note the natural saddle pads made of the spathes of an unidentified Mexican palm, and paper stock from the Florida Saw Palmetto (*Sabal serrulata*).

CASE 457.—The oils and fruits of palms. Note the carved necklace beads (*Acrocomia sclerocarpa*) from Porto Rico. Dragon's Blood, a medicine and dye resin obtained from the Malagan Deamon Palm (*Daemonerops draco*); and household utensils fashioned from the shells of the Coconut (*Cocos nucifera*).

The Walnut Family (*Juglandaceæ*).

(See also Case 166.)

CASE 458.—Note the woods, fruits and dye yielded by this family, especially the pure white wood Sawaguruma (*Pterocarya rhoifolia*) of Japan.

The Birch Family (*Betulaceæ*).

(See also Case 165.)

CASE 458.—Observe the model of a magnified portion of the catkins of the male and female White Birch (*Betula alba*) showing the characteristic grouping of the functional structures. Note the peculiar flakes of bark of the Paper Birch (*Betula papyrifera*), and yarns dyed with the bark of the European Alder (*Alnus glutinosa*).

The Oak Family (*Fagaceæ*).

(See also Cases 92, 93, 167, 168.)

CASE 459.—Note that the Chestnut (*Castanea americana*) and

the Beech (*Fagus americana*) belong with the Oaks; and that various tanning substances and hard charcoals are yielded by members of this family.

The Nettle Family (*Urticaceæ*).

(See also Cases 66, 67, 68.)

CASE 460.—Observe the various forms of Tapa Cloth manufactured by the natives of New Caledonia from the bark of the Paper Mulberry (*Broussonetia papyrifera*).

The Mulberry Family (*Moraceæ*).

(See also Cases 69, 87.)

CASE 461.—Note the fine fiber and cord of Bhang (*Cannabis indica*). Observe that figs (*Ficus carica*) and the Mock Orange (*Toxylon pomiferum*) belong to this family. Note the peculiarly marked Letterwood or Snakewood (*Brosimum aubletii*) from Trinidad, and the pure Caoutchouc yielded by one of the figs (*Ficus elastica*) of Malaya.

The Breadfruit Family (*Artocarpaceæ*).

CASE 463.—Observe the natural size reproduction of a branch of the Bread Fruit Tree (*Artocarpus incisa*) in full flower and fruit, also the large fruits of the Jack Fruit (*A. integrifolia*), together with sections of the two fruits showing their pulpy and seed characters, and a model of the magnified male and female flowers. Note the rubbers yielded by *Castilloa lactiflua*, the household Rubber Plant, and Contrayerba (*Dorstenia contrayerba*) a valuable antidote for all kinds of vegetable poisons.

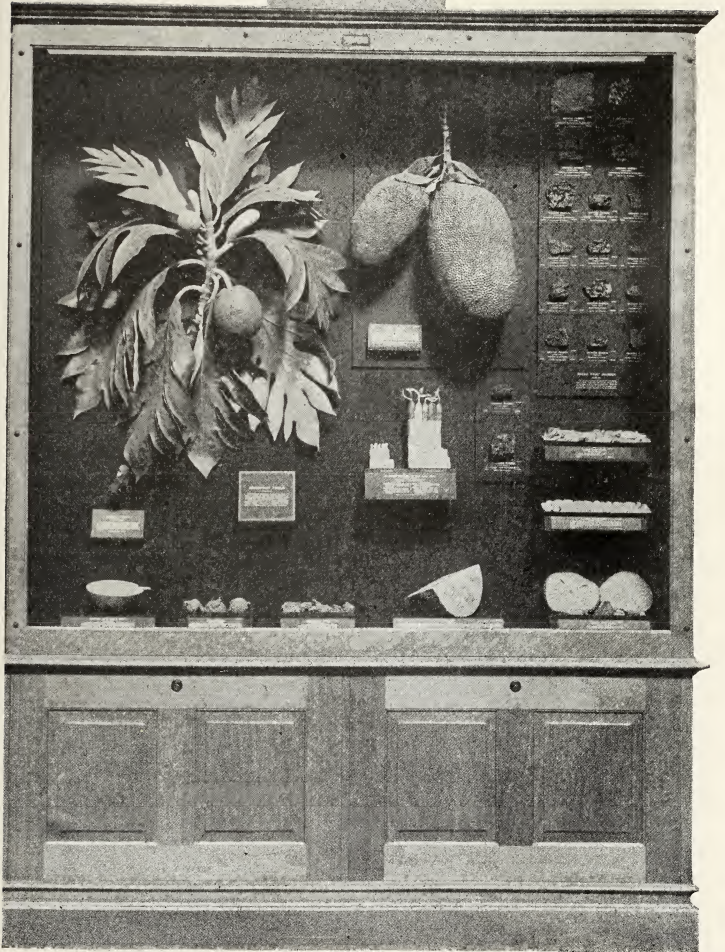
The Magnolia Family (*Magnoliaceæ*).

CASE 464.—Note the peculiar fruits of members of this family and the firm character of the woods and charcoals produced by various species. Also observe the resemblance of the flowers to those of the next family.

The Custard Apple Family (*Anonaceæ*).

CASE 464.—Observe, in the enlarged model of a Custard Apple flower, the thickness of the petals and the peculiar disposition of the essential organs. Note the Malaguita fruits of Colombia (*Xylopia longifolia*) and the models of the Sour Sop

THE BREADFRUITS
(ARTOCARPACEAE)



(*Anona muricata*) and Sweet Sop (*A. squamosa*), both of Jamaica.

The Witch Hazel Family (*Hamamelidaceæ*).

CASE 465.—Note the Divining Rod and fruiting branch of the Witch Hazel (*Hamamelis virginica*), and the wood and peculiar fruits, as well as the liquid storax yielded by the Sweet Gum (*Liquidambar styraciflua*), also the odd, corky bark of the young twigs of this tree.

The Sycamore Family (*Platanaceæ*).

CASE 465.—Note, in the structural characters of the pendant fruits of the Plane Tree or Button-ball (*Platanus occidentalis*), the strong resemblance to the fruits of the four preceding families. Note also the beauty of the markings in the "quartered" wood of the species.

The Bean Family (*Leguminosæ*).

(Cases 466 to 473, 49, 50 and 57 to 62.)

CASE 466.—Woods of the Bean Family. The woods of this family are hard, strong, durable and resistant. Note the Wallaba (*Eperua falcata*) naturally impregnated with its oil and thus very durable; the deep red Honey Locust (*Gleditsia triacanthos*) of North America; the clear, yellow Abati Timbati (*Hymenaea stilbocarpa*) of Paraguay, and the peculiar spiral spring-like stem of *Entada scandens*.

CASE 467.—Various products of the Bean Family. Note the very well armed Gorse (*Ulex europæus*); a pole basket of Hana fiber (*Crotalaria juncea*); Tamarind pulp (*Tamarindus indica*) a refrigerant drink in fever conditions; pure Indigo (*Indigofera anil*) from India; and a fine bundle of characteristic Liquorice root (*Glycyrrhiza glabra*) from Spain.

CASE 468.—Characteristic fruits of the Bean Family. Note the flat scimitar-shaped pods of the Royal Poinciana Tree (*Poinciana regia*) of Africa, *Entada scandens* from Brazil and the Bay Bean (*Canavalia sp.*) from Paraguay; the round scimitar pods of the Cassia (*Cassia grandis* and *C. fistula*); the bean-like fruits of the Tamarind, and St. John's Bread (*Ceratonia siliqua*); the broadly flat pods of the Kentucky Coffee Tree (*Gymnocladus dioica*), and the sweet smelling Tonka Bean (*Dipteryx odorata*);

the spiny fruits of the Gray and Yellow Nickers (*Guilandina crista* and *G. bonducella*); the peculiar, twisted, flat, blue pods of Timbo Morati (*Enterolobium sp.*), and many others.

CASE 469.—Seeds of the Bean Family. Note the similarity of the various seeds of this family to those of the common table bean. Examine the very poisonous Ordeal Bean of Old Calabar (*Physostigma venenata*); the Tahiti Chestnuts (*Inocarpus edulis*); the beautiful blue Damabo Bean (*Rhynchosia cyanosperma*) used as a weight for gold dust on the African Gold Coast; the Ox Eye Beans (*Dolichos sp.*) of South America, utilized, by inlaying, for watch charms by jewelers; the peculiar angular pods of the Soap Fruit of Africa (*Tetrapelura Thoningii*); the tanning fruits Algarobilla (*Prosopis sp.*) and Divi Divi (*Caesalpinia coriaria*) of the West Indies, and many other useful seeds.

CASE 470.—The Pea Nut (*Arachis hypogaea*) in its various forms and qualities; soap and candles made from the oil; various nut foods used as substitutes for meat; and a fruiting plant upset to illustrate the peculiar habit of this plant of maturing its fruit beneath the ground.

CASE 471.—Exhibits a long series of the useful gums yielded by the Bean Family. Note the valuable varnish gum Algarrobo, Corobore, Jatoba, Gum Anime or Locust Gum, the recent and fossil product of the South American Locust (*Hymenaea courbaril*); the beautiful, clear white Gum Tragacanth (*Astragalus leiocladus*) of Persia; the clear yellow Mesquite Gum (*Prosopis juliflora*) of the Southwestern States; the Persian Babul or Gum Arabic (*Acacia arabica*), and many others of beauty and value.

CASES 472 AND 473.—The tan and dye barks of the Bean Family. These are mostly the barks of various Acacia trees high in the yield of tannic acid. Note especially the Australian Wattle Barks (*Acacia decurrens*, *A. Maidenii*, *A. armata*, *A. dealbata*, *A. neriifolia*, *A. pycnantha*, *A. pruniosa*, *A. falcata*). The dye woods: Cam-wood (*Baphia nitida*) of West Africa, Sappanwood (*Caesalpinia Sappan*), Log-wood (*Haematoxylon campechianum*) and others.

The Mahogany Family (*Meliaceæ*).

CASE 474.—Note the fruit forms in this family as represented by that of the Mahogany (*Swietenia mahogani*); Spanish Cedar

(*Cedrela odorata*), the fluted Aglaia (*Aglaia sp.*), and the Star-shaped Leopard Tree fruit (*Flindersia australis*) from New South Wales. Note the various gums, and Crab Oil from the seeds of the Crabwood (*Carapa guianensis*) of South America, used as an illuminating and healing oil.

CASE 475.—Note the various tanning barks and mahoganies, especially Honduras Mahogany (*Swietenia mahogani*) and the Spanish or Cigarbox Cedar (*Cedrela odorata*); also the Carapa shingles (*Carapa guianensis*) which are very resistant to the weather on account of the oil with which they are naturally saturated.

The Rue Family (*Rutaceæ*).

CASE 476.—Note the model of the Grape Fruit (*Citrus decumana*) blossom giving the full characters of the Orange flowers, especially the oil dots that appear upon various parts of the flower. Note the jewel box made from the rind of the Bergamont fruit (*Citrus bergamena*), and the Indian Bel fruit (*Aegle marmelos*) known also as the Bengal Quince, a fruit delicious in taste and exquisite in fragrance, yielded by the most sacred of all Indian trees. Note the preserved Orange flowers (*Citrus aurantium*), a Persian sweetmeat, and the fruit and wood of the Chinese Cork Tree (*Phellodendron amurense*) now being planted to some extent in this country.

CASE 477.—Note the various barks utilized as antidiysenteric remedies, and the peculiar, warty bark of various trees known as Hercules' Clubs (*Xanthoxylum sps.*).

The Papaw Family (*Caricaceæ*).

CASE 478.—Note that the pawpaw of the United States does not belong to this family, but to the Custard Apples (Case 464). The papaw of the American tropics (*Carica papaya*) is the well known fruit that yields Vegetable Pepsin. The fruit is shown, in section, in this case. Note the beautiful glass model of a complete cluster of male flowers, and the wax and glass models of both the male and the female flowers enlarged.

The Incense Family (*Burseraceæ*).

CASE 479.—A small family of tropic trees and shrubs, most of which yield a more or less aromatic gum. Note Gum Olibanum

(*Boswellia papyrifera*), Myrrh (*Balsamodendron myrrh*) and Bdellium (*Commiphora Hotai*) incense gums of Biblical fame. Caraña (*Protium carana*), a South American gum used as a healing salve; Copal (*Bursera excelsa*) a Mexican varnish gum, and others. Observe the very sweetly odorous wood Linaloa (*Bursera Dalpechiana*) of Mexico.

The Quassia Family (*Simarubaceæ*).

CASE 479.—A family of mostly bitter plants noted for their tonic effect upon the digestive tract. Note the fruits of the Tree of Heaven (*Ailanthus glandulosus*); the yellow wood Quassia (*Picrasma excelsa*) and drinking cups made of the same in which water becomes bitter the moment it is poured in them.

The Spurge Family (*Euphorbiaceæ*).

(See also Case 56.)

CASES 480 AND 481.—Note the various forms of Castor Oil from the tropical Castor Oil Bean (*Ricinus communis*) a cluster of which may be seen in the lower left corner of the case. Observe the highly explosive fruits of the Sandbox Tree of South America (*Hura crepitans*) and the oil, soap and candles made from the Purging Nut (*Jatropha curcas*).

CASE 481.—Observe Cassava and Tapioca from the root of the tropic American Cassava (*Manihot apiù*) and the long series of Para Rubber from the American Rubber Tree (*Hevea brasiliensis*).

The Soapwort Family (*Sapindaceæ*).

CASE 482.—Note the peculiarities in the floral structure in this family as seen in the model of an enlarged flower of the Akee (*Blighia sapida*), and the peculiar form of the climbing stems of many species in this family. Note the Soap Berry (*Sapindus divaricata*) used in the tropics in lieu of soap, and Shellac deposited upon the stems of the Indian *Schleichera trijuga* (see also the bottom shelf of the next case 483).

The Horsechestnut Family (*Hippocastanaceæ*).

CASE 482.—Note the large fruits and nuts of the Buckeyes (*Aesculus glabra* and *A. hippocastanum*), and the wood of Tochi-no-ki (*A. turbinata*) of Japan.

The Buckthorn Family (*Rhamnaceæ*).

CASE 483.—Note the gums, dyes and fruits of this family: the Christ's Thorn (*Paliurus spini-Christi*) of Palestine, supposed to be the thorn that formed the crown at the crucifixion; Jujube Berries and gum (*Zizyphus jujuba*), the berries are known as Chinese Dates and are eaten fresh or dried. Buckthorn Berries (*Rhamnus catharticus*) from which the water color "sap green" is extracted; yarns dyed yellow and brown with the bark of the British Buckthorn (*R. frangula*); and Kemponashi (*Hovenia dulcis*) an interesting wood utilized by the Japanese for fancy cabinetry.

The Vine Family (*Vitaceæ*).

CASE 483.—Note the grapes and raisins produced by this family: Argols, the basis of baking powders, deposited on the inner surfaces of wine casks; grape sugar, a natural glucose from grapes; and note that the common dried "currants" or Zanté currant is not a currant, but a small seedless grape from Corinth, Greece (*Vitis carinthiaca*).

The Souaricut Family (*Caryocaraceæ*).

CASE 484.—Souari Nuts (*Caryocar nuciferum*) from British Guiana, said to be the most delicious of all nuts, and oil extracted from the kernels; Picuy, Pikia or Ouricori Oil from the kernels of *C. butyrosa*.

The Tea Family (*Theaceæ*).

(See also Cases 33, 34, 47.)

CASE 484.—Various types of teas, many of them very fine and costly. Note the gold and the silver tips (young leaves gathered before unfolding), also tea grown in South Carolina; soluble tea; and Brick Tea eaten in Thibet boiled like potherb. Note the wood of this family represented by Mokkoku (*Camellia japonica*).

The Wingedfruit Family (*Dipterocarpaceæ*).

CASE 485.—Note the resins yielded by various species in this family: Sal (*Shorea robusta*) an aphrodisiac gum of India; Doona Gum (*Doona trapezifolia*), and Hal Gum or Piney Resin from *Vateria acuminata*, both valuable varnish gums; and In Oil

from the seeds of *Dipterocarpus glandulosus*, a valuable waterproofing for buckets and other conveyors.

The Vegetable Tallow Family (*Guttiferæ*).

CASE 485.—A family peculiar in its yield of vegetable tallows, butters and greases. Note Kokam Butter from the seeds of the Indian *Garcinia indica*; Vegetable Grease from the kernels of the African *Allamblackia Stuhlmanni*; the seeds of the Tallow Tree of Sierra Leone (*Pentadesma butyracea*) the fruits of which yield an edible tallow; note other oils and gums and the Mangosteen (*Garcinia mangostena*) esteemed as the choicest of all fruits.

The Arnatto Family (*Bixaceæ*).

CASE 485.—Note the seeds, fruits and extract of the Butter Color Tree (*Bixa orellana*) of South America.

The Passionflower Family (*Passifloraceæ*).

CASE 486.—Note that the fruits of several species of passion-flowers are edible, especially the Grenadilla (*Passiflora edulis*) of Central and South America.

The Cactus Family (*Cactaceæ*).

CASE 486.—Note the various forms of cactus: the cochineel bugs and extract; the model of an edible cactus fruit (*Opuntia Toona*); and candy made of the pith of *Echinocactus Emoryi* the horribly spined form shown on the second shelf above.

The Leatherwood Family (*Thymelæaceæ*).

CASE 486.—Note the beautiful lace-like inner bark of the Lace-bark (*Lagetta lintearia*) of the West Indies, and whip and doileys made of the same; note Moose-wood (*Dirca palustris*) the bark of which was utilized by the American Indians for thongs.

The Pomegranate Family (*Punicaceæ*).

CASE 487.—A family composed of two species only, both yielding edible fruit. The Pomegranate (*Punica granatum*), of the oriental tropics, an acid fruit with a very astringent rind used for tanning. The flowers are used as an astringent medicine and as a dye.

The Mangrove Family (*Rhizophoraceæ*).

CASE 487.—The common mangrove of all low, muddy, tropic sea coasts (*Rhizophora mangle*). The bark is highly tannic and valuable as a tanning substance.

The Combretum Family (*Combretaceæ*).

CASE 487.—A small family the peculiar fruits of which form valuable mordants, dyes and tans. Note Harra fruit (*Terminalia chebula*), Bahera Fruit (*T. belerica*) and Arjuna fruit (*T. arjuna*) all Indian myrobalans; also Dengoo fruit (*T. sp.*) from Johore, and Kahata (*Careya arborea*) from Ceylon. Note also the anti-opiate plant *Combretum sundaicum* from the Straits Settlements.

The Monkeynut Family (*Lecythidaceæ*).

CASE 488.—Note the peculiar fruits of this family having their opening closed by a plug until ripe, and the heterogeneous disposition of the seeds (nuts) within the fruits. Sapucaya Nuts (*Lecythis Zabucaya*) a delicious nut of the Orinoco and Amazonian regions; Monkey Pots and Nuts (*L. ollaria*), and the Brazil Nut or Nigger Toe (*Bertholletia excelsa*) the rich, edible nut of one of the tallest of the Amazonian trees. Observe Wina fiber, the excellent, thin bast of *Lecthis pisonis* of Brazil.

The Clove Family (*Myrtaceæ*).

(See also Cases 85, 86.)

CASE 489.—Note Cloves (*Caryophyllus aromaticus*) the dried flower buds of a small Malayan tree, and Allspice (*Pimenta officinalis*) the fruit of a large tree known to grow only on the Island of Jamaica. Observe the various tanning and astringent medicinal barks yielded by members of this family; and the Guava (*Psidium guava*) the celebrated preserve fruit of the West Indies.

The Parsley Family (*Umbelliferæ*).

CASE 490.—A large family of strongly odorous plants yielding many aromatic stomachic remedies and several virulent poisonous plants. Note Celery seed (*Apium graveolens*), Parsley (*Petroselinum sativum*), Carrots (*Daucus carota*); Anise, Coriander, Dill, Fennel and Cumin seeds, all well known condiments

producing highly aromatic essential oils; Asafoetida, the concrete exudation of the roots of the Persian *Ferula assafoetida*, and Gum Ammoniacum that flows from insect punctures in the flowering stem of the Oriental *Dorema ammoniacum*, a tall parsley-like plant.

The Dogwood Family (*Cornaceæ*).

CASE 491.—A type of this family is the Flowering Dogwood (*Cornus florida*) the dense wood of which is known as American Boxwood from its utilization for printers' woodcuts. Note the Ogechee Limes or Tupelo Gum Fruits (*Nyssa aquatica*) eaten as a preserve in the Southern States.

The Wintergreen Family (*Ericaceæ*).

CASE 491.—A family of more or less aromatic plants, several of which find use in domestic medicine. Note the yarn dyed by the English Heather (*Calluna vulgaris*), and the density of the wood in this family as shown in the cross section of the Japanese Yashio t'sut'suji (*Menziesia purpurea*).

The Myrsine Family (*Myrsinaceæ*).

CASE 491.—A small family of tropic trees yielding little of economic importance except their lumber. Note the density and beauty of the wood as evident in the specimens of Lancewood (*Myrsine Grisebachii*) and Canelon (*M. floribunda*).

The Styrax Family (*Styracaceæ*).

CASE 491.—A small family of woody plants, several of which yield odorous incense gums. Note Sumatra Benzoin exuded by a small tree of Sumatra (*Styrax subdenticulata*), and Gum Benjamin, a similar resin exuded by the Malayan *S. Benzoin*.

The Sapodilla Family (*Sapotaceæ*).

CASE 492.—A small family of chiefly tropic and subtropic trees and shrubs having a milky juice, many of which yield delicious, edible fruits. Note the Star Apples (*Chrysophyllum cainito*), the Chinese Litchi (*Nephelium litchi*), and Formosan Longan (*N. longan*), the Mexican Mamme (*Lucuma mammosa*) and especially the Central American Sapoté (*Achras sapota*) the congealed milk (chiclé) of which forms the basis of most of the chewing gums.



Section of the ovary.

Section of the ovary.

ENLARGED FLOWER OF A MORNING GLORY.

(*Ipomoea batatas*).

ILLUSTRATING FAMILY CHARACTERISTICS.

Floral Envelope.

FLOWERS: - Arranged singly or in clusters that spring from the axils of the leaves.

CALYX: - Of 5 separate sepals in two series the outer overlapping (to some degree at least) the inner.

COROLLA: - Of 5 petals completely united into a bell-shaped or cylindrical, plaited corolla, the rim being mostly entire though sometimes lobed.

Essential Organs.

STAMENS: - 6, in two series one shorter than the other, the bases inserted upon the tube of the corolla, the anthers not rising above the rim.

STYLE: - Single, slender, tipped with a 2-lobed stigma.

OVARY: - (Partly invested by a lobed, fleshy disk) 2-5 celled (usually 2) with two ovules in each cell.

SEEDS: - With or without a long fringe of hairs on the angles.

Modeled (enlarged) from nature by B. E. Dahlgren, 1909.

The Ebony Family (*Ebenaceæ*).

CASE 492.—A small family of shrubs or trees bearing a more or less globular fruit. Note that the Persimmon (*Diospyros virginiana*) belongs to this family; observe the dried and preserved fruits of this well known tree of the central and southern states. Note Keg Figs, the dried fruit of the Korean *Diospyros Kaki* and the wood from Japan; also Japanese Ebony (*Diospyros lotus*).

The Morning Glory Family (*Convolvulaceæ*).

CASE 493.—A small and closely allied family of mostly twining plants typified by the common Morning Glory (*Ipomoea violacea*); observe the complete reproduction of a Sweet Potato plant (*Ipomoea Batatas*) from Jamaica, and the enlarged sectional model of the flower and its ovary. Note the tuberous roots, the characteristic stems and fruits, and the starches from other members of the family.

The Milkweed Family (*Asclepiadaceæ*).

CASE 494.—Note the peculiar twin fruits of this family as represented by those of the Common Milkweed (*Asclepias cornuta*) and the silky coma of the seeds. Note the Apples of Sodom (*Callotropis procera*), "They turn to dust and ashes," and the fruit of the Giant Milkweed (*C. gigantea*).

The Verbena Family (*Verbenaceæ*).

CASE 494.—Observe the character of the fruits as seen in the Monks Pepper (*Vitex agnus-castus*) and the dense resistant wood exemplified by Teak (*Tectonia grandis*) the valuable ship timber of India. Note also the various drugs yielded by several members of the family.

The Mint Family (*Labiatae*).

CASE 495.—A well known family of square-stemmed herbs typified by the common Peppermint (*Mentha piperita*) which yields a valuable aromatic essential oil and the crystalline substance menthol which see. Note Pennyroyal, Lavender, Sage, Thyme, Catnip, Horehound and Summer Savory, all aromatic flavoring plants employed in cookery and medicine.

The Sesame Family (*Pedaliaceæ*).

CASE 495.—Note the oriental Sesamé, Gingelli, Teel or Benny Seed (*Sesamum indicum*) and the valuable oil and food confections made from the same.

The Madder Family (*Rubiaceæ*).

(See also Cases 45, 46.)

CASE 496.—Note that Coffee (*Coffea arabica*) and Quinine (*Cinchona officinalis*) are members of this family. Note Madder (*Rubia tinctoria*) and yarns dyed by its roots, note also the yarns dyed by the roots of the common Bedstraw or Cleavers (*Galium verum*) of Europe and North America.

The Potato Family (*Solanaceæ*).

(See also Cases 70, 71, 72, 73.)

CASE 497.—Note the many poisonous plants used in medicine, viz., Belladonna (*Atropa belladonna*), Stramonium (*Datura Stramonium*), Henbane (*Hyoscyamus niger*) and Bittersweet (*Solanum Dulcamara*); and that the Potato, Egg Plant, Tomato and Tobacco belong to this family. Note the so-called Frozen Potatoes of Bolivia and Chile, and the Fruits of the Vine of Sodom of the plains of Jericho (*Solanum coagulans*).

CASES 498 AND 499.—Typical examples of various Tobaccos (*Nicotiana* spp.) from many parts of the world. Note the peculiar commercial forms from East Africa, Hayti, Ceylon, Egypt, Mexico and Guatemala; also the fine examples from Bulgaria, Russia, Japan, Virginia and Kentucky.

The Snapdragon Family (*Scrophulariaceæ*).

CASE 500.—Note the winged seeds of the family as represented by those of the valuable heart stimulant Digitalis (*Digitalis purpurea*) and their resemblance to the seeds of the next family. Note other medicinal agents yielded by this family and the wood of the Pride of China Tree (*Paulownia imperialis*) now planted to considerable extent in this country.

The Trumpet Flower Family (*Bignoniaceæ*).

CASE 500.—Observe the fruits in this family as represented by those of the Catalpa Tree or Indian Bean (*Catalpa bignoni-*

oides), the What-o-Clock (*Jacaranda caerulea*) of the Bahama Islands, and the Nymph's Comb (*Pithecoctenium Aubletii*) of Central America. Note in the latter fruit, the beautiful winged seeds (see also Case 31) and the extraordinary manner of their "packing" in the fruit. Note also Calabashes, the highly useful fruits of the Calabash Tree (*Crescentia Cujete*) of the American tropics, and the long, thin, bast fiber Tanary from the inner bark of *Tecoma leucoxylo*n used in Brazil in lieu of paper.

The Elder Family (*Caprifoliaceæ*).

CASE 502.—Observe the berry-like fruits, characterizing this family, as represented by Coralberry (*Symphoricarpos symphoricarpos*) and Laurestinus (*Viburnum tinus*). Note the medicinal barks and roots; yarns dyed green by the fresh berries of the European Elder (*Sambucus nigra*); and the dried flowers of the American Elder (*S. canadensis*) used as an infantile remedy.

The Teasel Family (*Dipsacaceæ*).

CASE 502.—Note the cylindric, prickly fruits of the Teasel (*Dipsacus sylvestris*), formerly utilized to a very large extent in "carding" wool for spinning.

The Valerian Family (*Valerianaceæ*).

CASE 502.—Note the various forms of Valerian, the root of several species of *Valeriana*, a noted remedy for hysteria and spasmodic attacks.

The Melon Family (*Cucurbitaceæ*).

CASES 502 AND 503.—A large family of twining or climbing tendril-bearing plants characterized by the Squash, Pumpkin, Melon and Cucumber plants. Note the mostly globular fruits of the family as exemplified in the Balsam Apple (*Micrampelis lobata*) of our hedge rows and waste grounds, and the characteristic oval, flat seeds shown in many species. Note the Colocynth Apples (*Citrullus colocynthis*) a valuable drug from Africa; the vegetable Sponges (*Luffa cylindrica*); and the examples of varied uses of the cellular fiber; and the thick, oily seeds of the Secua (*Fevillea trilobata*) and Canole (*F. scandens*) of northern South America.

The Daisy Family (*Compositæ*).

(See also Case 55.)

CASES 504 AND 505.—Note that though this is one of the largest of all families of flowering plants, embracing over 12,000 species, yet their utilitarian character is very slight. Observe, however, the large number of bitter medicinal plants, among which Boneset, Elecampane, Chamomile, Dandelion, Tansy, Feverfew, Wormwood and Arnica are well known household medicaments. Note yarns dyed yellow by tinctures of several plants of this family, and that Saffron for dyeing pink or rose color is yielded by the petals of *Carthamnus tinctorius*.

PEAT.

CASE 506.—Peat, the dead and partly decomposed roots of grasses, sedges and often Sphagnum or Mosses, and its various utilizations. Note the fuel, charcoal, torches, oakum, twine, cloth, paper, etc., made from this substance.

PETRIFACTIONS.

CASE 507.—Fossil woods and gums. Note the Onyxized Wood from the petrified forest of Arizona; the petrified Sugi from Japan and tray carved from the same; and the fossil oak found so frequently in excavations under Chicago.

THE STUDY COLLECTIONS.

A full series of duplicates of the specimens displayed in each case is preserved in the lockers beneath it. While these collections are secluded, they are at all times at the service of any visitor who desires to examine more intimately any object of special interest. A member of the Department staff will be detailed to open any locker desired, and give such further information as may be possible concerning the specimens, on application to the Curator at his office in the northeast corner of the North Gallery.

THE HERBARIUM.

The Herbarium of the Department is located in the balcony above the North Transept Gallery. It contains about 400,000 mounted plants, and is especially rich in plants of Illinois, Mexico, the Antilles, and the Bahamian Archipelago. These collections are open to specialists and students in Botany at any time, and also to those visitors who desire to examine them. Application should be made to the Curator as stated above.

Department of Zoology.

The collections in Zoölogy occupy the central Rotunda, Halls 19, 20, 22, 23, 24, 25, 26, 27, the West Court and its alcoves on South Side, and the South Court and its alcoves on the West Side.

The Rotunda.

This is occupied by two large African Elephants mounted in a fighting attitude. They were secured in British East Africa by the Museum's Expedition of 1905-6. The larger individual is 10 feet 10½ inches in height and its tusks weigh 93 and 95 pounds respectively. Further particulars are given on the descriptive labels.

West Court.

The greater part of this court is devoted to groups of large mammals collected by the Museum's East African Expedition, in 1896, and mounted by Mr. C. E. Akeley.

Beginning at the east end and extending along the north side is a row of large cases, the contents of which are as follows:

A group of Cheetah, or Hunting Leopard, Somaliland, East Africa.

A group of Dibatag, or Clarke's Gazelle, East Africa.

A group of Beisa Antelope, East Africa.

A group of Zebra, Transvaal, South Africa.

A group of Swayne's Hartebeest, East Africa.

A group of Striped Hyena, East Africa.

The case at the west end of the court contains a group of the Big Koodoo, East Africa.

Following from the west to the east end of the south side of this court is a second row of large cases, the contents of which are:

A group of Spotted Hyena, Somaliland, East Africa.

A group of Proboscis Monkeys, Borneo.

A group of Orang Utans, Borneo.

A group of Somaliland Wild Ass, East Africa.

A group of Lesser Koodoo, Somaliland, East Africa.

A group of Waller's Gazelle, Somaliland, East Africa.

A group of Northern Wart Hog, East Africa.

Near the center of the court, between the two rows of African groups, are installed three smaller cases showing American Rodents in their natural surroundings. The first contains Muskrats and one of their so-called "houses" of dead rushes, the next shows a family of Woodchucks or Groundhogs, and the third represents a party of Red Squirrels at play.

Immediately west of these small groups and near the middle of the west end of the court is a large case containing four of the Habitat Groups of Birds. Each group occupies one-fourth of the case and has a painted background of natural scenery. The groups are as follows: (1) The California Condor, showing two adult birds, one standing near its nest in a recess of a cliff and the other with wings at full spread just about to alight. The painted background represents a scene in the mountains of southern California. (2) The American White Pelican, showing several adult birds with their nests, eggs and characteristic surroundings on a sandy islet in a Saskatchewan lake. In the distance are seen flocks of various birds flying over the lake. (3) The Wild Turkey—four adult birds in the heavy woods of northern Louisiana. The season represented is autumn and the richly plumaged birds are quite in harmony with the gorgeous foliage represented on the background. (4) The Water Birds of Quill Lake, Saskatchewan. This group contains 37 birds of various species including the Canada Goose, the Pintail Duck, the Blue-winged Teal, the Blue-bill or Scaup Duck, the Widgeon, the Ring-billed and Franklin's Gulls, the Common Tern, Willet, and the Godwit. Many are shown on their nests or followed by broods of young and the group altogether is an intimate picture of the home life of these birds, nearly all of which are gamebirds common in the United States in fall and winter.

In the east end of this court, suspended from the roof of the building, is the skeleton of a North Atlantic Right Whale (*Balæna glacialis*), having a length of 44½ feet.

In the middle of the east end is a group of Musk Ox, and

near it is a case with Pacific Walrus and another with a group of Cougars.

At the extreme west end of the court are three cases; one contains a Sea Lion and Fur Seals; one, Llamas, Alpaca and Vicugna; and one contains a group of Harbor Seals and Elephant Seal.

Alcoves West Court.

ALCOVE 95.—Male Indian Elephant.

ALCOVE 96.—Two jaws of Sperm Whales and a skeleton of the Elephant Seal, a part of the Osteological collection which is installed in Halls 23 and 25.

In this alcove also are exhibited a few specimens which form a part of the collection of Fishes and Reptiles located in Hall 22, namely, a Leatherback and a Loggerhead Turtle; one case containing a Sword Fish and an Angler Fish; and one case with a large Florida Alligator.

ALCOVE 97.—Part of Osteological collection, the rest being installed in Halls 23 and 25.

ALCOVE 98.—Sumatran Rhinoceros; Gaur Ox; models of Grampus, Porpoise, etc.

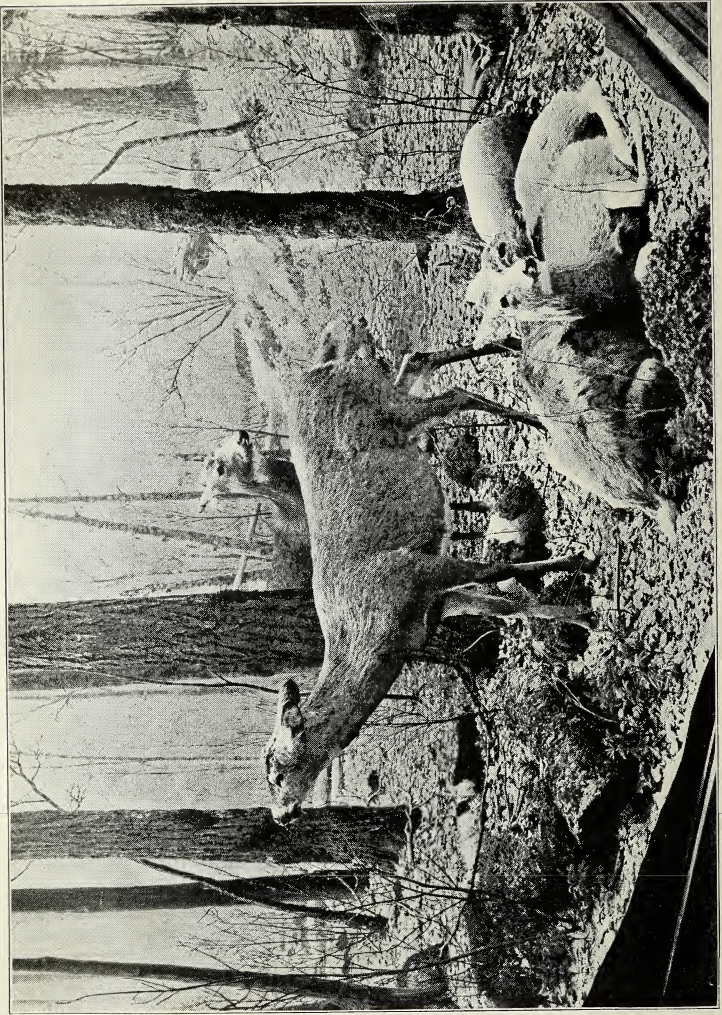
ALCOVE 99.—Insects. In the cases on the walls of this alcove are arranged a representative series of Butterflies and Moths from Europe, Asia, Africa, North America and Central and South America. Among them and worthy of attention are the metallic blue *Morphos*, the richly adorned *Caligos*, and the brightly colored *Catagrammas* from tropical America; and the beautiful Bird-wing Butterflies (*Troides*) from the Malay Archipelago, insects which are unrivalled in the brilliancy of their color.

CASES 1, 2.—Contain a collection of Illinois Insects, illustrating all the orders of this class of animals from the highest to the lowest forms.

CASE 3.—Contains enlarged models of the Silkworm, showing the life-history, anatomy and various phases of the disease that attacks this important insect.

CASES 4, 5, 6.—In these cases is installed temporarily a more complete series of North American Butterflies.

ALCOVE 100.—Birds' eggs and nests.



South Court.

In the center of this court are four groups of White-tailed or Virginia Deer, representing the animals in the four seasons. The case at the north end contains a group of Mountain Sheep, and that at the south end contains a group of Polar Bears.

Under the North Gallery and along the sides of this court are arranged table cases, numbers one to thirty-four containing Shells.

MOLLUSKS.

The collection of Shells or Mollusks contains 7,000 species or more. It is believed to represent fairly well the subject of Conchology. The collection is shown in 34 table cases, in the South Court. In the arrangement of the families Dr. Paul Fischer's classification in its reverse order has been followed.

CASES 1 AND 2.—These cases contain a small collection of Brachiopods; these are not Mollusks, though in external form they resemble the Lamellibranchs. The Brachiopods were very numerous in earlier geological times. The Mollusks proper follow the Brachiopods in Case 1, the important families represented are the *Anatinidæ*, *Pandoridæ*, *Tellinidæ* and the *Teredinidæ* (Ship Worms, Piddocks, etc.); examples of injury done submerged wood by the Ship Worms; *Pholadidæ* (Burrowing Shells); *Myidæ* (Soft-shelled Clams).

CASE 3.—*Solenidæ* (Razor Shells); *Psammobiidæ*; *Donacidæ* (Wedge Shells).

CASE 4.—*Veneridæ*, a very large family which contains many beautiful shells; *Chamidæ*.

CASE 5.—*Cardiidæ* (Cockle Shells); *Tridacnidæ* (Giant Clams); two very large examples of this family can be seen in a separate case; *Unionidæ* (River Mussels).

CASE 6.—*Unionidæ* continued, and a series of shells illustrating the various stages in the making of Pearl Buttons.

CASE 7.—*Unionidæ* continued.

CASE 8.—*Unionidæ* continued.

CASE 9.—In this case is represented a collection of Pearl-bearing Shells from Wisconsin, also a number of pearls. It contains also representatives of the *Arcidæ* (Ark Shells).

CASE 10.—*Mytilidæ* (Mussels); *Aviculidæ* (Wing Shells), this

family includes among other species the "Pearl Oyster," of which specimens are here shown.

CASE 11.—*Pectinidæ* (Scallop Shells); *Spondylidæ* (Thorny Oysters); these two families contain many shells which are interesting on account of their forms and their brilliant colors.

CASE 12.—*Ostreidæ* (Oysters); *Dentaliidæ* (Tooth-shells); *Chitonidæ* (Chitons); *Patellidæ* (Limpet Shells); *Fissurellidæ* (Keyhole Limpets).

CASE 13.—*Haliotidæ* (Ear Shells, Ablone).

CASE 14.—*Turbinidæ* (Top Shells); *Neritidæ*; *Naticidæ*; *Xenophoridæ*.

CASE 15.—*Capulidæ* (Cup and Saucer Limpets); *Ampul-lariidæ* (Apple Snails); *Littorinidæ* (Periwinkles).

CASE 16.—*Melanidæ*; *Turritellidæ*; *Vermetidæ* (Worm Shells, the shells being more or less contorted like worm tubes); *Cerithidæ*.

CASE 17.—*Strombidæ* (Conch Shells); *Cypræidæ* (Cowries), a family containing some of the most beautiful shells known.

CASE 18.—*Doliidæ* (Tun Shells); *Cassidæ* (Helmet Shells).

CASE 19.—*Tritonidæ* (Triton Shells).

CASE 20.—*Muricidæ*, a large family of mostly spiny and roughened shells.

CASE 21.—*Nassidæ* (Dog Whelks); *Buccinidæ* (Whelks); *Turbinellidæ*.

CASE 22.—*Fasciolaridæ*; *Mitridæ* (Mitre Shells); *Volutidæ*, a family containing many large and beautifully colored shells.

CASE 23.—*Marginellidæ*; *Harpidæ* (Harp Shells); *Olividæ* (Olive Shells).

CASE 24.—*Conidæ* (Cones), an extensive family living mostly in warm seas.

CASE 25.—*Terebridæ* (Auger Shells).

CASE 26.—*Bullidæ*.

CASE 27.—Materials illustrating two groups of Mollusks, many of whose members have the shell rudimentary or wanting entirely. Many of these animals are represented here by beautifully executed glass models; *Limnaeidæ*.

CASE 28.—*Limnaeidæ* continued; *Stenogyridæ*, this family and the remaining ones, which belong to the order *Pulmonata*, are air-breathing Mollusks, the largest belonging to the genus

Achatina. Most of the species live in Africa, where they remain in trees, descending to lay their eggs. Some of the eggs are exhibited.

CASE 29.—*Stenogyridæ* continued; *Pupidæ*; *Bulimulidæ*; *Helicidæ*.

CASES 30, 31, 32 AND 33.—*Helicidæ* (Air-breathers), a large family containing over 6,500 species. Many of the most attractive specimens in these cases are from the Philippine Islands. Some species of *Bulimus* reach a length of six inches. They lay large eggs, which resemble those of birds; some of these are shown.

CASE 34.—*Testacellidæ*; *Limacidæ* (Slugs), a few families of *Pteropoda* and the *Cephalopoda*, a class which includes the Nautilus, the Squids, the Octopus and Argonauts. A few of the soft *Cephalopoda* are represented by means of glass models. A model of the Giant Squid of the coast of New Foundland and the Giant Octopus of the Pacific Coast of the United States are suspended overhead in Hall 24.

Hall 19.

MAMMALS.

CASE 1.—Four representatives of the lower sub-class of Mammals, the *Prototheria*. Of these the most interesting is the Australian Duck-bill (*Ornithorhynchus*), so called on account of its duck-like beak. It is aquatic in its habits and swims with facility. Although a true mammal, the remarkable fact has been discovered that it lays eggs instead of producing living young. The Echidnas, or Spiny Ant-eaters, are inhabitants of New Guinea, Tasmania and Australia.

This case also contains members of the second sub-class of Mammals, the *Metatheria*, order *Marsupialia*. These comprise the Phalangers, the Bandicoots, the Kangaroos, the Dasyures, all inhabitants of Australia, Tasmania and New Guinea, and the Opossums, dwellers in the Americas. They present many strange and interesting forms of life. The Phalangers usually live in trees and have prehensile tails. Some species subsist on vegetation, others on insects. The "flying phalangers" resemble our flying squirrels, in having a fold of skin which acts as a parachute. The Bandicoots (*Perameles*) burrow in the earth

and subsist on roots and grain. The Kangaroos are grass-eating animals. The Dasyures are devourers of flesh. All the other animals belong to the sub-class *Eutheria*.

CASE 2.—Contains *Edentates*, including Armadillos, the strangely armored Pichiciago from the Argentine Republic, two species of Sloth, several species of Ant-eaters and two species of Scaly Ant-eaters or Pangolins, from Africa. The Armadillos have most of the skin converted into an armor of bony plates. They live on roots, insects, reptiles and carrion. They are able to burrow with astonishing rapidity. The Great Ant-eater lives on white ants, whose dwelling it tears open with its strong claws. The Pangolins have the body covered with overlapping horny plates. They subsist on ants.

This case also contains two representatives of the Sirenia. These are aquatic herbivorous animals which, in external form, resemble the whales. They have, however, no close relationship with the latter animals. The left-hand specimen is the American Manatee, or Sea-cow, a resident of Florida. The right-hand specimen is the Dugong from Australia.

CASE 3.—Hogs and Peccaries. The Peccaries here shown go in small herds of eight or ten, and are not as pugnacious as is another species found in South America.

CASE 4.—Female Wapiti; the male of this species is in the South Court.

CASE 5.—Reindeer and its close relative, the Caribou, from Maine. These are the only deer the females of which have well developed horns.

This case also contains the female Moose.

CASE 6.—The male Moose.

CASE 7.—A large male specimen of Stone's Caribou from Alaska, and several species of small and peculiar Old World Deer, including the Musk Deer, Water Deer, Muntjac, Tufted Deer and the tiny Mouse Deer.

CASE 8.—A pair of Pekin Sika Deer, an Indian Sambar Deer, a Fallow Deer and a Philippine Deer.

Hall 20.

Beginning on the north side and running west, the cases in this hall are:

CASE 9.—A pair of the common European Roe Deer and a pair of the larger Siberian Roe.

CASE 10.—North American Deer, including the Columbia Blacktail, Sonora Whitetails and an albino Virginia Deer.

CASE 11.—An African Sassaby, a Pronghorn Antelope, a Mexican Brocket and two South American Deer, the Pampas Deer and the Peruvian Guemal.

CASE 12.—A pair of South African Bontebok, one Lichtenstein's Hartebeest and one Coke's Hartebeest.

CASE 13.—White-tailed Gnus or Wildebeests and the Blesbok, a rare South African Antelope.

CASE 14.—White-bearded Gnu, Waterbuck, Duiker, White-eared Kob, and the rare and handsome Mrs. Gray's Waterbuck.

CASE 15.—Antelopes and Gazelles, including the rare Chiru, the Tibetan Gazelle, the Springbok, Impalla, Reedbuck and four species of the tiny Dikdiks.

CASE 16.—Sable Antelope, male and female, Grant's Gazelle, Yarkand Gazelle and Indian Gazelle.

CASE 17.—Large Antelopes—Nilghai, Gemsbok, Roan and Sitatunga.

CASE 18.—Goats and Goat Antelopes—Markhor, Caucasian Tur, Chamois, Serows and Angola Goat.

CASE 19.—Himalayan Tahr, Alpine and Persian Ibexes and Rocky Mountain Goats.

CASE 20.—Musk Ox and several species of Mountain Sheep, including the Argali, Bharal, Mouflon and Rocky Mountain Bighorn.

CASE 21.—A small Philippine Buffalo, the Tamarao, represented by male, female and calf.

Returning on the south side of the hall and running east, the cases are.

CASE 22.—American Bison, cow and calf.

CASE 23.—American Bison, bull and cow.

CASE 24.—Common or Mountain Zebra and Selous' Zebra; Mexican and Malayan Tapirs.

CASE 25.—Pair of Grevy's Zebra, the largest and finest of the Zebras.

CASE 26.—Rodents or Gnawing Animals. On the west side are shown on the top shelf Arboreal Squirrels; on the next shelf Ground Squirrels and Chipmunks; and on the bottom

Woodchucks and Prairie Dogs. On the east side on the upper shelves are smaller Rodents—Rats, Mice, Kangaroo Rats, etc., and on the bottom Beaver, Jumping Hares and Porcupines.

CASE 27.—Lion and Lioness; Tiger and Tigress.

CASE 28.—Various members of the Cat family and the related Civet family—includes examples of the Jaguar, Cougar, Yaguarondi, Snow Leopard, Black Leopard, Ocelot, Lynx, Genet, Meerkat, Paradoxure and Binturong.

CASE 29.—Polar, Black and Glacier Bears; Striped and Spotted Hyenas, Aard Wolf.

CASE 30.—Grizzly, Malayan and Japanese Bears.

CASE 31.—Various members of the family of Fur-bearing Animals (*Mustelidæ*) and the Raccoon family (*Procyonidæ*)—includes Skunks, Wolverines, Badger, Mink, Marten, Fisher, Kinkajou, Coati, Panda and Raccoon.

CASE 32.—Western half contains Bats from various parts of the World, including a number of the large Fruit Bats or Flying Foxes, so-called. Eastern half contains some eight species of Lemurs from Madagascar.

CASE 33.—Baboons and Macaques, including the Mandrill, the Gelada, the Chacma and the Proboscis Monkey.

CASE 34.—Various Old World Monkeys, including the striking black and white Colobus and several Langurs and Guenons.

CASE 35.—This large case in the southeast corner of the hall contains the Man-like Apes, including a fine old male Gorilla, two adult Chimpanzees and one young and several Gibbons. Orangs are exhibited in a group in the West Court. Temporarily installed in this case also are several South American Howling Monkeys.

Extending down the center of the hall are seven narrow cases, as follows:

CASE 36.—Contains Marmosets and Lemurs, including the peculiar Aye Aye, the Tarsier and Galago.

CASE 37.—On the upper shelf, Insectivorous Mammals, including Moles, Shrews, Hedgehogs, Tenrecs, Tree Shrews, etc. On the lower shelf, Otter, Mink and Weasels.

CASE 38.—Upper shelf, Foxes, Red, White and Gray. Lower shelf, Timber Wolves, Coyote and Dingo.

CASE 39.—Jackals and Coyotes.

CASE 40.—Hares and Rabbits on upper shelf; South American Rodents, Capybara, Agouti, Paca, Chinchilla, Tree Porcupine, etc., on the lower shelf.

CASE 41.—Peculiar Asiatic Goat-Antelopes or Serows.

CASE 42.—Arabian Ibex, Angola Goat and Aoudad.

Hall 22.

FISHES AND REPTILES.

In this hall are representatives of the Cold-blooded Vertebrates or vertebrate-like animals, which are included in the following classes: *Tunicata* (the Ascidians); *Leptocardii* (the Lancelets); *Marsipobranchii* (the Lampreys); *Pisces* (the Sharks, Rays and the True Fishes); *Batrachia* (Salamanders, Frogs, Toads, etc.); *Reptilia* (Snakes, Lizards, Turtles and Crocodiles). Owing to the nature of the material and its preparation for exhibition, it is not possible to arrange it in systematic order, beginning with the lower forms and ending with the higher. This arrangement is, however, made where possible.

CASES 1 AND 2.—These cases contain glass models of some Ascidians (*Tunicata*) and mounted Fishes arranged in systematic order. In these cases are represented many of the orders of fishes.

CASES 3 AND 4.—These cases contain mounted Fresh-water Fishes. In the upper portion of these cases are 8 groups showing the Fishes in their natural environment, as follows: Sunfishes, Perch, Small and Large-mouthed Black Basses, Walleyed Pike, Pickerel and Garpike. The lower portions of these cases contain Fresh-water Fishes preserved in formalin and arranged in systematic order.

CASE 5.—This case contains in its upper portion six groups of mounted Tropical American Fishes. These are mounted with accessories to show natural habitat. Among these are many of the brilliantly colored Coral Fishes. In the lower portion of this case is a large Tiger Shark with her young. This Shark was taken at Key West, Florida. The young, 44 in number, ready to be born, were taken from the body of the large one. The Tiger Shark is the largest and most ferocious shark in West Indian waters.

CASE 6.—This case also contains groups of Tropical American Fishes.

CASE 7.—This case contains one hundred mounted specimens of the peculiar and brightly colored Fishes of Hawaii, arranged in systematic order.

CASE 8.—This case contains a few large Sturgeons, Garpikes and an Electric Eel.

CASE 9.—This case contains large Skates and Sharks.

CASE 10.—This case contains a few Batrachians, Snakes and Lizards. The first are mostly preserved in alcohol, the others are mounted.

CASE 11.—This case contains mounted Turtles.

CASE 12.—This case contains mounted Crocodiles, Alligators, Cayman and Gavials.

The Batrachians and Reptiles in these last three cases are arranged in systematic order.

On the walls of this room are a number of plaster casts of North Atlantic Fishes and a few of European Trout.

In Alcove 96 in the West Court, one case contains a large Sword Fish and an Angler Fish, the other case a large Florida Alligator. There is also in this alcove one mounted Leatherback and one Loggerhead Turtle.

Hall 23.

OSTEOLOGY.

The Osteological collection is installed in Hall 23, part in Hall 25, and the remainder in Alcoves 96 and 97. It consists of mounted skeletons of over 280 species belonging to 37 orders and 134 families, and it affords excellent means for the study of the vertebrates. The arrangement corresponds to that of the Mammals in Halls 19 and 20, viz., beginning with the lower forms and ending with the higher Mammals, including man. The continuity of the systematic arrangement, however, is occasionally broken, as some of the skeletons are too large to be put in their proper places.

CASE 1.—Occupies the west side of Alcove 97, and contains the skeletons of Cold-blooded Vertebrates, i. e., Fishes, Frogs and Snakes.

CASES 2 AND 3 IN HALL 23.—Contain skeletons of the remainder of the Cold-blooded Vertebrates, i. e., Lizards, Turtles and Alligators.

CASES 4, 5 AND 6.—The Birds.

CASE 7.—The lower subclass of Mammals—the *Prototheria*, order *Monotremata*, to which belong the Duckbills (*Ornithorhynchus*) and the Spiny Ant-eaters (*Echidna*). This case also contains the subclass *Metatheria*, order *Marsupialia*, i. e., Opossums, Kangaroos, Wombats, etc.

CASE 8.—The *Sirenia* (Manatee and Dugong) and the *Cetacea* (Whales).

CASES 9, 10, 11, 12 AND 13.—The *Ungulata* (the Ungulates or Hoofed Mammals).

CASE 14.—In the southern half are the *Glires* or *Rodentia* (Rodents or Gnawers); and in the northern half, the *Pinnipedia* (Seals and Walrus).

CASES 15, 16 AND 17.—The *Feræ* or *Carnivora* (Carnivores or Flesh-eaters).

CASE 18.—The *Insectivora* (Insect-eaters) and the *Chiroptera* (Bats).

CASE 19.—In the case at the east side of Alcove 97 are the *Primates* (Lemurs, Monkeys and Man).

In the middle of Hall 23 are the skeletons of the Giraffe, Elephant, Hippopotamus and the Rhinoceros; and in the middle of Alcove 97, the Camel, Wapiti and Bottle-nosed Whale. In Alcove 96 a fine skeleton of the Sea Elephant is suspended from the balcony, and on the south wall are two jaws of the Sperm Whale. A skeleton of a North Atlantic Right Whale, having a length of 44½ feet, is also suspended from the roof over the east end of the West Court.

In a long wall case on the west side of Hall 25 is the collection of Crania, comprising 257 skulls, jaws and teeth of Fishes, Reptiles, Birds and Mammals. Skulls of the Orang Utan, Walrus, Elephant, Koodoo, Beisa, Wart Hog and Porpoise are mounted à la Beauchêne (bones spaced and hinged) to facilitate the study of the various bones of the face and cranium. Other skulls are prepared so as to show the character, development and succession of the teeth.

Hall 24.

SPONGES, JELLY FISH, CORALS, ETC.

In this hall are exhibited materials illustrating the branches of the animal kingdom known as the *Protozoa* (the one-celled animals), the *Coelenterata* (Sponges and Corals), and the *Echinodermata* (Crinoids, Starfishes, Sea-urchins and Sea Cucumbers).

CASE 1.—Contains on one side the Protozoa, mostly animals of microscopic size. These are illustrated by models representing them magnified about 2,300 times. Next in order are the *Porifera* or Sponges. These include some interesting forms such as Neptune's Cup, the Glass-rope Sponge, Venus' Flower Basket, etc. On the other side of the case are the Millepores, and Stylasters, and models representing the Jelly-fishes—such as the Portuguese Man of War.

CASE 2.—Contains representatives of the *Alcyonaria* (Eight-rayed Polyps). This group contains the Sea-fans, Sea-feathers, Organ-pipe Coral and Red Coral. These are continued in Case 3.

CASES 3, 4, 5 AND 6.—Contain the *Zoantharia*, which includes the Sea-whips, the Sea Anemones and the Stony Corals. At the end of Case 6 are a few models representing the *Ctenophora* or Comb-bearing Jelly-fishes.

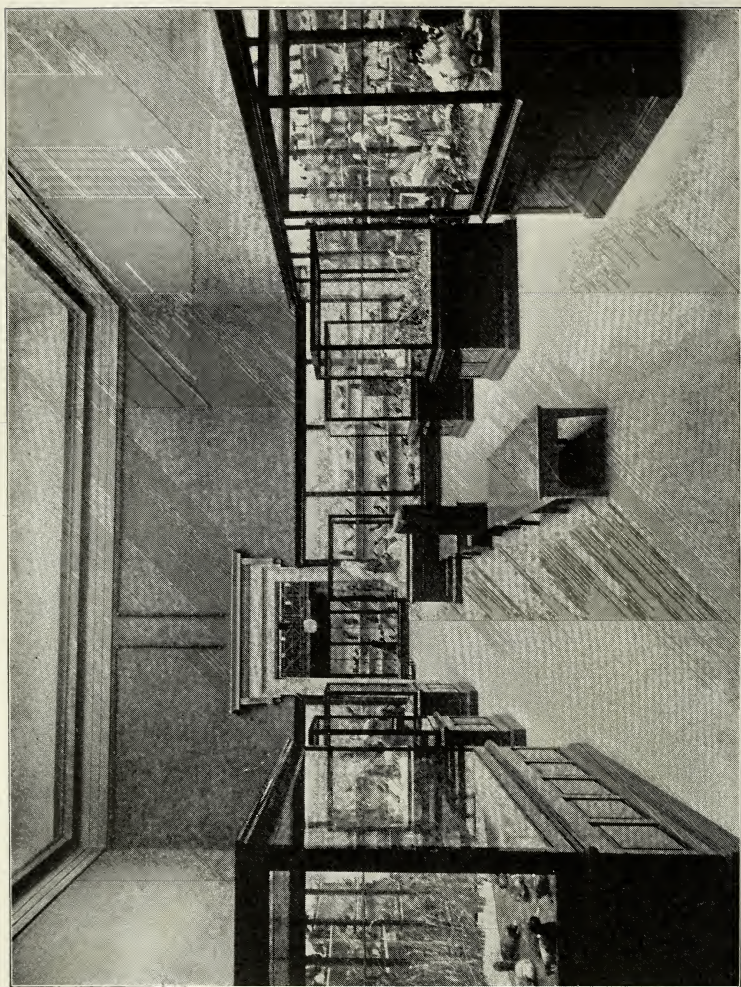
CASES 7 AND 8.—Contain part of the *Echinodermata*, which includes the *Crinoidea* (Sea Lilies, etc.); the *Ophiuroidea* (Brittle Stars and Basket Stars) and part of the *Asteroidea* (Star Fishes).

CASE 9.—Contains the *Echini* (Sea-urchins); and *Holothuria* (Sea Cucumbers).

CASES 10 AND 11.—Contain the *Vermes* (Worms); and *Crustacea* (Barnacles, Lobsters and Crabs).

BIRDS.

The collection of mounted Birds occupies Halls 25, 26 and 27; Alcove 100, in the West Court, is devoted to Birds' eggs; and near the middle of the west end of the just mentioned court are four Habitat Groups of Birds.



Hall 25.

GENERAL ORNITHOLOGY.

In this hall and in the one following are represented about 550 species illustrating the characteristics of about 100 families. They are arranged in the wall cases systematically, beginning with those which have lost the power of flight and the Diving Birds, and ending with the highly specialized Passeres or Perching Birds. In this hall are exhibited foreign Birds, the commencement of the series being on the east side of Hall 26.

Center Cases.

CASE A.—A group composed of an adult African Ostrich, a chick and an egg.

CASE B.—A group illustrating the peculiar domestic arrangements of the Rhinoceros Hornbill.

CASE C.—Examples of albinism in Birds and Mammals.

On the west side of the hall, in the long wall case, is an extensive series of skulls forming part of the Osteological collection exhibited in Hall 23.

Hall 26.

A systematic collection of North American Birds is shown on the west side of this hall; on the east side foreign Birds are exhibited, the series being concluded in Hall 25.

Center Cases.

CASE A.—“A Surprised Mother,” representing a domestic hen as mother of a lot of ducklings plunging into a basin of water.

CASE B.—A group showing the nesting site and a pair of Prairie Chickens.

CASE C.—A group of Quail in various attitudes.

CASE D.—Winter scene in the far North, illustrating the protective coloration of birds and mammals inhabiting high latitudes.

CASE E.—A group of American Eider Ducks.

CASE F.—A group of American Robin, showing the nest and eggs, and the parent birds much excited by the approach of a Black Snake.

CASE G.—A group of Ducks is shown in a section of a pond with the shore line fringed with grass. Some stand on the shore and others are swimming about near the edge of the pond, while in the background half hidden by the grass, a Florida Lynx is seen stealing upon the unsuspecting birds. The species of ducks represented are the Pintail, Lesser Scaup and Ring-necked Duck.

Hall 27.

BIRDS OF ILLINOIS.

Devoted exclusively to Illinois Birds and their eggs. The specimens are arranged by families in vertical sections, beginning at the right hand of the entrance from Hall 26, the order of classification being that adopted by the American Ornithologists' Union.

In the center of the hall is a large group illustrating the nesting habits of the American Egret, one of the "plume birds."

STUDY COLLECTIONS.

The study collection of Mammals, Fishes, Reptiles and Insects, consisting of thousands of specimens contained in tin, air-tight cases and glass jars, is located in the balcony over the south entrance, and is accessible during museum hours to those who desire to study the material or compare specimens. Every attention is paid to this important adjunct to the exhibition series for the assistance of scientific investigation. The study collection of Birds containing between thirty-five and forty thousand specimens is installed in the gallery of Hall 27. The Museum also contains study collections of Skeletons, Skulls and other Osteological material.

Department of Anthropology.

NATURE AND PURPOSE OF COLLECTIONS.—The aim of the collections in the Department of Anthropology is to represent the different cultures which have existed and which are in existence at the present time. No attempt has been made to represent the culture of modern Europe, especial attention having been paid to the culture of more primitive people. The collections are installed in two well-marked groups according to two general divisions of anthropology. The first group relates to physical man, the exhibits being anatomical in nature, while the second group relates to man's culture, the basis of the study of which is psychology.

In the first group of exhibits are found the apparatus and appliances in general use in the study of physical anthropology, an extensive collection of crania, skeletons, casts and other material illustrating the physical characteristics of types and races. A part of these exhibits is arranged in the gallery of the East Court.

The second great group in the Department of Anthropology comprises extensive collections representing past and present cultures; hence is both archaeological and ethnological in nature. The ethnological collections are those illustrating the living and the historical peoples, and as a rule are arranged according to the tribe or cultural area to which they pertain. The prehistoric collections are brought together in groups according to the locality from which they are derived, or, in certain cases, according to the people or time which they are thought to represent.

The archaeological and ethnological collections are placed on the main floor and occupy the entire east half of the building, also the North Court, the east alcoves of the South Court, the north alcoves of the West Court, and Halls 30, 31 and 34 in the northwest quarter of the building.

An attempt has been made to represent the cultures of the tribes or groups in an order corresponding as far as possible

with their original geographical relations. Owing to the crowded condition of the department, and through the rapidity of its growth, it has been found, however, impracticable to maintain for the present a satisfactory order. As a consequence, the order in which the collections are found will not be the best one in which to study them.

ORIGIN OF COLLECTIONS.—As to their origin the exhibits may be grouped in three principal categories: (1) Collections made for the World's Columbian Exposition by its Anthropological Department and turned over to the Museum at the close of the Fair; (2) Collections from various sources exhibited by the owners at the World's Fair, in the Anthropological Building and elsewhere, and acquired by the Museum by gift or purchase; (3) Collections not shown at the Fair, but acquired by gift, collection or purchase, subsequent to the foundation of the Museum.

In this first group are many important collections secured as the result of investigations undertaken for the World's Fair under the direction of Professor F. W. Putnam. The archaeological collections thus obtained are those made by W. K. Moorehead, in the Little Miami valley and Ross county, Ohio; Ernest Volk in New Jersey, Harlan I. Smith in Michigan, C. L. Metz in Ohio, E. H. Thompson in Yucatan, M. H. Saville and J. G. Owens in Central America, Lieutenant J. P. Scriver in Costa Rica, and G. A. Dorsey in Peru, Ecuador, Chili and Bolivia. The ethnological collections include those made on the North Pacific Coast by Deans, Jacobson, Eells, Swan, Morrison and Hunt, all under the personal direction of Dr. Franz Boas; by Isaac Cowie, among the Cree; by E. F. Wilson, among the Assiniboin; by J. M. McLean, among the Blackfeet; and by F. P. Hall among the Ojibwa.

Of the collections of the World's Fair exhibits which were obtained by gift or purchase the following are the most important: Of those by gift, the extensive collection from Mr. Edward E. Ayer which comprises ethnological material from the Northwest Coast, California, the Southwest, the Plains, and archaeological material from California, the Great Lakes region, the Mississippi and Ohio valleys, and Mexico, is the most important. Valuable collections were also donated by the governments of British Guiana, Mexico and Nicaragua. Collections

acquired by purchase are the Montez collection illustrating the archaeology of the interior of Peru, the Colombia collection of gold, silver, stone and pottery from ancient Chibcha graves; the Hassler collection from the Gran Chaco region of Paraguay; the Umlauff collection of ethnological material from northwestern America and from Patagonia, Africa and Oceania; the Peace collection from Melanesia; the Finsch collection from Polynesia; the Wyman collection of copper and stone implements from Wisconsin; the Boas collection of skulls and skeletons; the Remenyi collection from South Africa; the Pogosky collection from Siberia; the Lumholtz collection from Mexico; the Green cliff-dweller collection; the Harris collection from Peru; the Johnson collection of Irish jewelry, the Ward collections of skulls, skeletons, masks, etc., and the Cunningham collection of brain models.

The remaining collections found in the Department today have been secured since the opening of the Museum in 1894. These collections are so numerous that even the most important of them may not be enumerated. Most of them have been acquired by expeditions in the field. Some of these expeditions have been due to the generosity of friends of the Museum, especially to Mr. Stanley McCormick, Mrs. T. B. Blackstone, Mr. Robert F. Cummings, Mr. Martin A. Ryerson, Mr. Harlow N. Higinbotham, Mr. Edward E. Ayer, Mr. Joseph N. Field and Mr. Allison V. Armour.

Investigators who have been largely responsible for these collections, and who have spent much time in the field, are the curator of the department, the two assistant curators, Mr. H. R. Voth, Dr. C. F. Newcombe, Dr. J. W. Hudson, Mr. Alleyne Ireland, Dr. W. A. Phillips, Dr. William Jones, Dr. A. B. Lewis, Mr. F. C. Cole and Dr. M. L. Miller. The extensive collection of Etruscan, Roman and Egyptian antiquities is due largely to the interest of Mr. Edward E. Ayer. From the Bureau of Ethnology and the National Museum were obtained by gift large and interesting collections of Pueblo models, pottery and material from ancient stone quarries. Several important collections have also been secured by exchange since the opening of the Museum. Among the most important of these may be mentioned the large collection of skulls, skeletons and other material from the cliff ruins of the Southwest from the

Brooklyn Institute Museum, Eskimo material from the American Museum of Natural History of New York City, a large number of skulls from the Ontario Archaeological Museum, an archaeological collection from the British Museum, a collection of shields from the United States National Museum, and a large collection of Brazilian material from the Museum für Völkerkunde of Berlin.

PLACEMENT OF COLLECTIONS.—The Department occupies the North Court, the east alcoves of the South Court, the north alcoves of the West Court, Halls 30, 31 and 34 in the northwest quarter of the building, all of the east half of the building, including nearly all of the East Annex, and the east and south galleries of the East Court. The more precious exhibits of the Department, especially those of gold, are installed in Hall 32.

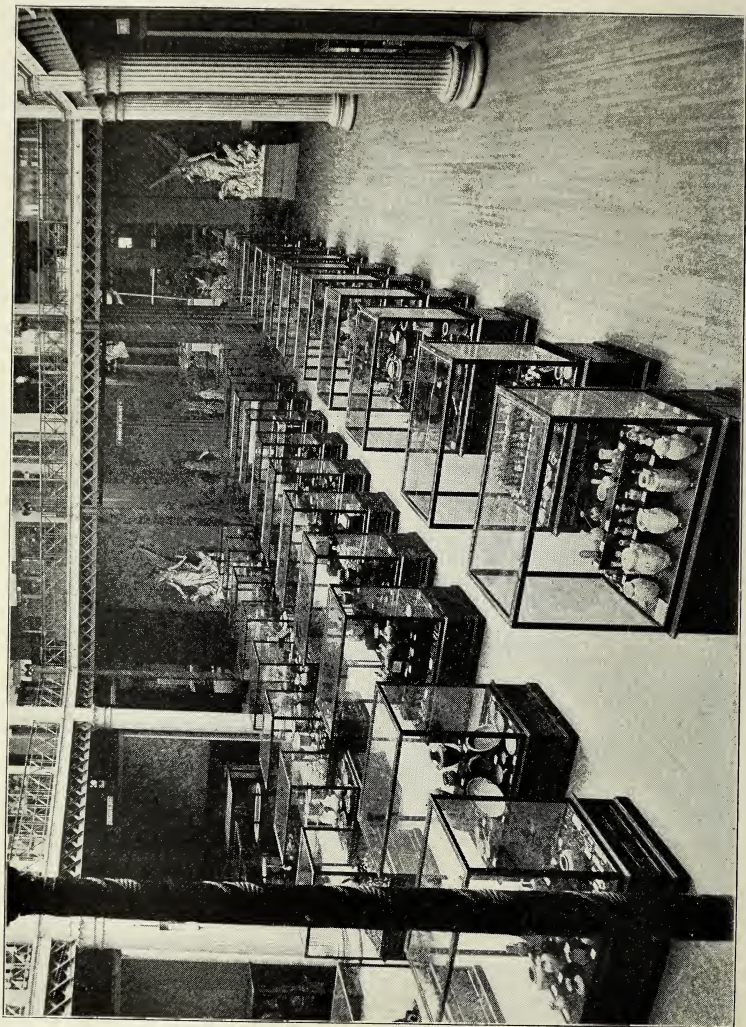
The North Court is occupied mainly by collections illustrating the archaeology of Europe.

The east alcoves of the South Court are devoted to overflow collections of North American ethnology.

The East Court and its alcoves contain groups of exhibits relating to North and South American archaeology.

Hall 9 is filled with Egyptian antiquities, and halls on the north side (1, 2, 3, 4, 5, 6 and 7), and the entire southeast section (10, 11, 12, 13, 14, 15, 16, 17 and 18) are devoted to the ethnology of America. Hall 18, or Ayer Hall is devoted especially to collections which pertain exclusively to the tribes of the Great Plains. Hall 1 is to be devoted to collections from the Mission Indians. Hall 2 is devoted to Sauk and Fox and Iroquois tribes. Hall 3 is occupied by exhibits from the tribes of the Columbia River and adjacent regions; Hall 4 is occupied by collections from the Eskimo; Hall 5 contains overflow collections from the Plains hall and is devoted exclusively to the Algonkin tribes of the Plains. Hall 6 is devoted to the non-pueblo tribes of the southwest, namely, the Navaho, Apache and tribes of Piman and Yuman stocks. Hall 8 contains archaeological collections from the Southwest.

The east alcoves of the South Court and Halls 10, 11, 12, 13, 14 and 15 contain collections from the Northwest Coast. Halls 16 and 17 are devoted to the Hopi Indians of the Southwest, and with Hall 8 represent the results of the Stanley McCormick Hopi expeditions.



General View of North Court, Showing European Archaeology.

The north alcoves of the West Court contain overflow collections from Ayer Hall and are devoted to the Caddoan tribes of the Plains. Halls 30 and 31 contain ethnological collections from Mexico, Colombia, Venezuela, British Guiana, Brazil, Paraguay and Argentina. Hall 34 is devoted exclusively to collections from California, Nevada and Oregon.

The collections from the Islands of the Pacific, Asia and Africa are being installed for exhibition in various halls in the East Annex. The storage collection of physical anthropology, instruments and apparatus used in anthropometry and osteometry will be found in Hall 49. The collections of physical anthropology on exhibition to the public are found in the south gallery of the East Court.

ARCHAEOLOGY.

North Court.

EUROPEAN ARCHAEOLOGY.

The central floor space and many of the alcoves of this court are devoted principally to European archaeology.

CASES 1, 6 AND 7.—Contain the Johnson collection of reproductions of Irish antiquities, consisting of crosses, croziers, shrines, bells, harps, drinking-horns, vases and personal ornaments. This is justly regarded as a most remarkable and interesting collection—the reproductions having been made with the utmost care.

CASES 2, 5, 8, 9, 10, 12, 13, 15, 16, 18, 19, 21, 22 AND 24.—Contain many Roman antiquities of bronze, a large part of the bronzes being reproductions from the originals now preserved in the Naples Museum. Of the reproductions, special attention may be called to the tables, braziers, chairs, etc., installed on pedestals in the court and alcoves. These collections were assembled by Mr. E. E. Ayer during the years 1894, 1895 and 1896.

CASES 3 AND 4.—Contain nearly two hundred examples of the exquisite glassware of the ancient Mediterranean nations. Much of the great number are credited to the Romans, whose influence and art extended over so many widely separated regions, but it is believed that a limited number of specimens are Phœnician. The uses were largely those of the toilet. The

forms and sizes are varied, and the color is in many cases attractive and brilliant.

CASES 11, 14, 17, 20, 25, 27, 28 AND 30.—These exhibits are mainly the contents of ancient Etruscan tombs, and consist of urns, vases, ornaments, etc., of special interest.

ALCOVE 117, NOS. 37, 38 AND 39.—Three large ancient Roman stone wine jars.

ALCOVE 118.—Reproductions of objects of bronze from Pompeii, originals preserved in the Naples Museum.

ALCOVE 119, CASES 32 AND 33.—Contain archaeological material from Swiss lake dwellings; England, Ireland, Italy and India.

ALCOVE 120, CASE 31.—Contains two ancient Roman stone grain mills.

ALCOVE 121.—Temporary installation of Chinese bronzes.

ALCOVE 122.—Contains temporary installation of Chinese bronzes and porcelains of great interest and value.

CASE 23.—Contains an Etruscan funeral bed.

CASE 26.—Contains an Etruscan decorated tomb.

CASE 29.—Contains an Etruscan decorated tomb.

ALCOVE 123, CASE 40.—Contains mural decorations from a village at Bosco Reale, near Pompeii.

CASE 41.—Contains Etruscan tiles, plaques, etc.

CASE 42.—Contains an original Roman bronze bath tub.

CASE 43.—Contains original objects of bronze of great interest.

CASE 44.—Contains an original Roman bronze bath tub.

CASE 45.—Contains ancient Italian tiling.

CASE 46.—Contains mural decorations from a villa at Bosco Reale, near Pompeii.

ALCOVE 124.—Two Etruscan tombs and mural decorations from a village at Bosco Reale, near Pompeii.

East Court.

ARCHAEOLOGY OF AMERICA.

The Central Floor Space.

The installation of the exhibits of this court and its alcoves may not be considered permanent, as collections are constantly being added which necessitate the shifting of the positions of the collections.

Beginning at the west is a case containing a group of three Indians executed in plaster and elaborated with much detail. They are represented as engaged in the work of quarrying boulders and roughing out stone implements from them, there is also a case containing a model of the Serpent Mound in Adams county, Ohio. About these cases are many interesting reproductions of Central American stone carvings.

The contents of several table cases are devoted to illustrating the ancient flint, copper, soapstone and red pipestone quarries of the United States.

Twenty-two table cases contain interesting archaeological material from Kentucky, Missouri, Illinois, Michigan, Wisconsin, Ohio, Indiana, Maine and Canada, and objects from the Cliff Dwellings of Utah.

Six table cases on the north side contain interesting and valuable collections from Yucatan, Chiapas, Oaxaca, Mexico.

At the east end of the court are models of the Pueblos of Hano, Arizona; Taos, New Mexico; Acoma, New Mexico, and Peñasco Blanco, New Mexico.

Swung at various points beneath the galleries are boats representing many primitive peoples, and along the sides and at the ends of the court are exhibited totem poles or heraldic columns from British Columbia and Alaska.

CASE 1.—Manufacture of gun flints from Brandon, England.

CASES 2 AND 3.—Manufacture of stone implements from Mill Creek, Illinois.

CASE 4.—Manufacture of stone implements from Illinois.

CASE 5.—Manufacture of stone implements from Peoria, Indian Territory.

CASE 6.—Manufacture of stone implements from eastern Wyoming.

CASE 7.—Manufacture of stone implements from District of Columbia and Arkansas.

CASE 8.—Aboriginal copper mining implements from Michigan. Manufacture of soapstone vessels from the District of Columbia. Manufacture of stone implements from Minnesota, Wyoming, Virginia, Pennsylvania, Ohio and California.

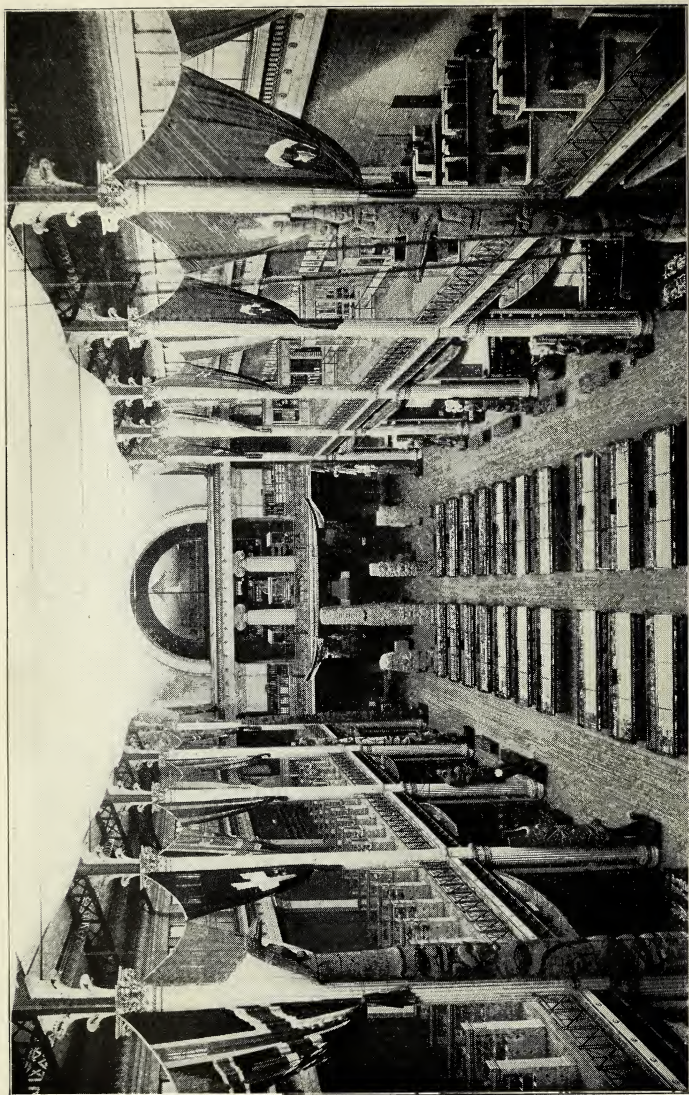
CASE 9.—Manufacture of stone implements from Flint Ridge, Ohio, and cave finds from Missouri.

CASE 10.—Archaeology of Delaware Valley.

- CASE 11.—Archaeology of Delaware Valley.
 CASE 12.—Archaeology of Delaware Valley.
 CASE 13.—Archaeology of Delaware Valley.
 CASE 14.—Shell heaps of Maine.
 CASE 15.—Archaeology of Chalcaqui, Argentine Republic.
 CASE 16.—Archaeology of Chalcaqui, Argentine Republic.
 CASE 17.—Archaeology of Chalcaqui, Argentine Republic.
 CASE 18.—Archaeology of Chalcaqui, Argentine Republic.
 CASE 19.—Cliff dweller remains from New Mexico.
 CASE 20.—Archaeology of Georgia.
 CASE 21.—Archaeology of Ohio.
 CASE 22.—Archaeology of Canada, Kentucky and Indiana.
 CASE 23.—Archaeology of Indiana.
 CASE 24.—Stone implements from Wisconsin.
 CASE 25.—Copper implements from Wisconsin.
 CASE 26.—Archaeology of Hopewell group of mounds, Ohio.
 CASE 27.—Archaeology of Mexico.
 CASE 28.—Archaeology of Valley of Mexico.
 CASE 29.—Archaeology of Valley of Mexico.
 CASE 30.—Archaeology of Valley of Mexico.
 CASE 31.—Ruins of Xkichmook, Yucatan.
 CASE 32.—Ruins of Chichen Itza, Yucatan.

Alcoves of the East Court.

- ALCOVE 81.—Reproductions of Central American antiquities.
 ALCOVE 82, CASE 1.—Prehistoric pottery of Mexico.
 CASE 2.—Stone carvings from Valley of Mexico.
 CASE 3.—Carved stone figures. Mexico and Central America.
 CASE 4.—(Temporary.) Archaeology of Mexico.
 ALCOVE 83, CASES 1, 2, 3, 4 AND 5.—Objects from the Hopewell group of mounds, Ohio.
 ALCOVE 84, CASE 1.—Archaeology of Costa Rica.
 CASES 2 AND 3.—Temporary installation of archaeological material from Mexico.
 CASE 4.—Archaeology of Nicaragua.
 ALCOVE 85, CASES 1 AND 3.—Prehistoric pottery from Arkansas.
 CASE 2.—Archaeology of Illinois.
 CASE 4.—Archaeology of Alabama, Florida and Arkansas.



General View of East Court, Showing American Archaeology and Alaskan Totem Poles;
Physical Anthropology and Botany in Gallery.

CASE 5.—Archaeology of Illinois and Missouri.

ALCOVE 86, CASE 1.—Archaeology of California.

CASES 2 AND 3.—Pottery, woven articles, etc., from Cliff Dwellers of Utah.

CASE 4.—Prehistoric pottery from Utah and New Mexico

ALCOVE 87.—Models of cliff dwellings.

CASE 1.—Archaeology of Southwestern Colorado.

ALCOVE 89, CASES 1, 2, 3 AND 4.—Prehistoric pottery, objects of stone, wood and metal from Cuzco, Peru.

ALCOVE 90, CASES 1, 2 AND 3.—Prehistoric pottery, objects of stone, wood, etc., from Santa Valley and Northern Peru.

CASE 4.—Archaeology of Iquique, Chili.

CASE 5.—Objects of copper, wood, stone and bone, Caldera, Chili.

ALCOVE 91, CASES 1, 2, 3 AND 4.—Prehistoric pottery and contents of graves from Sierra Gorda, Ancon, Chancay, Cerro Azul, Peru.

ALCOVE 92, CASES 1, 2, 3, 4 AND 5.—Mummies and contents of graves, Ancon, Peru.

ALCOVE 93, CASES 1, 2 AND 4.—Prehistoric pottery from Colombia.

CASE 3.—Archaeology of La Plata Island, Ecuador.

ALCOVE 94.—Reproductions of stone carvings of Central America.

ETHNOLOGY.

Owing to the rapid increase in the collections of ethnology and the peculiar size and arrangement of the halls and courts of this temporary building, it has not been possible to maintain a geographical arrangement of material such as would be necessary to bring out the historical and psychological relationship of the collections.

Hall 1.

This hall is to be devoted to the collections of the Mission Indians of California.

Hall 2.

This hall contains collections from the Sauk and Fox and Iroquois Indians.

CASE 1.—Miniature model of summer house. Sauk and Fox Indians, Iowa.

CASE 2.—Miniature model of winter home. Sauk and Fox Indians, Iowa.

CASE 3.—Clothing, ornaments and games. Sauk and Fox Indians, Iowa.

CASE 4.—Bows and arrows, musical instruments, baskets, painted hide bags, etc. Sauk and Fox Indians, Iowa.

CASE 5.—Woven rush bags, wooden bowls and spoons, weaving, etc. Sauk and Fox Indians, Iowa.

CASE 6.—Ceremonial paraphernalia, games and utensils, Iroquois Indians, Canada.

Hall 3.

CASE 1.—Implements of stone, baskets, games, etc., Kootenay Indians, Idaho and British Columbia.

CASE 2.—Drums, painted and carved hide packing bags, costumes, Warm Springs Indians, Oregon.

CASE 3.—Baskets, Klikitat Indians, Washington.

CASE 4.—Costumes, ornaments, horse-trappings, implements and utensils, Nez Perce Indians, Idaho.

CASE 5.—Costumes, ornaments, packing bags, musical instruments, Umatilla Indians, Oregon.

CASE 6.—Costumes, shields, implements, Comanche Indians, Oklahoma.

CASE 7.—Costumes, water jars of basketry, ornaments, games, utensils, Uintah Ute Indians, Utah.

CASE 8.—Painted hide and beaded bags, utensils, drums, flutes, Shoshoni Indians, Wyoming.

CASE 9.—Implements of stone, musical instruments, etc., Wasco Indians, Oregon.

CASE 10.—Costumes, utensils, games, etc., Bannock Indians, Idaho.

CASE 11.—Costumes, ornaments, etc., Ute Indians, Utah.

CASE 12.—Personal ornaments, amulets, dance paraphernalia, Shoshoni Indians, Wyoming.

CASE 13.—Objects of dress and ornaments, games, etc., Shoshoni Indians, Wyoming.

CASE 14.—Woven bags, Nez Perce Indians, Idaho.

CASE 15.—Costumes, hats, drum, painted packing bags, Yakima Indians, Washington.

CASE 16.—Costumes, Warm Spring Indians, Oregon.

CASE 17.—Clothing, ornaments, basketry, games, etc., Wasco Indians, Oregon.

Hall 4.

ESKIMO.

This entire hall is devoted to collections from the Eskimo of Alaska, Siberia, Hudson Bay and Greenland. Several groups with details carefully arranged, impart interest and instruction.

CASE 1.—Sleds, harness and whips.

CASE 2.—Eskimo hunter in kyak, with throwing stick and spear.

CASE 3.—Models of houses.

CASE 4.—Clothing from Yukon River, Alaska.

CASE 5.—Mats, basketry, etc., from Alaska and Siberia.

CASE 6.—Clothing, from Siberia.

CASE 7.—Bows, arrows, throwing sticks and lamps, from Alaska, Siberia and Greenland. Cutting and digging implements, from Alaska and Siberia.

CASE 8.—Clothing from Greenland.

CASE 9.—Harpoons, ice scoops, blubber hooks, from Alaska, Siberia, Hudson Bay and Greenland.

CASE 10.—Darts, paddles and hunting knives, from Alaska, Siberia and Greenland.

CASE 11.—Eye shades, seal calls, toggles, skin combs, implements, pipes, powder flasks, snuff mortars and masks.

CASE 12.—Clothing from Northern Alaska.

CASE 13.—Industrial group—man drilling ivory and woman dressing a skin.

CASE 14.—Clothing, from Hudson Bay.

CASE 15.—Group of Eskimo family, with dogs and sled.

CASE 16.—Snow knives, harpoon foreshafts, ivory boxes, man's working knives, net-making implements, ivory carvings, fish lines and bird snares.

CASE 17.—Girl fishing through hole in the ice.

Suspended above are skin boats. Around the walls are placed fishing nets.

Hall 5.

This hall contains collections from the Algonkin tribes of the Plains which properly form a part of Ayer Hall.

CASE 1.—Contains woman's implements, etc., Arapaho Indians, Wyoming and Oklahoma.

CASE 2.—Household effects, horse trappings, drums, etc., Arapaho Indians, Wyoming and Oklahoma.

CASE 3.—Costumes, ornaments, games, tools, household effects, Grosventre Indians, Montana.

CASE 4.—Horse trappings, bows, arrows and clubs, Cheyenne Indians, Montana and Oklahoma.

CASE 5.—Ornaments, etc., for men, Cheyenne Indians, Montana and Oklahoma.

CASE 6.—Ornaments, etc., for men, Cheyenne Indians, Montana and Oklahoma.

CASE 7.—Woman's costumes and ornaments, Cheyenne Indians, Montana and Oklahoma.

CASE 8.—Ceremonial paraphernalia, Arapaho Indians, Wyoming and Oklahoma.

CASE 9.—Costumes, shields, etc., Arapaho Indians, Wyoming and Oklahoma.

CASE 10.—Games, Arapaho Indians, Wyoming and Oklahoma.

CASE 11.—Household effects, Arapaho Indians, Wyoming and Oklahoma.

CASE 12.—Sun Dance altar, Arapaho Indians, Oklahoma.

CASE 13.—Sun Dance altar, Cheyenne Indians, Oklahoma.

CASE 14.—Miniature shields and games, Cheyenne Indians, Montana and Oklahoma.

CASE 15.—Models of tipis, showing heraldic designs, Cheyenne Indians, Montana and Oklahoma.

CASE 16.—Painted records on buffalo robes and household effects, Cheyenne Indians, Montana and Oklahoma.

CASE 17.—Ornamented bags for clothing, etc., musical instruments and tools, Cheyenne Indians, Montana and Oklahoma.

CASE 18.—Parts of costumes, ornaments, musical instruments, baby carriers, etc., Arapaho Indians, Wyoming and Oklahoma.

CASE 19.—Men and women's costumes, Arapaho Indians, Wyoming and Oklahoma.

CASE 20.—Painted and ornamented buffalo robes, Arapaho Indians, Wyoming and Oklahoma.

CASE 21.—Beaded and painted hide and skin bags for clothing, etc., Arapaho Indians, Wyoming and Oklahoma.

CASE 22.—Ceremonial paraphernalia and costumes, Arapaho Indians, Wyoming and Oklahoma.

Hall 6.

This hall contains collections from the non-Pueblo tribes of the Southwest. Those from the Piman and Yuman stocks are found in the east half of the hall, while those from the Navaho and Apache are found in the west half of the hall. The Navaho and Apache are tribes of Athapascan stock.

CASE 1.—Basketry, Apache Indians, Arizona.

CASE 2.—Basketry, Apache Indians, Arizona.

CASE 3.—Horse trappings, etc., Apache Indians, Arizona.

CASE 4.—Medicine man's outfit, Navaho Indians, Arizona.

CASE 5.—Musical instruments, games, etc., Pima Indians, Arizona.

CASE 6.—Pottery and tools for making same, games, bows and arrows, etc., Papago Indians, Arizona.

CASE 7.—Baby carriers, pottery, mortars, etc., Mohave Indians, Arizona.

CASE 8.—Pottery, games, musical instruments and ornaments, Yuma Indians, California.

CASE 9.—Water jugs and burden carriers of basketry, food-stuffs, games, utensils, clothing, etc., Walapai Indians, Arizona.

CASE 10.—Basketry, etc., Pima Indians, Arizona.

CASE 11.—Silver ornaments, buckskin garments, etc., Navaho Indians, Arizona.

CASE 12.—Shields, headdress, implements of war and the chase, Apache Indians, Arizona.

CASE 13.—Musical instruments, beaded bags, games, etc., Apache Indians, Arizona.

CASE 14.—Ornaments, etc., Apache Indians, Arizona.

CASE 15.—Costumes, ornaments, games, etc., Mohave Indians, Arizona.

CASE 16.—Basketry, Navaho Indians, Arizona.

CASE 17.—Blankets and belts, Navaho Indians, Arizona.

CASE 18.—Blankets and belts, Navaho Indians, Arizona.

CASE 19.—Models of winter and summer homes, Navaho Indians, New Mexico and Arizona.

CASE 20.—Storage basket, Apache Indians, Arizona.

Hall 8.

The collections of archaeological specimens of the Hopi Indian, presented by Mr. Stanley McCormick, are installed in this hall, and consist of pottery, bahos, stone slabs, implements and ornaments, from graves and ruins of Arizona and New Mexico.

CASE 1.—Pottery. Ruins of Sikyatki, Arizona.

CASE 2.—Pottery, etc. Ruins of Homolobi No. 2, Arizona.

CASE 3.—Pottery. Ruins of San Cosmos, Arizona.

CASE 4.—Pottery, etc. Ruins of San Cosmos, Arizona.

CASE 5.—Pottery, etc. Ruins of Ojo Caliente, New Mexico.

CASE 6.—Pottery, etc. Ruins of Bittahoochee, Arizona.

CASE 7.—Pottery. Walpi, Arizona.

CASE 8.—Pottery. Walpi, Arizona.

CASE 9.—Pottery. Walpi, Arizona.

CASE 10.—Pottery. Homolobi No. 1, Arizona.

CASE 11.—Pottery. Homolobi No. 1, Arizona.

CASE 12.—Pottery. Homolobi No. 1, Arizona.

CASE 13.—Pottery. Homolobi No. 1, Arizona.

CASE 14.—Pottery. Homolobi No. 1, Arizona.

CASE 15.—Pottery. Homolobi No. 1, Arizona.

CASE 16.—Pottery, etc. Sikyatki, Arizona.

CASE 17.—Pottery, etc. Sikyatki, Arizona.

CASE 18.—Pottery, etc. Mishongnovi, Arizona.

CASE 19.—Pottery, etc. Mishongnovi, Arizona.

CASE 20.—Pottery, etc. Awatobi, Arizona.

CASE 21.—Pottery, etc. Tusayan, Arizona.

CASE 22.—Painted stone slabs and bahos from ruins of Walpi, Arizona.

CASE 23.—Painted stone slabs and bahos from ruins of Walpi, Arizona.

Hall 9.

EGYPTIAN ARCHAEOLOGY.

In this hall are installed the extensive collections brought together by Mr. Edward E. Ayer and others:

CASE 1.—Contains five mummies of younger persons. One of these is remarkable in having a portrait painted on wood sub-

stituted for the usual mask, and another has the wrapping removed, so that a good idea of the state of preservation may be gained.

CASE 2.—Mortuary papyrus of a lady named Isty.

CASE 3.—Mummies of two young children with elaborate gilt masks.

CASE 4.—Contains neatly prepared mummies in their original coffins, one of which is wood, and one, a unique specimen, of interlaced bulrushes.

CASE 5.—Two mummies of women in plain wooden coffins. Ptolemaic period 325 to 44 B. C.

CASE 6.—Contains a coffin.

CASE 7.—Contains a coffin.

CASE 8.—Contains a coffin.

CASE 9.—Coffins and mummy of a lady named Tentat. Thebes, XXII Dynasty, 10th century, B. C., presented by "The Railroad Table of the Chicago Club."

CASE 10.—Mummy case, containing the body of a lady named Dje-Mutesankh. Thebes, XXI Dynasty (about 1000 B. C.). Presented by Mr. James W. Scott.

CASE 11.—Contains a coffin.

CASE 12.—Contains a coffin.

CASE 13.—Contains a coffin.

CASE 14.—Contains a coffin.

CASE 15.—Mummy case of a lady named Naja-Rames. XXXII Dynasty, B. C. 700. Presented by Mr. F. H. Winston.

CASE 16.—Contains a coffin.

CASE 17.—Mummy of a man named Pu-Nefer. XIX Dynasty, B. C. 1200.

CASE 18.—Mummy of a lady named Men, in coffin with light colored lid with yellow stripes, containing inscriptions; XXII Dynasty, B. C. 1000.

CASE 19.—Casts of Egyptian rulers, etc.

CASE 20.—Busts and fragments of stone statues.

CASE 21.—Cast of Rosetta stone.

CASE 22.—Mummy of a woman in a sitting position.

CASE 23.—Mummies of cats, dogs, jackals, hawks, alligators, etc.

CASE 24.—Tomb tablets of stone of various periods.

CASE 25.—False doorway of tomb of nobleman Unis-Onekh.

CASE 26.—Wooden mortuary offerings.

CASE 27.—Ushebti figures of wood, weights of stone and implements of iron.

CASE 28.—Bronze figures of various divinities, mirrors, etc., presented by Mr. Watson F. Blair.

CASE 29.—Glazed pottery, amulets and temple vessels of bronze.

CASE 30.—Bronze implements and utensils.

CASE 31.—Figures of stone and personal ornaments.

CASE 32.—Clay vessels and inscribed potsherds.

CASE 33.—Stone and clay mortuary offerings and cut leather corselet of priest.

CASE 34.—Mortuary offerings of gray schist and stone vases.

CASE 35.—Glazed earthen ware ushebti figures.

CASE 36.—Writing material, palettes, etc.

CASE 37.—Earthenware vessels.

CASE 38.—Pottery vessels from tombs.

CASE 39.—Earthenware vessels.

CASE 40.—Alabaster vases and objects.

CASE 41.—Alabaster vases and objects.

CASE 42.—Papyrus.

CASE 43.—Two mummy cases.

CASE 44.—Two mummy cases.

CASE 45.—Alabaster vases.

CASE 46.—Bronze implements and utensils.

CASE 47.—Mortuary boat excavated at foot of Dashur pyramid.

CASE 48.—Inner coffin of a temple doorkeeper named Padi-Mut.

CASE 49.—Mummy unwrapped to show the manner of beginning the work of applying the bandages.

CASE 50.—Mummy with wrappings complete.

CASE 51.—Granite sarcophagus.

CASE 52.—Mortuary chests, frames of couches and stools.

Occupying the upper lines on the east and west walls are a number of good examples of balcony fronts from modern Cairo, and three specimens of colored glass screens.

Upon the north wall above the cases are arranged frames containing excellent specimens of mortuary cloths and a facsimile of papyrus of Ani, and an original papyrus.

The south wall is covered with fragments of stone tombs and colored casts of twenty-seven stones in Hatshepsa temple, representing the procession of the sacred boat.

ALCOVES OF THE SOUTH COURT.

Alcove 109.

CASE 1.—Ceremonial paraphernalia, Tlingit Indians, Alaska.

CASE 2.—Clothing, household utensils, etc., of Athabascan tribes of the Yukon Valley, Alaska.

Alcove 110.

The material installed in this alcove is part of the Tlingit Indian (Alaska) collection installed in Alcove 111 and Hall 10.

CASE 1.—Travel and transportation.

CASE 2.—Ornaments, shaman's paraphernalia, etc.

CASE 3.—Shaman's paraphernalia and dance paraphernalia.

CASE 4.—Ceremonial dance paraphernalia.

CASE 5.—Ceremonial dance head gear.

Alcove 111.

The material installed in this alcove is part of the Tlingit Indian (Alaska) material installed in Alcove 110 and Hall 10.

CASE 1.—Fishing hooks, nets, traps, etc.

CASE 2.—Objects pertaining to hunting, etc.

CASE 3.—Objects of warfare.

CASE 4.—Defensive armors.

Hall 10.

The material installed in this hall is part of the Tlingit Indian (Alaska) material installed in Alcoves 110 and 111.

CASE 1.—Dishes.

CASE 2.—Spoons.

CASE 3.—Household furnishings.

CASE 4.—Basketry.

CASE 5.—Basketry.

CASE 6.—Basketry.

CASE 7.—Basketry.

CASE 8.—Pipes and games.

CASE 9.—Storage receptacles.

CASE 10.—Men and women's tools.

CASE 11.—Blankets.

Hall 11.

In this hall are installed collections from the Kwakiutl Indians of British Columbia.

CASE 1.—Household furnishings.

CASE 2.—Blanket weaving.

CASE 3.—Dress and ornaments.

CASE 4.—Basketry.

CASE 5.—Women and men's industries.

CASE 6.—Hunting and fishing, arts and manufactures.

CASE 7.—Mortuary objects, games and model of house.

Around the walls are house posts.

Hall 12.

In this hall are installed collections from the Kwakiutl Indians of British Columbia.

CASE 1.—Clans ceremonial paraphernalia.

CASE 2.—Winter ceremonial paraphernalia.

CASE 3.—Guessing game group.

CASE 4.—Feast dishes and spoons.

CASE 5.—Potlatch paraphernalia.

CASE 6.—Cannibal dance group.

CASE 7.—Winter ceremonial paraphernalia.

CASE 8.—Clans ceremonials paraphernalia.

CASE 9.—Winter ceremonial paraphernalia.

CASE 10.—Winter ceremonial paraphernalia.

CASE 11.—Figure of cannibal dancer.

CASE 12.—Ceremonial feast dishes.

CASE 13.—Ceremonial feast figures.

Around the wall are house crests, etc.

Hall 13.

The collections in this hall are devoted principally to tribes of the Salishan stock of British Columbia and Washington.

CASE 1.—Basketry, Lillooet Indians.

CASE 2.—Basketry, spoons, boxes, Coast Salish Indians, B. C.

CASE 3.—Mortuary objects, Lillooet Indians.

CASE 4.—Spirit boat and accessories, Salish Indians, Washington.

CASE 5.—Basketry, spoons, games, etc., Salish Indians, Puget Sound.

CASE 6.—Clothing, utensils, Chinook Indians, Washington.

CASE 7.—Loom, weaving tools, Coast Salish Indians, B. C.

CASE 8.—Dance paraphernalia, foods, Coast Salish Indians, B. C.

CASE 9.—Basketry, Salish Indians, Thompson River, B. C.

CASE 10.—Basketry, Salish Indians, Thompson River, B. C.

CASE 11.—Industries, Coast Salish Indians, B. C.

CASE 12.—House Group, Salish Indians, B. C.

CASE 13.—Industries, Salish Indians, B. C.

CASE 14.—Basketry and clothing, Skokomish Indians.

CASE 15.—Industries, foods, etc., Thompson River Indians, B. C.

CASE 16.—Clothing, ornaments, etc., Salish Indians, Thompson River, B. C.

Hall 14.

This hall is devoted to collections principally from the Haida and Tsimshian Indians of Queen Charlotte Islands and Skeena River, British Columbia.

CASE 1.—House models, Haida.

CASE 2.—Dance paraphernalia, Haida.

CASE 3.—Household effects, Tsimshian.

CASE 4.—Dance material, Tsimshian.

CASE 5.—Industries and transportation, Tsimshian.

CASE 6.—Hunting and fishing implements, Haida.

CASE 7.—Mortuary objects, Haida.

CASE 8.—Clan crests, Haida.

CASE 9.—Storage chests, Haida.

CASE 10.—Feast dishes and spoons, Haida.

CASE 11.—Feast dishes and spoons, Haida.

CASE 12.—Industries, Haida.

CASE 13.—Dance paraphernalia, Haida.

CASE 14.—Dance paraphernalia, Tsimshian.

CASE 15.—Musical instruments, Haida.

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CASE 16.—Shaman's paraphernalia, games, war and hunting implements, Haida.

CASE 17.—Chief's paraphernalia, Haida.

CASE 18.—Basketry and matting, Haida.

CASE 19.—Storage chests, Haida.

Hall 15.

Collections from the Bella Coola and Nootka tribes of Washington and British Columbia are installed in this hall.

CASE 1.—Masks, Makah.

CASE 2.—Masks, ceremonial objects, Makah.

CASE 3.—Ceremonial objects, Nootka.

CASE 4.—Models of house and grave posts, Bella Coola.

CASE 5.—Ceremonial objects, household utensils, Bella Coola.

CASE 6.—Dance masks and whistles, Bella Coola.

CASE 7.—Dance masks and whistles, Bella Coola.

CASE 8.—Fishing paraphernalia, Nootka.

CASE 9.—Household furnishings, Nootka.

CASE 10.—Ceremonial paraphernalia, Nootka.

CASE 11.—Basketry, matting, etc., Nootka.

CASE 12.—Hunting and fishing implements, Nootka.

CASE 13.—Dance aprons and robes, Bella Coola.

CASE 14.—Stone implements, games, tools, Bella Coola.

CASE 15.—Tools, matting, hats and clothing, Nootka.

Hall 16.

The collection in this hall is devoted to the religion and ceremonies of the Hopi Indians of Arizona, and was presented by Mr. Stanley McCormick.

Other parts of the Hopi Indian collection will be found in Halls 8 and 17.

CASES 1, 2, 3, 4, 5 AND 6.—Contain dolls or katchinas and ethnological and ceremonial objects.

CASES 7 AND 8.—Ceremonial masks and headdresses.

CASE 9.—Cho altar and sand mosaic.

CASE 10.—Altar of the Drab-Flute Society.

CASE 11.—Katchina initiation sand mosaic.

CASE 12.—Ana Katchina dancers.

CASE 13.—Hemis Katchina dancers.

CASE 14.—Powamu altar and sand mosaic.

CASE 15.—Powalawu sand mosaic.

CASE 16.—Snake altar and sand mosaic.

CASES 17 AND 18.—Ceremonial masks and headdresses.

Hall 17.

The collection in this hall is devoted to the archaeology of the Hopi Indians of Arizona, and to the domestic side of their modern life, the main portion of which was presented by Mr. Stanley McCormick.

Other parts of the Hopi Indian collections presented by Mr. McCormick will be found in Halls 8 and 16.

CASE 1.—Soyal (Winter Solstice) altar, with star and war gods.

CASE 2.—Altar of Marau, a woman's society.

CASE 3.—Ooqol altar and priestess.

CASE 4.—Women's ceremonial costumes.

CASE 5.—Costumes of men, women and children.

CASE 6.—Kadcina and snake dance costumes.

CASE 7.—Model of Pueblo of Walpi.

CASE 8.—A Hopi home, illustrating the domestic pursuits.

CASE 9.—Clothing, ornaments, loom, weaving implements, etc.

CASE 10.—Utensils, toys, etc., Oraibi.

CASE 11.—Balulukon screen.

CASE 12.—Stone implements, blankets, ornaments, etc.

CASE 13.—Kadcinas and stone implements.

CASE 14.—Figure of a boomerang thrower.

CASE 15.—Figure of a bride.

CASES 16 AND 17.—Meal trays of basketry.

Hall 18.

Edward E. Ayer Hall.

TRIBES OF THE GREAT PLAINS.

This hall is devoted to the so-called tribes of the Great Plains, principally of the Siouan stock, though there are temporarily installed there collections from tribes of the Algonkin stock.

This hall contains only a small part of the gift of Mr. E. E. Ayer. Upon the north wall are arranged the original Catlin

paintings of Indians. Suspended from the ceiling are canoes of various tribes.

CASE 1.—Costumes, ornaments, ceremonial objects, Osage Indians, Oklahoma.

CASE 2.—Matting, woven bags, bowls, ladles, pipes, etc., Osage Indians, Oklahoma.

CASE 3.—Arrows, pipes, ornaments, Kiowa Indians, Oklahoma.

CASE 4.—Buffalo robe, bags, ornaments, Kiowa Indians, Oklahoma.

CASE 5.—Bags, games, spoons, knife cases, clothing, Flathead Indians, Montana.

CASE 6.—Painted hide tipi lining, sleds, harness, utensils, etc., Cree Indians, Alberta, Northwest Territory, Canada.

CASE 7.—Decorated hide tipi lining, wooden bowls, ladles, utensils, Blackfoot Indians, Montana and Alberta, Northwest Territory, Canada.

CASE 8.—Drums, rattles, bows, arrows, ceremonial objects, games, etc., Blackfoot Indians, Montana and Alberta, Northwest Territory, Canada.

CASE 9.—Wooden bowls, ladles, mortars, utensils, Ottawa Indians, Canada and Michigan; packing bags, Kickapoo Indians, Oklahoma; wooden household utensils, etc., Micmac Indians, Nova Scotia.

CASE 10.—Ceremonial paraphernalia, etc., Ojibwa Indians, Minnesota.

CASE 11.—Woven and beaded bags, beaded ornaments, etc., Ojibwa Indians, Minnesota and Wisconsin.

CASE 12.—Men's costumes and ornaments, pipes and bags, Blackfoot Indians, Montana and Alberta, Northwest Territory, Canada.

CASE 13.—Women's costumes and ornaments, Blackfoot Indians, Montana and Alberta, Northwest Territory, Canada.

CASE 14.—Rabbit-skin robe, child's robe, objects for women's use and wear. Cree Indians, Alberta, Northwest Territory, Canada.

CASE 15.—Men's costumes, pipes, ornaments, games, etc., Cree Indians, Alberta, Northwest Territory, Canada.

CASE 16.—Musical instruments, bags, clothing, ornaments, etc., Cree Indians, Canada.

CASE 17.—Games, musical instruments, headdresses, ornaments, amulets, pipes, etc., Crow Indians, Montana.

CASE 18.—Horse trappings, tools, utensils, etc., Crow Indians, Montana.

CASE 19.—Carved, painted and beaded hide bags, pipes, etc., Crow Indians, Montana.

CASE 20.—Decorated hide tipi, Cree Indians, Alberta, Northwest Territory, Canada.

CASE 21.—Men's and boys' costumes, war bonnets, Crow Indians, Montana.

CASE 22.—Women's and girls' costumes, cradles, etc., Crow Indians, Montana.

CASE 23.—Buffalo hide shields, Crow Indians, Montana.

CASE 24.—Buffalo hide shields, Crow Indians, Montana.

CASE 25.—Buffalo hide shields, Crow Indians, Montana.

CASE 26.—Buffalo hide shields, bows and arrows, Crow Indians, Montana.

CASE 27.—Shields, bows, arrows, rattles, flutes, etc., Osage Indians, Oklahoma.

CASE 28.—Costumes, pipes, etc., Oto and Ponca Indians, Oklahoma.

CASE 29.—Leggings, ornaments, Tonkawa Indians, Oklahoma.

CASE 30.—Woven bags, drums, wooden bowls, ladles, mortars, etc., Winnebago Indians, Wisconsin and Nebraska.

CASE 31.—Drums, flutes, medicine bags, beaded pouches, horn spoons, etc., Sioux Indians, North and South Dakotas.

CASE 32.—Stone war clubs, bows, arrows, etc., Sioux Indians, North and South Dakotas.

CASE 33.—Saddles, saddle cloths, beaded bags, painted bags, Sioux Indians, North and South Dakotas.

CASE 34.—Beaded cradles, dolls, amulets, etc., Sioux Indians, North and South Dakotas.

CASE 35.—Decorated buffalo hide, ornaments, etc., Sioux Indians, North and South Dakotas.

CASE 36.—Pottery, basketry, etc., Catawba and Cherokee Indians, North and South Carolinas.

CASE 37.—Basketry, ornaments, etc., Seminole Indians, Florida.

CASE 38.—Painted, beaded and quill worked buffalo robes, Sioux Indians, North and South Dakotas.

CASE 39.—Men's costumes, etc., Sioux Indians, North and South Dakotas.

CASE 40.—Women's and girls' costumes, etc., Sioux Indians, North and South Dakotas.

CASE 41.—Pipes, pipe bags, pipe cleaners, etc., Sioux Indians, North and South Dakotas.

CASE 42.—Rattles, carved wooden bowls, horn spoons, etc., Cuthead Sioux, North Dakota. Ornaments, games, etc., Sisseton Sioux, North Dakota. Painted robe, games, etc., Yankton Sioux, Montana.

CASE 43.—Berry bags, saddles, drums, headdresses, costumes, etc., Assiniboin Indians, Montana.

ALCOVES OF THE WEST COURT.

Alcove 106.

CASE 1.—Musical instruments, games, etc., Wichita Indians, Oklahoma.

CASE 2.—Clothing, Wichita Indians, Oklahoma.

CASE 3.—Clothing, Pawnee Indians, Oklahoma.

CASE 4.—Pipes, bags, musical instruments, clothing and ornaments, Pawnee Indians, Oklahoma.

CASE 5.—Games, bows, arrows and shields, Pawnee Indians, Oklahoma.

CASE 6.—Games and musical instruments, Pawnee Indians, Oklahoma.

CASE 7.—Wooden bowls and spoons of horn and wood, etc., Pawnee Indians, Oklahoma.

Alcove 107.

CASE 1.—Miniature model of Ceremony of Animal Dance of the Medicine Men, Pawnee Indians, Oklahoma.

CASE 2.—Purification of Sacred Bundles, Pawnee Indians, Oklahoma.

CASE 3.—Clothing, ornaments, etc., Arikara Indians, North Dakota.

CASE 4.—Miniature model of Thunder Ceremony, Pawnee Indians, Oklahoma.

CASE 5.—Miniature model of Grass Lodges, Wichita Indians, Oklahoma.

CASE 6.—Basketry, saddles, implements, etc., Arikara Indians, North Dakota.

Alcove 108.

CASE 1.—Miniature model of Ceremony of Sacrifice of a Captive Maiden, Pawnee Indians, Oklahoma.

CASE 2.—Sacred bundles, Pawnee Indians, Oklahoma.

CASE 3.—Sacred bundles, Pawnee Indians, Oklahoma.

Hall 34.

This hall is devoted to extensive collections from the tribes of California and Oregon.

CASE 1.—Fishing apparatus, basketry, stone mortars, etc., Klamath and Modoc Indians, Oregon and California.

CASE 2.—Basketry in form of plaques, Klamath and Modoc Indians, Oregon and California.

CASE 3.—Costumes, ornaments, bows and arrows, stone implements, etc., Klamath and Modoc Indians, Oregon and California.

CASE 4.—Basketry and stone mortars, Klamath and Modoc Indians, Oregon and California.

CASE 5.—Basketry, Hupa, Yurok, Karok Indians, Northwestern California.

CASE 6.—Basketry and stone implements, Hupa, Yurok, Karok Indians, Northwestern California.

CASE 7.—Bows, arrows, bone and stone implements, etc., Hupa, Yurok, Karok Indians, Northwestern California.

CASE 8.—Wooden paddles and spoons of horn and wood, cradles, musical instruments, etc., Hupa, Yurok, Karok Indians, Northwestern California.

CASE 9.—Ceremonial paraphernalia, Hupa, Yurok, Karok Indians, Northwestern California.

CASE 10.—Costumes, basketry, ornaments, money bags and sacks, feather wands, etc., Hupa, Yurok, Karok Indians, Northwestern California.

CASE 11.—Basketry, Hupa, Yurok, Karok Indians, Northwestern California.

CASE 12.—Basketry and wooden dishes, Hupa, Yurok, Karok Indians, Northwestern California.

CASE 13.—Buckskin costumes, etc., Hupa, Yurok, Karok Indians, Northwestern California. Basketry, Shasta Indians, Northern California.

CASE 14.—Fishing apparatus for clams, basketry, woman's ornaments, etc., Achomawi Indians, Northeastern California.

CASE 15.—Basketry, Achomawi Indians, Northeastern California.

CASE 16.—Basketry, bows and arrows, musical instruments, etc., Wintun Indians, North Central California.

CASE 17.—Fishing apparatus and boat of rushes, Pomo Indians, North Central California.

CASE 18.—Fighting knives, bows, arrows, headdress, fishing traps, games, etc., Pomo Indians, North Central California.

CASE 19.—Musical instruments, rope and twine, walking canes, wooden and stone implements, etc., Pomo Indians, North Central California.

CASE 20.—Rabbit skin blankets, mats and wooden household implements, etc., Pomo Indians, North Central California.

CASE 21.—Stone mortars, bows, arrows, dance paraphernalia, feather head dress and ornaments, Pomo Indians, North Central California.

CASE 22.—Feathered, beaded and plain basketry and stone implements, Pomo Indians, North Central California.

CASE 23.—Basketry, etc., Pomo Indians, North Central California.

CASE 24.—Basketry, Owen's River and Lake Group, Shoshoni Indians.

CASE 25.—Basketry, Pomo Indians, North Central California.

CASE 26.—Figures of Medicine men, Pomo Indians, North Central California.

CASE 27.—Blanket of woven rabbit skin, foodstuffs, bows, arrows, twine, basketry, ornaments, games, etc., Mono Indians, East Central California.

CASE 28.—Basketry, Mono Indians, East Central California.

CASE 29.—Basketry and wooden bowls, Mono Indians, East Central California.

CASE 30.—Basketry and wooden bowls, Mono Indians, East Central California.

CASE 31.—Basketry and material for making same, Mono Indians, East Central California.

CASE 32.—Games, basketry and cradles, Yokut Indians, Central California.

CASE 33.—Dance paraphernalia, foodstuffs, fishing apparatus, mat of rushes, twine, stone implements and feather head dress, Yokut Indians, Central California.

CASE 34.—Basketry and stone mortars, Yokut Indians, Central California.

CASE 35.—Basketry, Miwok Indians, East Central California.

CASE 36.—Basketry, Miwok Indians, East Central California.

CASE 37.—Bows, arrows, stone mortars and implements, games, etc., Miwok Indians, East Central California.

CASE 38.—Basketry, Maidu Indians, Northeastern California.

CASE 39.—Twine, basketry, stone mortars, wooden paddles, foodstuffs, musical instruments, etc., Maidu Indians, Northeastern California.

CASE 40.—Basketry and stone mortars, Washo Indians, Lake Tahoe, California.

CASE 41.—Feather headdress, bows, arrows, ornaments, fishing apparatus, cradles, etc., Washo Indians, Lake Tahoe, California.

Hall 30.

In this hall are installed collections from the Sierra Madre Indians of Mexico. Modern Mexican ceramics, blankets, ponchos and other objects of wearing apparel, implements of war and of the chase, household utensils, etc., from tribes of Colombia, Costa Rica, Peru, Bolivia, Paraguay and Brazil.

CASE 1.—Basketry, looms, etc., Mexico.

CASE 2.—Modern ceramics, Mexico.

CASE 3.—Bows, arrows, musical instruments, looms and textiles, U. S. Colombia.

CASE 4.—Shields, blowguns, bows, arrows and bark clothing, Jiveros Indians, Peru.

CASE 5.—Clothing, personal ornaments, bows and arrows, Chunchos Indians, Pangoa River, Peru.

CASE 6.—Bark cloth, hammocks, painted gourd bowls, blowguns, spears and feather ornaments, Brazil.

CASE 7.—Dance costumes, musical instruments, basketry, tribes between Yapura and Negro Rivers, Northwestern Brazil.

CASE 8.—Dance costumes, musical instruments, basketry, tribes between Yapura and Negro Rivers, Northwestern Brazil.

CASE 9.—Hammocks, Paraguay.

CASE 10.—Fly fans, Paraguay.

CASE 11.—Clothing, etc., Paraguay.

CASE 12.—Basketry, Brazil.

CASE 13.—Clothing and artificially shrunk human heads, Jiveros Indians, Peru and Ecuador.

CASE 14.—Clothing and textiles, Quichua and Aymara Indians, Peru and Bolivia.

CASE 15.—Clothing and textiles, Quichua and Aymara Indians, Peru and Bolivia.

CASE 16.—Clothing and textiles, Quichua and Aymara Indians, Peru and Bolivia.

CASE 17.—Clothing and textiles, Quichua and Aymara Indians, Peru and Bolivia.

CASE 18.—Bark cloth, ornaments, bows and arrows, Salamanca Indians, Costa Rica.

CASE 19.—Woven woolen material, Tarahumare Indians, Sierra Madre, Mexico.

CASE 20.—Basketry, bows, arrows and utensils of pottery and stone, Tarahumare Indians, Sierra Madre, Mexico.

On the east and west walls are boats from Peru and Colombia. On the north wall are representations of Mexican feather shields.

Hall 31.

On one side of this hall are valuable collections from Venezuela and British Guiana. On the other side of the hall are collections from the Gran Chaco tribes. The most northern of the groups inhabit Brazil and Bolivia, while the more southern extend into the Argentine Republic.

The principal tribes represented in the collections are the Toba, Lengua, Chamacoco, Guarani, Cuximoso, Pana, Paita and Omiri. The collections are especially interesting as representing tribes which have had but little contact with civilization.

CASE 1.—Feather ornaments, Gran Chaco Region, Paraguay.

CASE 2.—Feather ornaments, Gran Chaco Region, Paraguay.

CASE 3.—Feather ornaments, Gran Chaco Region, Paraguay.

CASE 4.—Pottery, musical instruments, etc., Gran Chaco Region, Paraguay.

CASE 5.—Bows, arrows and clubs, Gran Chaco Region, Paraguay.

CASE 6.—Bows and arrows for shooting clay balls, Gran Chaco Region, Paraguay.

CASE 7.—Bags, etc., of woven material, Gran Chaco Region, Paraguay.

CASE 8.—Personal ornaments and dance paraphernalia, Gran Chaco Region, Paraguay.

CASE 9.—Blowguns, spears, bows and arrows, etc., Venezuela.

CASE 10.—Clothing, ornaments, musical instruments, basketry, etc., Venezuela.

CASE 11.—Hammocks, utensils, pottery, Venezuela.

CASE 12.—Blowguns, bows, arrows, war clubs, clothing, personal ornaments, British Guiana.

CASE 13.—Hammocks, basketry, utensils, etc., British Guiana.

CASE 14.—Pottery, British Guiana. (On the walls are suspended canoes and large drums.)

Hall 37.

Devoted to temporary installation of material from Borneo and Java.

Hall 40.

Devoted to material of Igorot tribes from Central Luzon.

Hall 41.

This hall is devoted entirely to a portion of the R. F. Cummings Philippine collections of the Tinguian tribes of Northern Luzon, P. I.

CASE 1.—Household baskets.

CASE 2.—Household baskets.

CASE 3.—Transportation baskets and matting.

CASE 4.—Men's dress and accessories.

CASE 5.—Household paraphernalia.

CASE 6.—Household paraphernalia.

CASE 7.—Household paraphernalia.

CASE 8.—Rope and bark cloth manufacture.

CASE 9.—Ceremonial and mortuary paraphernalia.

CASE 10.—Household paraphernalia, Kalinga-Tinguian-Igorot.

CASE 11.—Traps.

CASE 12.—Medicines and foods, toys, musical instruments and fishing paraphernalia.

CASE 13.—Clothing, etc., Tinguian-Apayao-Kalinga.

CASE 14.—Ceremonial paraphernalia.

CASE 15.—Weapons and tools.

CASE 16.—Farming tools.

CASE 17.—Forge group.

CASE 18.—Miniature village.

CASE 19.—Men and women's costume.

CASE 20.—Blanketry.

CASE 21.—Textile manufacture.

Above the cases are stretched nets for hunting wild pig and deer.

Hall 50.

Devoted to temporary installation of material principally from Somali Land, Egyptian Soudan and Northeast Africa.

Hall 51.

Devoted to temporary installation of material principally from East Africa.

Hall 52.

Devoted to temporary installation of collections principally from West and South Africa.

Hall 53.

This hall is devoted to temporarily installed material principally from Australia, New Caledonia, New Ireland and New Guinea.

CASE 1.—Clubs, shields, etc., Australia.

CASE 2.—Spears, shields, boomerangs, throwing sticks, etc., Australia.

CASE 3.—Spears, New Caledonia.

CASE 4.—Spears and household paraphernalia, New Caledonia.

CASE 5.—Clothing and personal ornaments, New Hebrides.

CASE 6.—Bows, arrows and clubs, New Hebrides.

CASE 7.—Household utensils, etc., New Hebrides.

CASE 8.—Spears, clothing, personal ornaments, etc., Admiralty Islands.

CASE 9.—Spears, personal ornaments, household paraphernalia, Hermit and Anchorite Islands.

CASE 10.—Dance masks, German New Guinea.

CASE 11.—Ceremonial paraphernalia, New Ireland.

CASE 12.—Ceremonial paraphernalia, New Ireland.

CASE 13.—Spears, paddles, clubs, personal ornaments, etc., New Ireland.

CASE 14.—Ceremonial paraphernalia, etc., New Caledonia.

CASE 15.—Clubs and sling shots, New Caledonia.

CASE 16.—Clothing, personal ornaments, New Caledonia.

CASE 17.—Ceremonial paraphernalia, New Ireland.

Hall 54.

Collections from New Zealand, Samoa, Fiji, Solomon and other islands are temporarily installed in this hall.

CASE 1.—Clothing, ornaments, tapa cloth, tapa beaters, etc., Samoa.

CASE 2.—Feather robes, carvings in wood, etc., New Zealand.

CASE 3.—Axes and paddles, Hervey Island.

CASE 4.—Clubs, clothing, ornaments, Caroline and Marshall Islands.

CASE 5.—Clubs, bows, costumes and ornaments, Fiji Islands.

CASE 6.—Wooden bowls, fish lines, paddles, etc., Samoa Islands.

CASE 7.—Masks, bows and arrows, clubs, personal ornaments, etc., Solomon Islands.

CASE 8.—Bows, clubs, adzes, implements of war and the chase, Matty and Durour Islands.

CASE 9.—Implements of war and the chase, Matty Island.

CASE 10.—Implements of war and the chase, Matty Island.

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CASE 11.—Household paraphernalia and models of canoes, Matty Island.

Hall 55.

Temporary installation of Philippine material, forming part of the R. F. Cummings expeditions.

Hall 56.

Devoted to material from India, Ceylon, Japan, Korea and Siberia.

Hall 57.

At the time of the issuing of the Guide this Hall was not completed, but is intended to be devoted to Philippine ethnology, forming a part of the R. F. Cummings expeditions.

THE LIBRARY.

The Library is designed for reference only. It has many valuable scientific works and is primarily for the use of the Curators and those desiring to pursue scientific studies.

The Library contains approximately 55,000 books and pamphlets and is divided into a General and four Departmental libraries. Many valuable books relating to the work of the Museum are deposited in these libraries. The most notable series is—

The Edward E. Ayer Library of Ornithology, which contains a set of the original Audubon books and over three hundred rare and valuable reference works.

Among others: The Kunz collection of works on minerals, gems and semi-precious stones, including several rare editions on these subjects.

The Skiff collection of books of reference and reports on minerals, mining and metallurgy.

The Rothrock Botanical and the Strecker Entomological collections are among the recent additions.

RULES OF THE LIBRARY.

1. The Library is open daily, except Sunday, from 9:00 A. M. to 4:30 P. M. It is entirely a library of reference.

2. Books may be obtained by making application to the Librarian.

3. Books or periodicals deposited in the Departmental Libraries will, in certain cases, upon application, be returned to the General Library for the use of an applicant.

4. Current periodicals can be consulted in the Reading Room only.

5. Curators may have accommodation transfers to their respective Departmental Libraries.

6. Any defacement of books and all losses or injuries must be promptly adjusted to the satisfaction of the Librarian.

In the Reading Room will be found the current magazines and periodicals pertaining more particularly to scientific, technical, and kindred subjects.

THE OFFICES OF THE MUSEUM.

THE DIRECTOR.—Southeast corner of South Court.

THE DEPARTMENT CURATORS:

ANTHROPOLOGY — East Gallery of East Court.

BOTANY — North Gallery of North Court.

GEOLOGY — Southwest corner of West Annex.

ZOOLOGY — Southwest corner of West Court.

THE LIBRARIAN.—Northwest corner of North Court.

THE RECORDER.—Southeast corner of South Court.

