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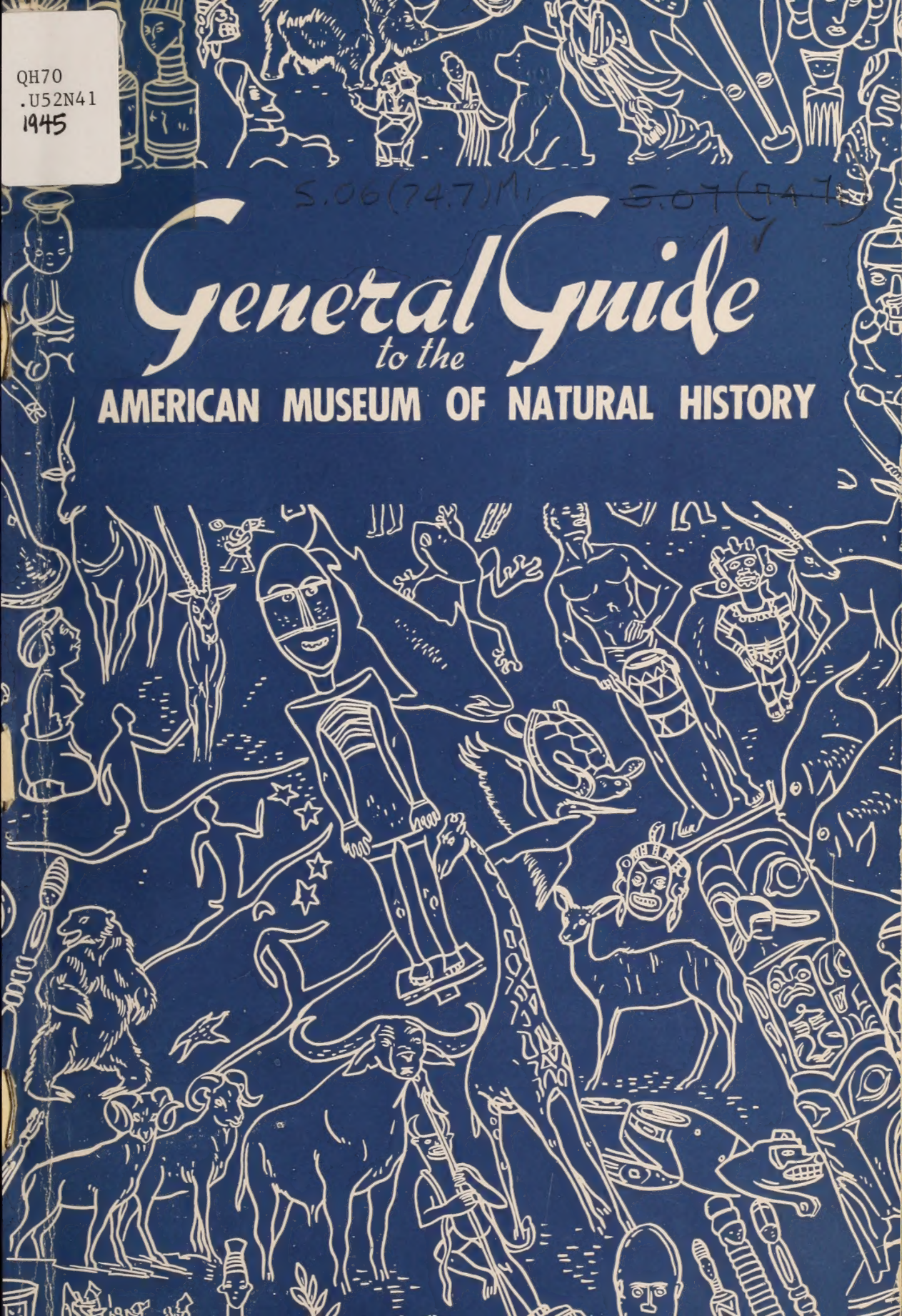
General Guide
to the
AMERICAN MUSEUM OF NATURAL HISTORY



The Museum is located on Central Park West from 77th Street to 81st Street and on 77th Street to Columbus Avenue. It may be reached as follows:

By Buses—8th Avenue or Columbus Avenue lines or 81st Street crosstown.
By Subway—6th and 8th Avenue to 81st Street (Museum) station.
7th Avenue to 79th Street station. Lexington Avenue to 77th Street station.
Take crosstown bus from East 79th Street to 81st Street and Central Park West.

The Main Entrance is on Central Park West at 79th Street. The South Entrance is on 77th Street.
Telephone: ENdicott 2-8500.

General Guide
to the Exhibition Halls of the
American Museum
of Natural History

SCIENCE GUIDE NO. 118

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THE AMERICAN MUSEUM OF NATURAL HISTORY, MANHATTAN SQUARE, NEW YORK

The buildings occupy most of the space between Central Park West, Columbus Avenue and 77th and 81st Streets. The main entrances are on Central Park West, through the Roosevelt Memorial, at three levels: street, vehicle (driveway beneath the steps), and subway. There is also an entrance on West 77th Street (center of block).

The Planetarium may be entered from West 81st Street (vehicle and foot) and through the Museum.

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ENTRANCE HALL ROOSEVELT MEMORIAL

The Theodore Roosevelt Memorial

THE Theodore Roosevelt Memorial, erected by the people of the State of New York in memory of the man whose name it bears, forms the main entrance to the Museum on Central Park West. Its graceful architecture follows a stately Romanesque design.

Passing through the central archway the visitor steps into the great Memorial Hall. Above the marble mosaic floor, rise walls of cream colored marble and limestone extending to an elaborate Corinthian cornice overarched by an octagonal coffered barrel-vault 100 feet above the floor. The central part of each wall is recessed and divided into three parts by two Roman Corinthian columns 48 feet high supporting the entablature. Three of these recesses are adorned with great mural paintings symbolic of the varied career of Theodore Roosevelt. On the walls, quotations from his writings are given in bronze letters.

MAIN ENTRANCE
ROOSEVELT MEMORIAL

The facade of the Memorial is adorned by four Ionic columns fifty-four feet high representing Boone, Audubon, Clark, and Lewis, pioneers in the early exploration of our country.

(*Right*) Sculptures of animals in low relief decorate the base of the columns

(*Above*) Theodore Roosevelt stands over a Nubian lion and lioness. Several birds which completed the collections at the American Museum are included

(*Left*) Events in old Russian history are represented here through several historic personages of the period before 1000 A. D. At the bottom are shown the ancestors of the Roosevelt family, their names being incribed above them. This and the opposite mural commemorate Roosevelt's part in the Russo-Japanese peace treaty of 1905

Murals in Roosevelt

(*Above*) In a tangle of gnarled trees, hemmed in by rocks, an African elephant is captured by a group of native hunters with shields and spears

(*Right*) Japanese spiritual beliefs are here represented in the figures of various gods and goddesses and in the first historic Japanese emperor, descendant of the Sun Goddess. At the bottom are the maternal ancestors of Theodore Roosevelt

Memorial Hall

General Information

THE American Museum of Natural History is located in Manhattan Square and occupies most of the space between Central Park West, Columbus Avenue, 77th Street, and 81st Street. The main entrances are on Central Park West, through the Roosevelt Memorial, at three levels: street, vehicle (driveway beneath the steps), and subway. There is also an entrance on West 77th Street (foot and vehicle, center of block), and one on Columbus Avenue, near 77th Street (foot). (See Frontispiece.)

The Planetarium may be entered from West 81st Street (vehicle and foot) and through the Museum. Cars may be parked at the curb on the streets surrounding the Museum square.

ADMISSION

There is no charge for admission except for the Planetarium. The Planetarium, which was constructed by Reconstruction Finance Corporation funds, is a self-liquidating project, and admission will be charged until the loan has been repaid.

The Museum is open to the public from 10:00 A.M. to 5:00 P.M. daily except Sundays, Thanksgiving Day, Christmas, New Year's Day and July 4th, when it is open from 1:00 to 5:00 P.M.

CHECK ROOMS AND GUEST SERVICES-INFORMATION DESKS

The main check room is located at the right as one enters the main entrance on the first floor of the Roosevelt Memorial (carriage entrance). Coats and packages may be left here. Wheel chairs for children and adults are available free of charge. There is also a checking room at the left of the 77th Street entrance. There is no charge for checking.

Information may be obtained at the check rooms and Guest Services-Information desks located on the main (second) floor of the Roosevelt Memorial, and in the 77th Street foyer. The latter is also the Education Bureau for the registration of instructors and students and the convenience of Members desiring guidance through the building by Museum instructors. Information concerning the exhibits or lectures may also be obtained here. Announcements of lectures and meetings of societies held at the Museum may be obtained here free of charge.

MUSEUM BOOK AND GIFT SHOP

The entrance to the Museum Book and Gift Shop is located near the 77th Street entrance to the Museum, adjacent to the elevators.

Books on natural history and its allied subjects by Museum authors and others in good standing are for sale here, as well as postcards, souvenirs, and objects of interest to Museum visitors.

BULLETIN BOARDS

The main bulletin boards are located at the right of Memorial Hall in the East Corridor, directly opposite the elevators and at the 77th St. Guest-Services Desk. Here programs of lectures and meetings are displayed and also a directory to the exhibits on the various floors. Pictorial plans of the floors of the Museum are posted near the elevators and at convenient points throughout the Museum to aid in guiding the visitors to the various halls.

NOTE

Due to constant rearrangements of exhibits in the halls, certain discrepancies may be noted at times between the arrangements in the halls and those in this volume. Various guide leaflets procurable at the Guest Services Desks and at the Bookshop will keep the visitor informed for the most part, while the most recent changes will be announced on the bulletin boards.

SKETCHING AND PHOTOGRAPHING

Artists and students are encouraged to draw from specimens on exhibit. Chairs may be had on application from the attendant. Amateur photographers may obtain permission to photograph in the halls of the Museum from the Guest-Services Desks. Professional photographers may obtain permission from the Photographic Division of the Department of Education.

GUIDING

Free Service: This is offered to public schools and similar educational institutions and to Members of the Museum and their friends upon presentation of Members' inscribed tickets. In order to secure a guide, an appointment should be made in advance. Please state the day and hour desired, the number to be guided, and any special halls to be seen.

For appointments call ENdicott 2-8500, Extension 255.

Paid Service: This is provided for individuals not members of the Museum at 25 cents per hour for each person in a group. Minimum charge, $1.00.

Groups of 8 or more individuals from private schools may secure guide service at $2.50 per hour.

CAFETERIA

(*Index Plan, page 16, Hall 12, Basement*)

Convenient to the subway entrance in the Roosevelt Memorial Building is the Museum Cafeteria, which is operated as a Museum department for the accommodation of visitors. It is under the direction of a dietitian-manager.

The Cafeteria is open on all week days from 8:00 A.M. to 4:30 P.M. It is closed Memorial Day, July 4th, Thanksgiving Day, Christmas and New Year's Day.

Breakfast and luncheon are served. There is also a sandwich counter and soda fountain.

CAFETERIA FOR SCHOOL CHILDREN

(*Index Plan, p. 16, First Floor, Hall 11, Basement*)

A cafeteria in the Education Building caters especially to school children and their teachers. Arrangements for using this cafeteria should be made in advance. Call ENdicott 2-8500, Ext. 342, or write to Supervisor of Guest Services, Dept. of Education.

LIBRARY

(*Take elevator to Fifth Floor*)

The Library is located on the fifth floor of the Museum. It is devoted to works on natural history, exploration, and travel. It contains some 131,000 volumes, which comprise not only the important periodicals of our own and foreign countries but also all representative and standard works on zoology, physical anthropology, ethnology, prehistory, archaeology, geology, and paleontology. The collection on vertebrate paleontology forms the Osborn Library of Vertebrate Paleontology, founded by President Henry Fairfield Osborn.

The Reading Room of the Library is also located on the fifth floor, and is open to the public from 10 A.M. until 4 P.M. except on Sundays and holidays. The Library is also closed on Saturdays from June to September. Those interested in consulting the books and periodicals are welcome to do so during the available hours.

PUBLICATIONS

The publications of the Museum fall naturally into two groups, technical and popular.

The technical publications, comprising the *Bulletin*, *Anthropological Papers*, *Memoirs*, and *American Museum Novitates*, contain information gathered by the various expeditions or derived from the study of material collected. The *Bulletin* contains the larger scientific papers, covering records of explorations and collections of the Museum. The *Anthropological Papers* are devoted to researches in the study of man, supervised by the Museum's Department of Anthropology. The *Memoirs*, quarto in size, contain monographs, many of which require large illustrations. The *Novitates* include the shorter scientific contributions, descriptions of species, etc., which demand immediate publication. The Scientific publications are distributed to libraries of scientific institutions and societies throughout the world, largely on an exchange basis.

The popular publications include *Natural History* Magazine, *Junior Natural History* (a children's magazine), *Guide Leaflets*, *Science Guides*, *Handbooks*, and *School Service Series*. The purpose of all these publications is to provide the public with accurate and interesting information in all fields of natural science.

Natural History is a copiously illustrated magazine containing articles of interest to the general public on exploration, primitive man, amateur science, nature photography, and the interpretation of the world of nature. It contains the stories of museum expeditions and describes interesting and noteworthy

exhibits. It is distributed as a privilege of membership in the Museum, or on subscription. For information regarding subscription to *Natural History* and *Junior Natural History*, inquire of the Membership Secretary, American Museum of Natural History, 77th Street and Central Park West, New York City.

The Museum's popular *Science Guides* deal with exhibits of particular interest and other subjects. More than 100 of these illustrated booklets have been published, and new ones are constantly being prepared. The *Handbooks*, thirteen of which have been issued, deal with themes related to the collections rather than to the particular objects exhibited. They are frequently used as textbooks.

A catalogue of the popular publications of the American Museum will be sent free on request. (Adress: Popular Publications, American Museum of Natural History, 77th Street and Central Park West, New York, 24, N. Y.)

An Annual Report is issued yearly.

EDUCATION BUILDING

Adjoining the West Corridor is the Bickmore Memorial Corridor, named in honor of Professor Albert S. Bickmore who inaugurated the work of the Museum with the schools. This leads to the Education Building, a five-story structure which contains the exhibits, offices, and classrooms of the Department of Education.

The Department of Education includes in its services practically all of the public relations work of the Museum. Intramurally it serves the public and private schools, colleges, and other educational institutions, as well as many other adult and youth groups and individuals through lectures, demonstrations, guiding, and other contacts. Beyond this, information and materials are sent to thousands of persons throughout the United States and neighboring countries through radio programs, news publicity, portable museums, slides, motion pictures, and cased collections.

On the first floor is *Education Hall* (Index Plan, page 16, First Floor, Hall II), which is used for important temporary exhibits and special gatherings.

The second floor contains a *lecture hall*, seating 400, which can be divided into two smaller halls. This floor also contains one large classroom; the office of the Supervisor of Guest Services, with whom instructors make arrangements when planning to bring classes to the Museum; the office of the Associate Curator, who is in charge of the Teaching Staff and who should be consulted when guiding is desired; and the offices of the Supervisors of Press Relations and Radio.

On the third floor are *administration offices*, the *slide division*, and a *teachers' reference library*.

On the fourth floor is the office of the *photographic division*, with the photographic studios, and the *motion picture division*, with the offices of the circulating film library.

MEMBERSHIP

Through its explorations, The American Museum of Natural History is bringing together rare and valuable natural history collections from all parts of the world. Through its exhibition halls, its lectures, its work with school children and its publications, the Museum is making these wonders of nature easily accessible. The growth of this work is in large measure dependent upon the contributions of friends. Membership receipts are applied directly to these purposes. There are approximately twenty-six thousand members, who believe that the Museum is doing a useful service to science and to education, and are contributing to this work.

The Trustees invite you to lend your support by becoming a member.

Membership blanks may be obtained at the Education Bureau or Sales Booth, or from the boxes near the elevators.

Memberships may start at any time and will continue for a full year's period.

The various Classes of Membership, with the sums they contribute, are:

Endowment Members	$100,000
Benefactors	50,000
Associate Founders	25,000
Associate Benefactors	10,000
Patrons	5,000
Life Members	1,000
Fellows	500
Supporting Members (annually)	100

Contributing members (annually)		$50
Sustaining Members	"	25
Annual Members	"	10
Associate Members	"	4

Associate Members of the American Museum of Natural History enjoy the following privileges:

Current issues of *Natural History*—a popular illustrated magazine of science, travel, exploration and discovery, published monthly (except July and August), the volumes beginning in January and June.

A copy of the President's Annual Report on request.

An Annual Pass admitting to the Members' Room. This room is open every day in the year, is given over exclusively to Members, and is equipped with every comfort for rest, reading and correspondence.

Two Complimentary Tickets admitting to the Members' Room for distribution by Members to their friends.

In addition to these privileges, Members of the higher classes, to which all friends of the Museum are eligible, enjoy the following:

An Annual Pass admitting the Member and friends accompanying him to the Reserved Seat Section of the auditorium at Lectures for Members.

Two Single Admission Course Tickets to Spring and Autumn Series of Lectures for Members, to distribute to friends.

Two Single Admission Course Tickets to Spring and Autumn Series of Lectures for the Children of Members.

Current numbers of all Guide Leaflets, on request.

THE HISTORY AND WORK OF THE MUSEUM

The American Museum of Natural History was founded and incorporated in 1869 for the purpose of establishing a Museum and Library of Natural History; of encouraging and developing the study of Natural Science; of advancing the general knowledge of kindred subjects, and of furnishing popular instruction. For eight years its home was in the Arsenal in Central Park.

The cornerstone of the present building in Manhattan Square was laid in 1874 by President Ulysses S. Grant. In 1877, the first section (South Central Wing) was completed, and on December 22, 1877, it was formally opened by President R. B. Hayes.

In 1880, the educational work with the schools was inaugurated by Professor Albert S. Bickmore.

The Museum building is one of the largest municipal structures in the city, and has cost to date approximately $16,000,000. The South Facade is 710 feet in length, and the present East Facade, on Central Park West, is 600 feet. When completed, the building is designed to occupy all of Manhattan Square.

The building is largely erected and maintained by the City, through the Department of Parks. The Roosevelt Memorial section was the gift to the City by the State of New York as its monument to Theodore Roosevelt, and the Whitney Wing was erected jointly by the late Harry Payne Whitney and the City of New York. The Hayden Planetarium was financed by funds loaned by the Reconstruction Finance Corporation of the Federal Government. The annual City appropriation, known as the Maintenance Fund, is devoted to the care and upkeep of the building and the safeguarding of the collections.

The Museum is under the control of a self-perpetuating Board of Trustees, who give their services.

The scientific and educational work is carried on by some fourteen departments, each headed by a Chairman or Curator, under the leadership of the Director.

The funds through which specimens are purchased, exhibits constructed, explorations carried on, and scientific investigation conducted, are contributed by the Trustees, Members, and other friends. The scientific and popular publications of the Museum and the enlargement of the Library are also made possible through these contributions.

For the *instruction of the public* the halls of the Museum are devoted to the large series of exhibits which are described in this guidebook. These are supplemented by lectures and publications of a popular nature. On Wednesday and Saturday afternoons except from June through September there are special motion picture showings. An important course of evening lectures is given every Spring and Fall for the Members, also Saturday morning courses of Science Stories for

children of Members. All lectures are illustrated by lantern slides and motion pictures, many of which have been secured by Museum expeditions.

Under the direction of the *Department of Education* of the Museum, extensive series of talks are given for the public school children of New York, and there are special showings of motion pictures on science, and social studies for students of high schools and colleges. Series of talks on Museum activities also are broadcast by the Radio Division.

The larger audiences meet in the main auditorium of the Museum on the first floor (Index Plan, P. 16, First Floor, Hall 7). This hall is completely equiped with stereopticons and apparatus for projecting silent and sound motion pictures. A second hall, similarly equipped, is on the fifth floor of the Roosevelt Memorial, and additional rooms on the floors below are used for smaller groups.

Scientific Societies meet at the Museum regularly and a number of their lectures are of general interest.

The New York Academy of Sciences, the oldest scientific society in New York City, founded in 1817, has its headquarters in the Roosevelt Memorial Building (Index Plan, p. 19, Fourth Floor, Hall 12a). It offers to scientists interested in pure research a forum for the discussion of their problems from a technical standpoint, and opportunities for the publication of their results.

Behind The Scenes

THE fifth floor of the Museum is devoted to the administrative offices, the offices and laboratories of the scientific departments and the library. On this floor are the work rooms of the Department of Vertebrate Palaeontology, where the skeletons of fossil animals are prepared and mounted, and the laboratory where the beautiful models of invertebrates are made. These, like the other laboratories, are of necessity not open to the public.

Scientific Laboratories and Study Collections. On the sixth floor of the African Section are the well equipped laboratories devoted to experimental biological research and to physiology and life histories based on the study of living animals.

Most of the scientific study collections are on the fifth floor. These are for the benefit of investigators and to preserve the evidences and records of our vanishing animal life and of the life and customs of primitive peoples.

The vast majority of the Museum's natural history specimens are in study collections to protect them from deterioration and for ready accessibility to scientific investigators. A careful selection is made of objects of greatest educational value and these form the basis of the Museum displays in its exhibition halls.

Work Shops. An important part of the Museum not seen by the public comprises the work shops, located in the basement and provided with machinery of the most improved pattern. Here, among other things, are constructed the various types of cases used in the Museum. There is also a fully equipped printing establishment. In other parts of the Museum, also not open to the public, are the studios where the varied work of preparing exhibits is carried on by a large staff of artists and artisans. Here are cast, modeled or mounted the figures for the groups, while leaves and flowers are fashioned so accurately that they seem to grow and bloom. The latter are for accessories in the groups. Reptiles and amphibians are mounted and anatomical models of fishes are created in wax and other materials with painstaking care.

Entering The Museum

FIFTY-EIGHT halls of the Museum covering thirteen acres of floor space are now open to public exhibition. The visitor begins his journey through this immense treasure house

of natural history from one of three directions: through the Roosevelt Memorial (see pages 6-8), through the Planetarium (see page 20), or through the South, or Seventy-seventh Street Entrance, which will now be described. A glance at the frontispiece will enable the visitor to get his bearings.

SOUTH ENTRANCE ARCHWAY

Under the arch on Seventy-seventh Street, before entering the Museum doorway, may be seen the Bench Mark established by the United States Geological Survey in 1911, on which are inscribed the latitude and longitude, 40°46′47.17″ N., 73°58′41″ W., and height above sea level, 86 feet.

On the right is a *Glacial Pot Hole* from Russell, St. Lawrence County, New York, formed by an eddy in a stream beneath the melting ice of the glacier that once covered northern New York State. Pebbles, whirling around the eddy, cut and ground this hole, which is two feet across and four feet deep.

Glacial Grooves. On the left, is a large slab of fossiliferous limestone from Kelly Island in Lake Erie, near Sandusky, whose surface has been smoothed, grooved, and scratched by the stones and sand in the bottom of the vast moving ice sheet that covered northeastern North America during the Glacial epoch.

On either side of the archway are the two largest *beryl crystals* ever quarried. They were cut in Albany, Maine. These hexagonal crystals show the typical aquamarine color in their clearer portions.

MEMORIAL HALL

(*Index Plan, p. 16, First Floor, Hall 2*)

One enters Memorial Hall, through the lobby from the South Entrance. In this hall are placed temporary exhibits of current interest. Many of these exhibits represent research in various departments of the Museum and recent results of exploration by Museum expeditions. The walls of this rotunda display the famous Covarrubias maps of the world which show the distribution of primitive art, natural resources, etc. Attractive reproductions of these maps can be purchased at the Bookshop, which is situated near this hall.

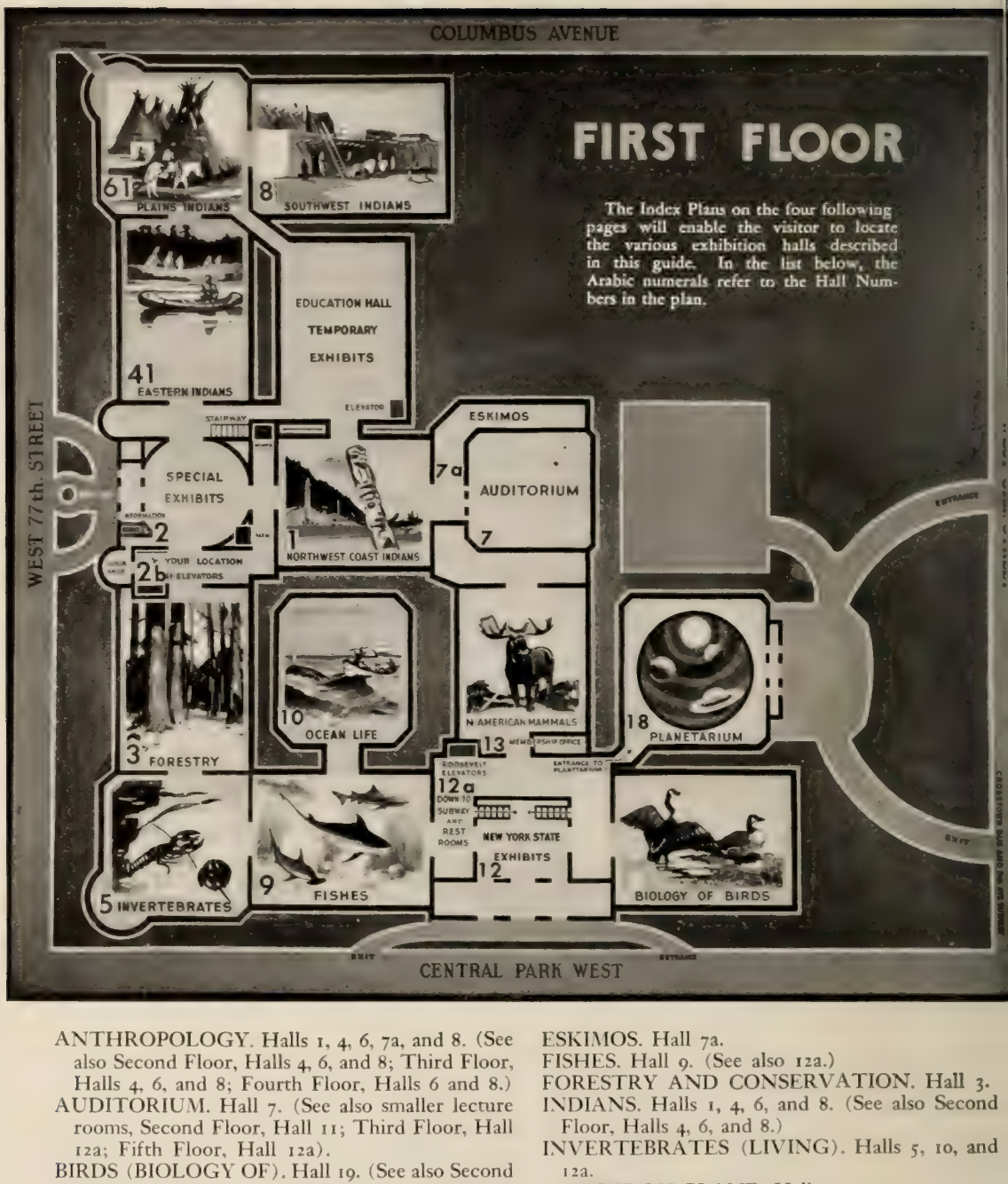
EXPLORATION AND GEOGRAPHY

Exhibits showing equipment of polar explorations made in cooperation with the Museum are located in the corridor leading to the elevators. (Index Plan, p. 16, First Floor, Hall 2b).

Here are sledges with which *Peary* (1909) and *Amundsen* (1911) reached the North and South Poles, respectively; also souvenirs of the *Amundsen-Ellsworth* expeditions of 1925 and 1926. Maps of the Polar Regions show the routes of various explorers and the polar air flights.

In a room at the left end of this corridor is the large *Mainka seimograph* for recording earthquakes. This was presented to the New York Academy of Sciences by Emerson McMillin, and recently donated to the Museum by the Academy.

Lindbergh Plane. Another exhibit of historical interest for scientific exploration, now in the Hall of Ocean life (Index Plan, p. 16, First Floor, Hall 10), is the airplane flown by Charles and Anne Lindbergh "north to the orient." This plane later took them by way of Greenland to Europe, thence down to Africa, across to Brazil, and up the Atlantic Coast to New York, a total distance of 30,000 miles.



ANTHROPOLOGY. Halls 1, 4, 6, 7a, and 8. (See also Second Floor, Halls 4, 6, and 8; Third Floor, Halls 4, 6, and 8; Fourth Floor, Halls 6 and 8.)
AUDITORIUM. Hall 7. (See also smaller lecture rooms, Second Floor, Hall 11; Third Floor, Hall 12a; Fifth Floor, Hall 12a).
BIRDS (BIOLOGY OF). Hall 19. (See also Second Floor, Halls 1, 2, and 19; Third Floor, Hall 1; Fourth Floor, Halls 12a and 19.)
BIRDS, LOCAL. Hall 12a.
BOOK SHOP. Halls 2 and 2b. (See also Sales Booth,, First Floor, Hall 18.)
CAFETERIA. Hall 12 (Basement). For teachers and children: Hall 11 (Basement).
CHECK ROOMS. Halls 2 and 12 (Vestibules).
CORAL REEF GROUP. Hall 10.
DARWIN HALL. Hall 5.
EDUCATION BUREAU. Hall 2.
ELEVATORS. Halls 12a and 2b.
ESKIMOS. Hall 7a.
FISHES. Hall 9. (See also 12a.)
FORESTRY AND CONSERVATION. Hall 3.
INDIANS. Halls 1, 4, 6, and 8. (See also Second Floor, Halls 4, 6, and 8.)
INVERTEBRATES (LIVING). Halls 5, 10, and 12a.
LINDBERGH PLANE. Hall 10.
MAMMALS (LIVING). Halls 10, 12, 12a, and 13. (See also Second Floor, Halls 3, 5, 9, and 13; Third Floor, Halls 2, 3, and 13.)
PLANETARIUM. Hall 18. (See also Second Floor, Hall 18.) Automobiles reach the front entrance of the Planetarium from 81st Street.
POLAR EXPLORATION. Hall 2b.
SEISMOGRAPH. Between Halls 1 and 2b.
SUBWAY. Hall 12a (Basement).
TEMPORARY EXHIBITS. Halls 2 and 11.
TREE OF LIFE. Hall 5.

AFRICAN MAMMALS. Hall 13. (See also Third Floor, Hall 13.)

AKELEY AFRICAN HALL. Hall 13. (See also Third Floor, 13.)

ANTHROPOLOGY. Halls 4, 6, and 8. (See also First Floor, Halls 1, 4, 6, 7a, and 8; Third Floor, Halls 4, 6, and 8; Fourth Floor, Halls 6 and 8.)

ARCHAEOLOGY. Halls 4 and 6.

ASIATIC MAMMALS. Halls 5 and 9.

BIRDS. Halls 1, 2, and 19. (See also First Floor, Halls 12a and 19; Third Floor, Hall 1; Fourth Floor, Halls 12a and 19.)

EDUCATION. Hall 11. (See also First Floor, Halls 2 (Vestibule) and 11 (Temporary Exhibits); Third Floor, Hall 11; Fourth Floor, Hall 11.)

GOLD ORNAMENTS. Halls 4 and 8.

INFORMATION DESK. Hall 12. (See also First Floor, Hall 2.

LECTURE ROOM. Hall 11. (See also First Floor, Hall 7; Third Floor, Hall 12a; Fifth Floor, Hall 12a.

MAMMALS (LIVING). Halls 3, 5, 9, and 13. (See also First Floor, Halls 10, 12, 12a, and 13; Third Floor, Halls 2, 3, and 13.)

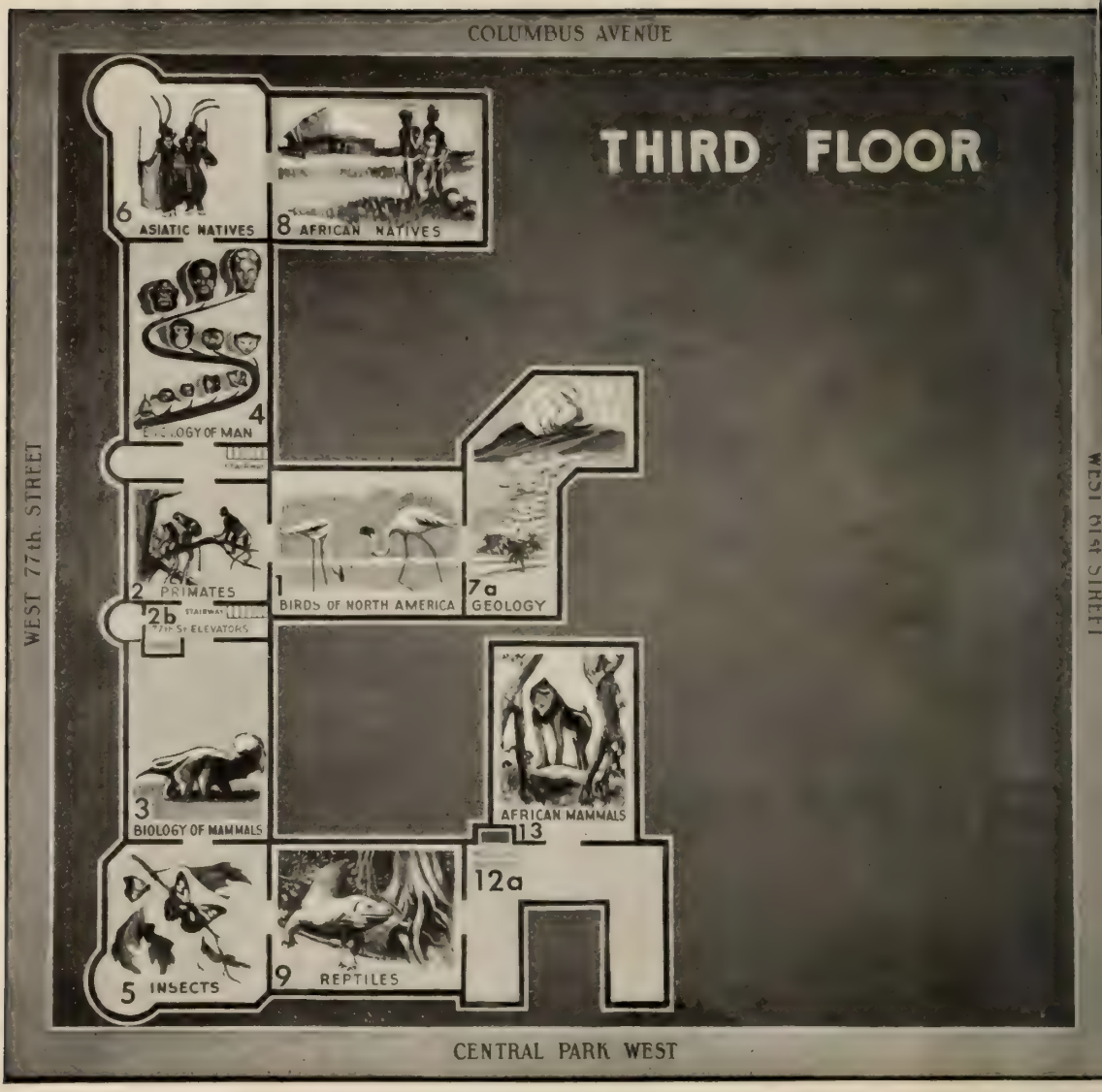
MEXICAN AND CENTRAL AMERICAN INDIANS. Hall 4.

NORTH AMERICAN MAMMALS. Hall 3. (See also First Floor, Hall 13.)

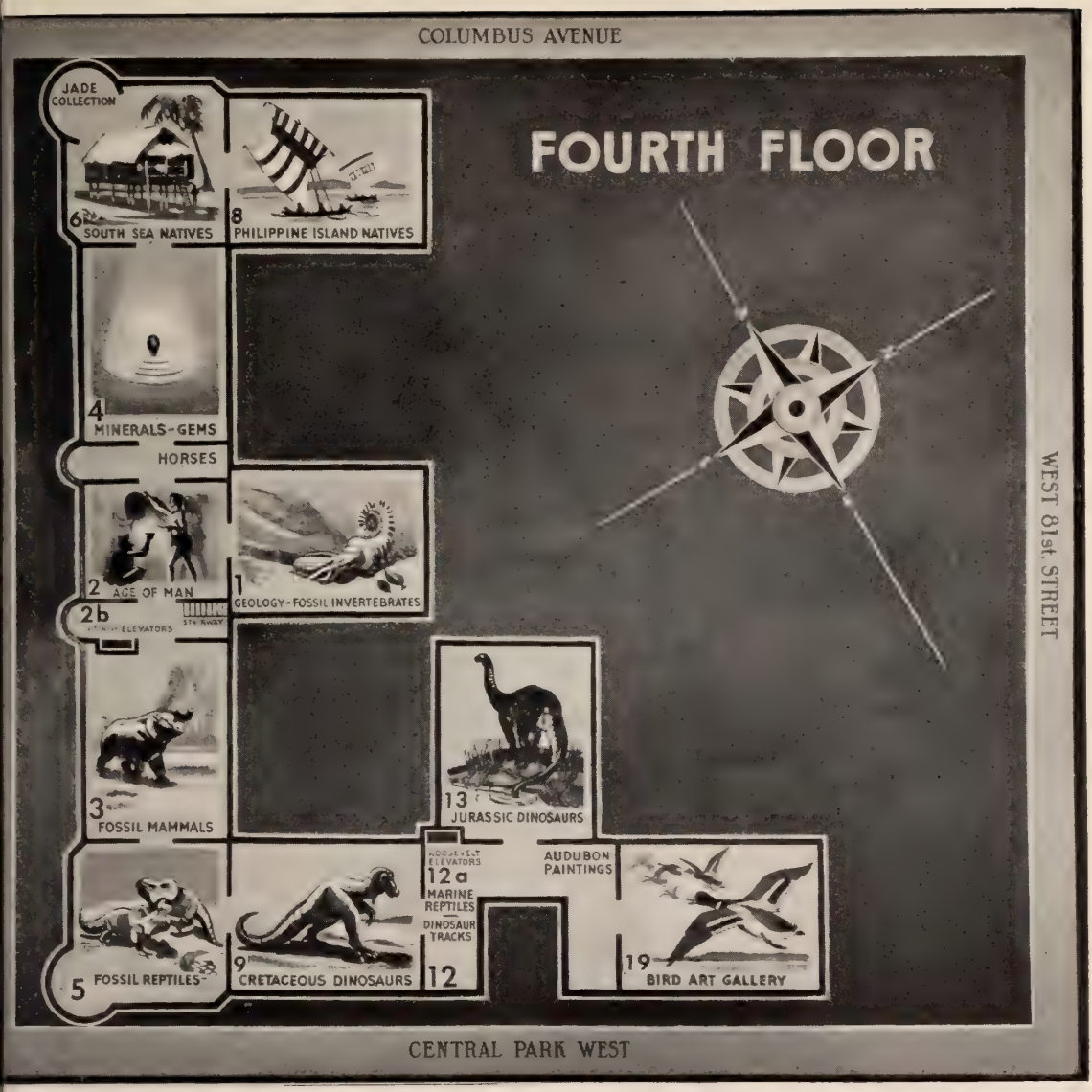
PANDA, GIANT. Hall 5.

PLANETARIUM. Hall 18. (See also First Floor, Hall 18.)

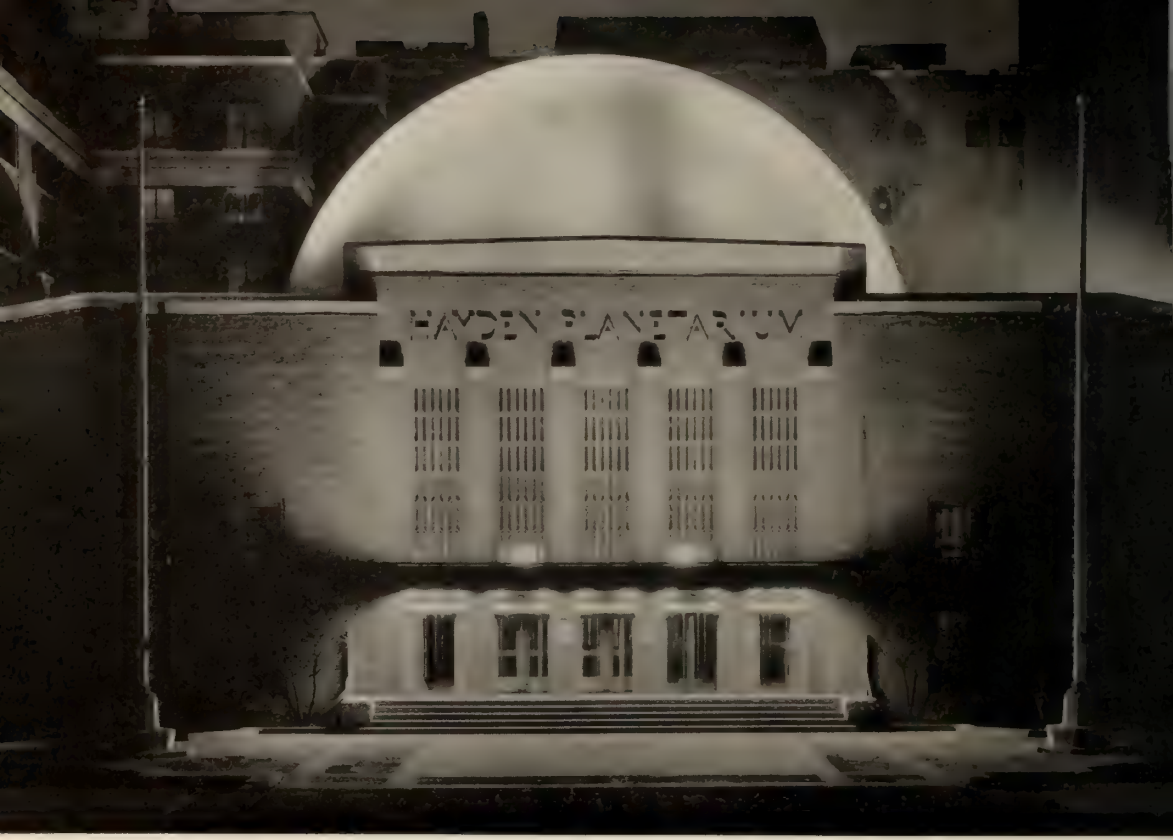
SOUTH AMERICAN INDIANS. Hall 8.



AFRICAN ANIMALS. Hall 13.
AFRICAN NATIVES. Hall 8.
AKELEY AFRICAN HALL (BALCONY). Hall 13.
AMPHIBIANS. Hall 9.
ANTHROPOLOGY. Halls 4, 6, and 8. (See also First Floor, Halls 1, 4, 6, 7a, and 8; Second Floor, Halls 4, 6, and 8; Fourth Floor, Halls 6 and 8.)
APES, MONKEYS, and LEMURS. Hall 2.
ASIATIC NATIVES. Hall 8.
BIRDS. Hall 1. (See also First Floor, Halls 19 and 12a; Second Floor, Halls 1, 2, and 19; Fourth Floor, Halls 12a and 19.)
COMPARATIVE ANATOMY. Hall 4.
EDUCATION. Hall 11. (See also First Floor, Halls 2 (Vestibule) and 11; Second Floor, Hall 11; Fourth Floor, Hall 11.)
INSECTS. Hall 5. (Also First Floor, Hall 12a.)
JUMBO SKELETON. Hall 3.
LANTERN SLIDES. Hall 11.
LECTURE ROOMS. Hall 12a. (Also First Floor, Hall 7; Fourth Floor, Hall 12a; Fifth Floor, 12a.)
MAMMALS (LIVING), BIOLOGY AND EVOLUTION OF. Halls 2 and 3; Akeley Hall Gallery, Hall 13. (See also First Floor, Halls 10, 12, 12a, and 13; Second Floor, Halls 3, 5, 9, and 13; Fourth Floor, Hall 2a.)
PETROLOLOGY. Hall 7a. (See also Fourth Floor, Hall 1.)
PRIMATES. Hall 2.
REPTILES (LIVING). Hall 9. (See also First Floor, Hall 12a; Basement, Hall 12,)
WHALE MODEL. Hall 3. (Seee also First Floor, Halls 10 and 12a.)



ANTHROPOLOGY. Halls 6 and 8.
AUDUBON ART EXHIBIT. Hall 12a.
BIRD ART GALLERY. Hall 19.
CAMEL, EVOLUTION OF. Hall 3.
DINOSAURS. Halls 5, 9, 12a, and 13.
DRUMMOND COLLECTION OF JADE. Hall 6.
EDUCATION. Hall 11. (See also First Floor, Halls 2 (vestibule) and 11 (temporary exhibits); Second Floor, Hall 11; Third Floor, Hall 11.)
ELEPHANTS, MAMMOTHS, MASTODONS. Hall 2.
FISHES (FOSSIL). Hall 5.
FOSSIL EXHIBITS:
FISHES. Hall 5.
INVERTEBRATES. Hall 1.
MAMMALS. Halls 2 and 3.
REPTILES. Halls 5, 9, 12, and 13.
GEMS AND MINERALS. Hall 4.
GEOLOGY. Hall 1. (Also Third Floor, Hall 7a.)
HORSE, EVOLUTION OF. Hall 3.
HORSES, (MODERN, INCLUDING FAMOUS RACERS). Hall 2a.
INVERTEBRATES (FOSSIL). Hall 1.
JADE, DRUMMOND COLLECTION. Hall 6.
LECTURE ROOM. Hall 12a. (See also First Floor, Hall 7; Second Floor, Hall 11; Third Floor, Hall 12a; Fifth Floor, Hall 12a.)
LIBRARY. Take elevator (Hall 12a or 2b) to Fifth Floor.
MAMMALS (FOSSIL). Halls 2 and 3.
MAN, ORIGIN OF. Hall 2. (See also Third Floor, Hall 4.)
MINERALS AND GEMS. Hall 4.
MOTION PICTURES (SOUND AND SILENT FILMS FOR CIRCULATION). Hall 11.
NEW YORK ACADEMY OF SCIENCES. Hall 12a.
PHILIPPINE NATIVES. Hall 8.
PREHISTORIC ANIMALS. Halls 2, 3, 5, 9, 12a, and 113.
REPTILES (FOSSIL). Halls 5, 9, 12a, and 13.
SOUTH SEA NATIVES. Hall 6.



HAYDEN PLANETARIUM AT NIGHT

Astronomy and Planetarium

(Index Plan, pp. 16-17, First and Second Floors, Hall 18)

THE Hayden Planetarium, with its main entrance on Eighty-first Street and Central Park West, constitutes the Museum's Hall of Astronomy. The principal feature of the building is the projection instrument. Installed in the centre of a hemispherical dome seventy-five feet in diameter, this amazing instrument is made up of a series of projectors which throw on the artificial sky the fixed stars, the sun, moon, planets, and the Milky Way. Since there are no pillars to intercept the light, the illusion of the depth of space is perfect.

Plans for an astronomy section of the Museum were first developed in 1925 by the late Howard Russell Butler, in collaboration with the Museum staff and the architects, Trowbridge and Livingston.

In the spring of 1933 the Trustees of the American Museum formed a separate corporation under the Reconstruction Finance Corporation to construct and equip such a planetarium. Mr. Charles Hayden of New York, after whom the building is named, generously donated both the projection planetarium instrument and the Copernican planetarium on the first floor.

The sky shows are scheduled as follows:

Weekdays: 2:00, 3:30, 8:30 P.M.

Saturdays: 11:00 A.M., 2:00, 3:00, 4:00, 5:00, 8:30 P.M.

Sundays and Holidays: 2:00, 3:00, 4:00, 5:00, 8:30 P.M.

Admission (including tax):

Mornings and afternoons	$ .35
Evenings	.50
Children under 17 yrs. of age, at all times	.25

THE SUN GOD PURSUES THE MOON GODDESS ACROSS THE SKY. Mural painting by Charles R. Knight

As the visitor enters the first-floor corridor he sees opposite the entrance a large mural painting by Charles R. Knight, based on astronomical legends and myths of the American Indians. The myths represented were selected from the Blackfoot Indians. The central figure depicts the Sun God pursuing the Moon Goddess across the sky. In the upper right may be seen the Pleiades as conceived by the Indians, and in the upper left the Big Dipper and the North Star. On a mountain in the lower left corner sits the Ancient or Original Man sending the little animals down below the water to bring up mud out of which he makes the world, in accordance with a wide-spread creation legend.

On the second floor of the Planetarium are hung the astronomical paintings of the late Howard Russell Butler, of Princeton, the most striking of which are the three eclipse subjects over the south-east entrance to the Planetarium dome representing eclipses observed in 1918, 1923, and 1925, in Oregon, California, and Connecticut respectively.

Notable also among Mr. Butler's paintings is the strange and beautiful "Lunar Landscape," showing the sky as it would appear from the surface of the moon, with the earth as a heavenly body shining in the distance. The two paintings of the red planet Mars, as seen from its inner and its outer moons, show the so-called canals and other surface features. The exquisite painting of the Northern Lights as seen in August, 1919, from the coast of Maine, is one of the most beautiful of all astronomical paintings.

On the first floor is the Hall of the Sun, with its animated model of the solar system, forty feet across. Here we see the sun and six of the nine known planets—part of that family of heavenly bodies to which our earth belongs—as though we were viewing them from a great distance, from far out in space.

In the center of the circular room, suspended from the ceiling, is a large luminous

globe representing the sun itself. At increasing distances from this are the small globes of those planets nearest the sun: little Mercury, closest of all; Venus, veiled by a dense layer of bright clouds; Earth, with its seas and continents and its attendant moon; Mars, long disputed as a possible abode of life; Jupiter, the giant planet, bigger than all the rest rolled together; and Saturn, surrounded by its unique and beautiful rings.

The miniature worlds of this complicated machine not only revolve about the sun but rotate on their axes as the real planets rotate, moving always at the correct relative speeds.

The three planets farthest from the sun, Uranus, Neptune and Pluto, are not included in the apparatus because of their enormous distances.

Before each sky show in the planetarium dome, a preliminary talk is given in the Hall of the Sun. This talk is arranged to prepare the audience for the show they will see later upstairs. Each month it is changed to relate the planetary motions to the subject of the month.

The floor of the Hall of the Sun is enriched by a reproduction in terrazzo by Victor Foscato of the famous Aztec Calendar Stone in Mexico City. The original symbolizes the Sun which was, to the Aztecs, the most important of the heavenly bodies adored by them, and commemorates the four past epochs of the world and the one in which they lived. A cast of the original is to be found in the Mexican Hall on the second floor of the Museum.

The projection apparatus itself is installed on the second floor. It is shaped like a huge dumb-bell about twelve feet long, at each end of which is a large globe. These two globes contain the projectors of the fixed stars, one globe for the northern hemisphere of the sky, the other for the southern. Lantern slides so shaped that their images fit together when projected on the dome, make a complete picture of the starry heavens without overlapping and without gaps.

The representation of the fixed stars, including the Milky Way, is a comparatively simple part of the performance of the instrument, and yet it is certainly the most impressive. When the light is gradually dimmed, bringing on the darkness the stars are "turned on," giving a realistic illusion of the starry heavens.

The projection of the stars is controlled by a switchboard arranged like a desk-top with switches reminiscent of organ-stops. These turn the stars on and off. On the vertical part of the board are rheostats controlling the brightness of the stars and other celestial objects. With this instrument before him, the lecturer has over two thousand combinations at his command.

The apparatus has several different speeds, all many times faster than the real motions. This makes it possible to condense a very long astronomical story, so as to give in a few minutes a clear understanding of the seemingly intricate workings of the heavenly bodies.

The American Museum of Natural History collection of meteorites exhibited in the first floor corridors of the Planetarium is one of the largest in the world, comprising many specimens from huge masses like the Ahnighito (Greenland) meteorite, weighing 36½ tons, the largest meteorite in any museum, to thousands of small specimens like gravel comprising the study collection.

Meteorites are those extra-terrestrial bodies which fall to the earth from outer space. They consist of stone or metal, or a combination of these materials, and vary in size from dust particles to immense masses weighing tons. When passing through the earth's atmosphere these celestial objects are usually accompanied by manifestations of light and sound, and are known as shooting stars, meteors or fireballs. The term meteorite is applied only after they reach the ground and form a part of the earth.

Also in the first floor corridor is a remarkable collection of sun-dials, compasses, and astronomical instruments. This fine loan collection covers almost the entire range from ancient Chinese instruments through the fine metal instruments made in the middle-centuries in France and Germany, down to the very accurate compasses which play such an important part in modern navigation.

THE GREAT PROJECTION INSTRUMENT IN THE HAYDEN PLANETARIUM. This is the principal feature of the Planetarium building. Through its means the illusion of the heavens with the fixed stars and planets, following their apparent paths through the sky, is thrown upon a dome-shaped ceiling

Geology

(Index Plan, pp. 18-19, Third Floor, Hall 7a; Fourth Floor, Hall 1)

The geological exhibits in the Museum are found in the Hall of Geology and Invertebrate Paleontology on the fourth floor, and on the third floor in the Hall of Petrology and Economic Geology.

Geology is the science of the past and present conditions of the earth. It enters into a consideration of the materials composing the earth, their composition, structure, distribution, and the physical changes they have undergone or may be undergoing. It deals with minerals and their arrangement and association in rocks and ores. It considers the occurrence, distribution, origin and history of the principal kinds of rocks, namely: igneous, sedimentary and metamorphic. It especially treats of the order of deposition and sequence of the stratified beds of rock, for these, together with the fossils found in many of them, give not only a chronological account of the events in the development of the earth's crust, but reveal the succession of life forms on the earth. The processes and agents at work within and on the surface of the earth, tending to modify it, such as rock weathering, underground waters, glaciation, diastrophism, vulcanism, metamorphism and gradation, are acting to-day and have been throughout the history of the earth.

The three principal branches of geology are: (1) Structural geology, treating of the form, arrangement and internal structure of rocks; (2) Dynamical geology, dealing with causes and processes of geologic change; (3) Historical geology, which, aided by other sciences, aims to give a chronological account of the events in the earth's history.

GEOLOGIC EXHIBITS IN THE HALL OF GEOLOGY AND INVERTEBRATE PALEONTOLOGY

(Index Plan, p. 19, Fourth Floor, Hall 1)

To illustrate the three principal branches of geology, pictorial models of fifteen areas within the United States have been installed. These show the most evident and striking results of geologic forces acting through long periods of time.

Beginning at the left near the entrance, they are as follows:

1. The model of the Bright Angel section of the *Grand Canyon* of the Colorado River, Arizona, illustrated on page 27.
2. A model of the *Niagara Falls* region, built to the same scale as the Grand Canyon, showing the falls and the seven-mile gorge which its waters have cut in ancient sedimentary rocks, and also the more recent glacial deposits covering the surface.
3. The *Potomac River* section, showing the Appalachian Mountain type of folding and erosion, with rivers adjusted to the softer rocks of Silurian and Devonian age.
4. The *Van Horn*, Texas, region, featuring fault block structures and a bolson basin—a depression nearly enclosed by mountains.
5. *Yellowstone Park*, Wyoming, including the geyser basins and the Rocky Mountain type of topography.
6. The *Pike's Peak*, Colorado, model, showing the mountain, composed of red granite, and the bordering stratified deposits of the Great Plains near Colorado Springs.
7. The Caldera of *Mt. Mazama*, five miles in diameter and two thousand feet deep, which has been made a National Park and has become famous under the name Crater Lake. Numerous outpourings of lava suggest the structure and history of the ancient volcano.
8. The *Standing Stone* district near Monterey, Tennessee, showing normal subaërial erosion and the production of sink holes in horizontally disposed beds of limestone and shale.

Continuing on the opposite side of the hall are the following models:

9. The *Mt. Tom-Mt. Holyoke* district of western Massachusetts, showing a great trough, traversing the ancient crystalline rocks, which was filled with the sands, muds and intruded lava flows in Triassic time.
10. The *Watkins Glen-Seneca Lake* district of central New York State, showing moraine deposits and other features due to the advance and retreat of the continental ice sheet over a region of horizontally bedded limestone, sandstone and shale. In the background

THE ERUPTION OF MT. PELEE ON THE ISLAND OF MARTINIQUE. This was one of the most destructive eruptions known in history. It took place in the year 1902 and completely destroyed the city of Saint Pierre causing the death of 30,000 inhabitants. From a painting in the Hall of Geology

appears a representation of the retreating ice-front of the last glaciation.

11. The *Mt. Washington*, New Hampshire, region, showing typical glacial cirques and other glacial phenomena in an area of crystalline rocks.

12. The picturesque *Yosemite Valley* in the Sierra Nevada Mountains of California, with U-shaped glaciated valley bottom and precipitous marginal walls

13. The *San Francisco*, California, model, exhibiting a portion of the Pacific Ocean, the Coast Range with volcanic and sedimentary rocks, the California trough or inner lowland with plains bordering San Francisco Bay, and the famous strait, Golden Gate.

14. The *New York City* model, showing the Hudson River estuary; the crystalline pre-Cambrian rocks on Manhattan Island to the north and east; the Triassic rocks west of the Hudson, which include red sandstone, shale and conglomerate, the Palisades diabase and the Watchung basaltic ridges; also the glacial drift and terminal deposits on Long Island, on Staten Island, and in New Jersey.

15. The last model in this series is one of *Porto Rico* and the *Virgin Islands*, showing a narrow submerged platform and neighboring vast oceanic "deeps."

Facing the entrance of the Hall is a geological relief model of the *lower Hudson River region* from New York City nearly to Albany.

In each of the eight alcoves on the west side of the hall is placed a model showing a stage in the *geographic development of the North American continent*. Those represented fall within the following geologic periods: Cambrian, Ordovician, Silurian, Devonian, Permian, Cretaceous, Eocene and Pliocene. The present known surface, evidenced by outcrops of fossiliferous rock of the age represented, is shown in black. From this and other data the extent of the ancient epicontinental seas has been determined and the shore-lines marked. The present oceanic

depths are shown in relief, while the various marine basins and elevated land masses on the continent are marked with colors without relief. The present outline of North America, shown on each model, indicates that the geography during the first six periods was quite different from that of to-day.

At the rear of the hall, to the right, is the *Copper Queen Mine* exhibit. A large model, 18 by 12 feet, shows on a miniature scale the surface features and buildings over four of the principal mines belonging to the Copper Queen Consolidated Mining Company of Bisbee, Arizona, while a painted background represents the surrounding mountains and the town of Bisbee. The sides of the model give vertical sections to the depth of about 1,200 feet, illustrating the geology of the area and showing the general manner of getting out the ore and hunting for new deposits.

Specimens of ore, minerals and rocks from the mine and the adjacent country illustrate the geology of the region, including velvet malachites and a great block of malachite and azurite weighing about three tons taken from the original "Queen" mine.

Opposite the Copper Queen exhibit is a display of *caves and cave material*, including a reproduction of part of a beautiful cave discovered at the Copper Queen mine. It was formed by the dissolving action of water traversing joints in limestone, and its walls, roof and bottom were afterward coated with incrustations, stalactites and stalagmites of calcite, some of which are dazzlingly white while others are colored green with copper salts or pink with manganese compounds.

Near by is a reproduction of a chamber in Weyer's Cave, Virginia. Here the heavy rainfall of the region is probably the principal factor in producing a greater wealth of stalactite and stalagmite growth than in the Copper Queen Cave.

THE HALL OF PETROLOGY OR ROCK HISTORY

(*Index Plan, p. 18, Third Floor, Hall 7a*)

The new Hall of Petrology, on the third floor, is approached through the Hall of North American Birds (Third Floor, Hall 1). It has been designed to present the visitor and student with a concise and graphic visualization of the basic processes of rock formation, as well as the application of the science of Geology to modern life and the industrial world.

At the entrance to the Hall is a series of paintings and exhibits depicting the most spectacular and best-known volcanoes in the world—Mt. Lassen, Mt. Pelée (see page 25), Vesuvius, Sakurajima and others—and a map showing the world distribution of volcanoes.

Leading from this section the Hall exhibits products of magma, or molten rock, from deep in the earth. The various products of volcanic eruptions, such as ash, pumice, lava, volcanic bombs, gaseous deposits, are also shown.

The following cases and diagrams show the result of igneous intrusions of molten rock into cold rocks at various levels and the types of rocks so formed—how man is able to glean the precious stores of gold, silver, copper, iron, radium and lead as a result of these cooling processes.

In the succeeding exhibits the visitor observes the breakdown of primary rocks by wind and water and then the deposition in seas and valleys to build up a new class of rocks—the sedimentary rocks—forming sandstones, shales and limestones.

Exhibits describing structural geology show how rocks can be folded and broken when the surface of the Earth is being molded into new mountain chains and new seas. The third group of rocks shown is that of the metamorphic rocks—those created under such terrific pressures and heat that an entirely new class of crystalline rocks is made.

Further economic geology is shown by exhibits of ore-bearing rocks. The various processes that produce coal and oil are illustrated, as well as the history and types of coal and their distribution in the United States.

The nature of the interior of the earth is shown in another case.

MINIATURE MODEL OF THE GRAND CANYON OF THE COLORADO SHOWING GENERAL APPEARANCE AND GEOLOGICAL SECTION

(*Index Plan, p. 19, Fourth Floor, Hall 1*)

The Grand Canyon of the Colorado River is represented in this model in such a manner

MODEL OF THE GRAND CANYON OF THE COLORADO

as to show not only the chief features of this magnificent example of erosion but also the successive layers of rock which make up its geological structure. The Grand Canyon is more than three hundred miles long, thirteen miles wide and a mile in depth from the brink of the canyon to the river bed. For countless ages the layers of gneiss and granite were formed. Then the region sank beneath the sea and successive layers of sandstone, limestone, and shales were deposited upon it to a depth of more than 4000 feet. After several millions of years these rocks were raised above sea level, and erosion by streams, wind and frost took place. A second time this region was submerged beneath the sea and more marine deposits were laid upon it. Similar changes continued to take place throughout the ages until about a million years ago, when the whole plain was again above sea level and the excavation of the present canyon was started, which is still progressing.

This relief model represents a region about sixteen miles wide from west to east and thirteen miles from north to south.

The Grand Canyon was first seen by white men early in the sixteenth century, when Cardenos and his twelve companions were guided by Hopi Indians to some now unknown point on the rim. He remained there four days looking in vain for a way to descend. Cardenos had been sent out by de Coronado to find the wonderful river whose existence had been communicated to de Tovor, another member of the famous exploring expedition. The first sure traverse of the Canyon was made in small boats in the summer of 1869, by Major J. W. Powell with eight brave companions.

The head of the Bright Angel Trail is 6866 feet above mean sea level, while the river in front of this spot is about 2400 feet above the sea, making the canyon about 4460 feet deep below an observer standing in front of the hotel. The opposite brink of the canyon, however, is eight thousand feet above sea level so that the total depth is more than one mile.

JAPANESE ROCK CRYSTAL ELEPHANT. This polished rock crystal sphere is mounted on an elephant also carved from a single piece of clear rock crystal of transparent colorless quartz. The work is done in the Japanese manner

Minerals and Gems

(*Index Plan, p. 19, Fourth Floor, Hall 4*)

HALL OF MINERALS AND GEMS

THE Morgan Memorial Hall of Minerals and Gems is entered through the Hall of the Age of Man on the fourth floor. This hall, through the gift of Mr. George F. Baker, has been remodeled to contain the General Collection of Minerals and the Morgan Gem Collection.

Of these, the General Collection of Minerals is without question one of the finest to be found in the world, ranking with that of the British Museum and the Jardin des Plantes. It is composed chiefly of the well-known Bement Collection, presented to the Museum in 1900 by the late Mr. J. Pierpont Morgan. Although remarkably complete in its representation of most of the mineral species known to science, this collection is especially noteworthy for its assemblage of splendid examples of the commoner and more widely distributed minerals.

The visitor should begin with the first of the cases, to the left of the entrance, and proceed from left to right along each side of every case, advancing through the south row of cases and returning through the north row. The different species are divided within the case by narrow strips between the mounts. The large and imposing specimens are arranged in wall panels around three sides of the Hall, and constitute a Key Collection. To the right of the entrance will be found cases in which the subject of Crystallization is presented by a series of models. This series, as well as other explanatory exhibits in adjoining cases, constitutes an important key to the understanding and appreciation of the general mineral collection.

The cases occupying the middle of the hall contain the Morgan Gem Collection, comprising the valuable series of gems and precious stones also presented by J. Pierpont Morgan, to which have been added from time to time noteworthy specimens given by other friends of the Museum.

The Morgan Collection includes the series of American gems assembled by Tiffany and Company for the Paris Exposition of 1889 and the series of foreign gems and gem stones exhibited at the Paris Exposition of 1900.

The installation comprises examples of those minerals which are used for gems and for ornamental objects and consists of rough, uncut material and of fashioned gem stones and carved objects. All of the specimens exhibited have been chosen with great care and are not only thoroughly representative but include many examples which are unique in size, beauty of coloring and perfection of execution, reflecting the very highest standards of the art of the lapidary. Here again explanatory labels are used to give meaning and weight to the exhibit, not merely as a display of jewelry material but as a complete visual exposition of the knowledge of gem stones.

Among the notable gems included in this collection are:

The *De Long Star Ruby*, one of the finest gems of this kind in the world, and the "*Star of India*," the largest star sapphire in the world (Case III).

The fine *engraved emerald*, bequeathed by Miss Cockcroft-Schettler (Case IV).

The *Morgenthau blue topaz* (Case VI).

The *Vatican Cameo* carved from essonite garnet (Case VIII).

The *oriental cat's eye*, and the *Russian alexandrite gems* (Case XI).

The Betts bequest *opal pendant* (Case XII).

The *kunzite gems* (Case XXIII).

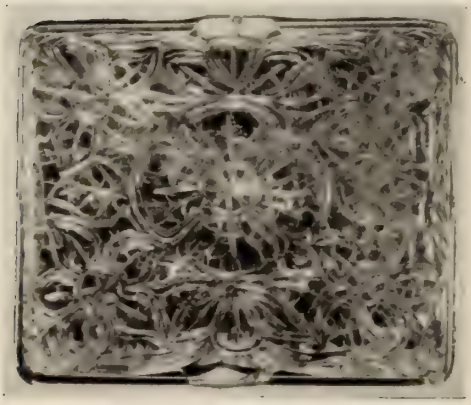
The *Tonnelier chalcedony figurine*, the gift of Charles Lanier (facing the Morgan Tablet).

THE EMERALD

The Emerald affords a striking example of a gem that owes its beauty of color to an impurity which is non-essential to the mineral of which it is a variety. The fine green color so desirable in this stone, which is a variety of the mineral Beryl, is entirely due to a very small amount of chromium.

The refractive index of emerald is very low, a fact which accounts for the lack of brilliancy and "fire" which characterizes the cut stones. Since little or nothing can be gained by using a brilliant cutting for emeralds, the step cutting is almost universally used. Flawless emeralds are extremely rare, the imperfection usually taking the form of cracks and inclusions which greatly impair the transparency of the stone. It is this rarity of desirable stones of the first quality which renders the emerald the most costly of precious stones, the value of the best gems being between three and four times that of diamonds of equal weight.

The principal source of emeralds is the Muso Mines of Colombia, a locality which was furnishing gems to the aborigines at the time of the Spanish conquest.



ENGRAVED EMERALD ORNAMENT. This engraved emerald weighing 87.64 carats was originally from Muso, Colombia. Sir Purden Clarke placed this gem, probably of Delhi cutting and used as a head ornament by some Hindu prince, in the period of the Mogul domination of India (1526-1739).
Gift of Elisabeth Cockcroft Schettler

THE TOPAZ

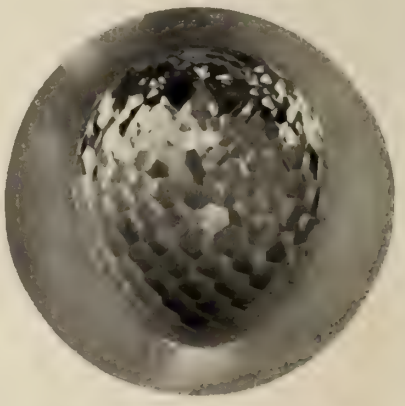
Although gem crystals of the mineral topaz are found in a variety of yellow, orange and blue shades, the deep orange-yellow color, resembling sherry wine, is generally accepted as typical. To such an extent is this true that we find the word topaz often incorrectly used to describe other yellow stones, as for example, oriental topaz, (yellow sapphire) and false topaz (quartz). A colorless variety is occasionally used as an imitation diamond in cheap jewelry, its brilliancy surpassing that of cut glass.

The hardness of topaz, greater than that of amethyst (quartz), is almost equal to that of emerald. It is therefore eminently fitted for the high rank which it takes among semi-precious stones. Gems of fine color rank in value with choice aquamarines of equal weight.

Although topaz is obtained from a great number of localities, the best colored stones come from Brazil.

THE EDITH HAGGIN DE LONG STAR RUBY

This is the finest and largest gem of its kind known to exist in the world. Its color is a peculiar milky crimson, best described as "orchid red." The curious and beautiful six-rayed star which glows within the gem results from a myriad of minute hollow tubes which are distributed throughout the crystal with great regularity, parallel to its six sides.



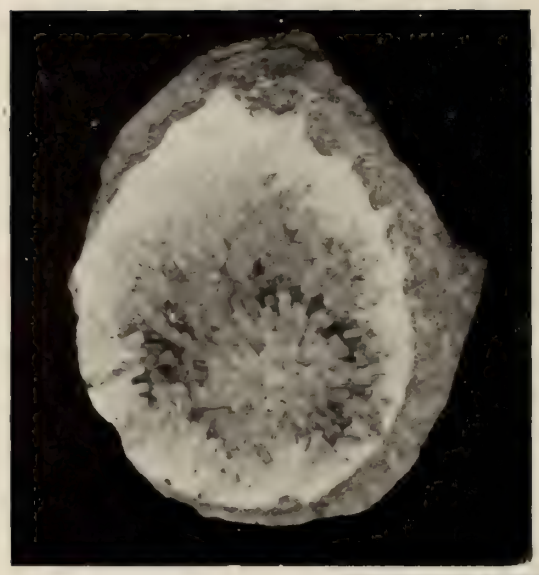
BLUE TOPAZ FROM JAPAN. Egg-shaped, brilliant cut, with 440 facets and weighing 1,463 carats. Natural size.
Gift of M. L. Morgenthau

THE EDITH HAGGIN DE LONG STAR RUBY. This unusually beautiful star ruby is reputed to be the largest and finest gem of its kind in the world. It weighs 100 carats and was discovered in one of the ruby mines of Burma. Its color is a peculiar orchid-red. A remarkable six-rayed star glows within the gem, formed from a myriad of minute hollow tubes which are distributed throughout the crystal with great regularity, parallel to its six sides. The stone has been cut in a rounded dome, the shape which best reflects the light from the interior. It was presented to the Museum by Mrs. George Bowen De Long, in whose honor it is named

When cut *en cabochon*, so that the rounded dome arches over this hexagonal pattern of cavities, stones of this kind reflect the light from the interior as a six-rayed star and consequently they are termed star rubies and star sapphires. This gem, weighing 100 carats, was discovered in one of the ruby mines of Burma and was presented to the Museum by Mrs. George Bowen De Long, in whose honor it is named. It is unique among star rubies, being larger than any other remotely approaching it in quality.

GEOLOGY AND MINERALS OF NEW YORK STATE

Two cases illustrating these features are exhibited on the first floor of the Roosevelt Memorial (Index Plan, p. 16, First Floor, Hall 12). One case shows the principal minerals characteristic of the State and the localities where they may be found. The other demonstrates the extent of the sedimentary, igneous, and metamorphic areas within the borders of the State.



TWO FINE SPECIMENS OF NATROLITE FROM THE MUSEUM'S COLLECTION OF MINERALS. The specimen of natrolite to the left came from Lippa, Bohemia. The slender orthorhombic crystal-like prisms, nearly square in cross section, form a radiating group somewhat resembling clusters of organ pipes

(Right) NATROLITE FROM WEST PATERSON, NEW JERSEY Besides the tetragonal crystals, finer hair-like crystals in the form of long slender silky needles radiate from a central nucleus suggesting a fluffy seed ball of the dandelion

TWO QUARTZ GEODES FROM URUGUAY. A geode is a nodule of stone having a cavity lined with crystals of mineral matter. The rock cavity in the upper figure was encrusted in successive layers of agate deposited from the silica dissolved in the water which circuated through it. Crystalline quartz was ultimately added in a final layer. This quartz, colored with a purplish hue, is known as amethyst

ASBESTOS (*left*) is a variety of serpentine, a hydrous magnesium silicate consisting of white, gray, or green fibers which are easily separated and can be spun or filtered to make non-combustible fabrics

STIBNITE (*to the right*) is a sulphide of the semi-metallic substance known as antimony. The slender orthorhombic prisms are made up of many crystals joined parallel to each other. This mineral is the chief source from which antimony is obtained. The specimen illustrated came from Inyo, Japan

A FOSSIL AMMONITE of 150,000,000 years ago, related to the ancestors of the common nautilus

Paleontology

(*Index Plan, p. 19, Fourth Floor, Hall 1*)

CLOSELY connected with geology, and indeed almost inseparable from it, is paleontology, or the study of ancient forms of life. The sedimentary rocks have been found, on examination, to contain in many places remains of plants or animals, which may closely resemble, but more often appear very different from, those now living on the earth. The order of deposition of the beds, with the oldest at the bottom and the youngest at the top, and the imbedded fossil forms of life, give the geologist the means of constructing a chronological chart, or time scale, depicting the eras, periods, epochs and formations of geologic time. There are five eras: Archaeozoic (Primal life), Proterozoic (Primitive life), Palaeozoic (Ancient life), Mesozoic (Medieval life), and Cenozoic (Modern life). The rocks of the Archaeozoic era have not afforded recognizable fossils,

(*Right*) FOSSIL SEA SCORPION: a eurypterid

FOSSIL BRACHIOPODS OF THE SILURIAN AGE. Primitive shelled creatures somewhat resembling clams externally but not related to them

although the indirect evidence is sufficient to assume that life existed at that time. In a few localities (as in Montana and Southern Australia), fossils have been obtained from the rocks of late Proterozoic age. Beginning with the basal period of the Palaeozoic era, the Cambrian, well-preserved fossils indicate that most of the various classes of invertebrate life were in existence, though represented by primitive forms. The earliest known records of vertebrate life are fossil fish scales from the upper Ordovician rocks of Colorado.

A FOSSIL INVERTEBRATE OF ANCIENT SEAS. (*Below*) A well-preserved crinoid, or sea-lily, a flower-like animal related to modern starfishes

FOSSIL INVERTEBRATES

As installed in the Hall of Geology and Invertebrate Paleontology the exhibits of fossil invertebrates occupy alcoves on either side of the hall. The specimens in the cases on the left are arranged to illustrate historical geology, beginning at the entrance with the Pre-Cambrian rocks and advancing regularly through the Cambrian, Ordovician, Silurian,

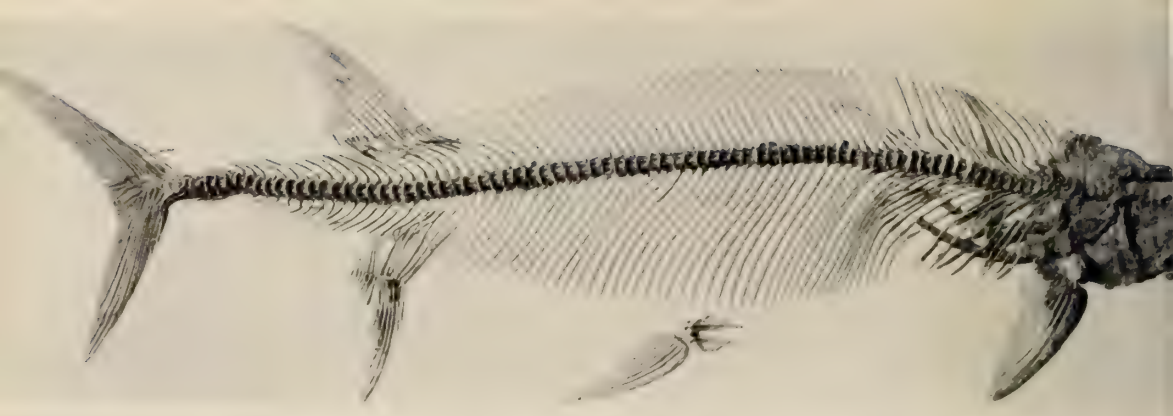
TRILOBITES (*below*) flourished in Devonian seas and became extinct millions of years ago. Perhaps related to the ancestors of modern Crustacea

Portion of a large rock crowded with brachiopods (*Spirifer vanuxemi*).

Devonian, Mississippian, Pennsylvanian, Permian, Triassic, Jurassic, Cretaceous, Eocene, Oligocene, Miocene, Pliocene, and Pleistocene periods of geologic time. Most of the specimens shown are from American localities. The examples shown are those particularly characteristic of the various horizons, the object being to give an idea of the general character of the life of different periods of the world's history.

The specimens on the right side are arranged to illustrate the classification and relationship of the plants and animals of past geologic times. The series starts with the invertebrate animals, beginning with the lower, or simpler, forms and continuing to the highest. The specimens have been drawn from foreign and domestic localities and different geologic ages. The exhibits illustrate at a glance the wide range of variation which each group has taken during geologic time.

In the center of the hall are the stump and part of the roots of a large tree from an anthracite coal mine under Scranton, Pennsylvania. Millions of years ago this tree grew upon the top of a thick swamp deposit of decaying vegetation, which ultimately became a valuable bed of coal. The stump, left in the roof of the mine when the coal was removed, fell to the floor years after the gallery had been abandoned, and was discovered only through the chance visit of a miner.



GIANT BULLDOG FISH (*Portheus molossus*). This huge fossil fish came from the chalk beds of Kansas. It is 15 feet, 8 inches long and about 80 million years old

Two stumps of a large fossil tree-fern of Middle Devonian age from Gilboa, New York, appear in the first alcove on the right. These specimens were obtained from a quarry opened in connection with the great engineering work of the New York City Board of Water Supply. They are the oldest trees known.

FOSSIL VERTEBRATES

(Index Plan, p. 19, Fourth Floor, Halls 2, 2b, 3, 5, 9, 12a, 13)

Fossils are the petrified remains of plants or animaals that lived at some past period of the earth's history. Sometimes, as with the bones of the great Irish elk, the objects have been buried in swamps or bogs, and in a few rare instances, as with the mammoth and woolly rhinoceros, entire animals have been preserved for thousands of years in ice or frozen mud. Fossils are found in localities where the dead animals or plants were gradually buried under layers of sediment to such a depth and for so long a time that they finally became petrified. Later, through upheaval and erosion, they were again brought to or near the surface of the earth. Petrifaction is the slow replacement of animal or vegetable material by such minerals as carbonate of lime or silica, which are carried in solution by the underground waters. The process is very slow and for this reason the soft parts usually decay before they can be petrified. Fossil beds are found in every continent. In our own country, Texas, Montana, Wyoming and the Bad Lands of South Dakota are famous for their large fossil beds, and many of the finest and rarest fossils in the Museum were obtained in these localities.

As it takes thousands of years for the various layers of earth to accumulate over the bones, and for the latter to become hardened to rock, the study of fossils and of the strata in which they are found is an important aid in determining the age of the earth and the succession of life thereon. The skeletons exhibited in these halls are of animals which lived from 10,000 to 250,000,000 years ago, while in the Hall of the Age of Man specimens of fossil man are exhibited dating from 10 000 to 1,250,000 years ago.

To prepare a specimen for exhibition, the matrix in which the bones are embedded is carefully chipped away and the missing parts restored in cement and plaster. The bones are then assembled as in life. In the specimens on exhibition, the restored parts differ in color from the original skeleton and can readily be distinguished.

The Museum's collections of fossil vertebrates are probably the finest in the world, considering not merely numbers but especially variety, quality and perfected methods of preparation and exhibition.

The walls of several of the halls are adorned by mural paintings by Charles R. Knight, portraying some of the more striking animals of the various geologic ages, culminating with those contemporary with early man in Europe and America.

The Museum's exhibits of fossil vertebrates are all displayed on the Fourth Floor.

FOSSIL FISHES

(Index Plan, p. 19, Fourth Floor, Hall 5)

The Bashford Dean Memorial Exhibit of Fossil Fishes occupies the Southeast Tower of the Museum on the Fourth Floor.

One enters the exhibit below a model of the jaws of an enormous fossil shark about 9 feet across, with the actual fossil teeth set in place. This monster, closely related to the modern White Shark or "Man-eater," is estimated to have been 46 feet long.

At the left of the entrance is a bronze portrait plaque of Professor Bashford Dean (1867-1928), former Curator of Fishes at this Museum, where he studied especially the armored fishes of past ages, a fine series of which are included in this exhibit.

The huge fish shown as if swooping down from the ceiling is a model of *Dinichthys*, one of the great armored fishes from the Devonian of Ohio. The original skull, shown near by, is one of the prizes of the collection.

These curious forms, of numerous species, all had a pair of joints connecting their bony head-pieces with their shoulder plates. This gave rise to their group name, "Arthrodira," or "joint-necks." They were the tyrants of their day and were doubtless unpleasant neighbors to the nearly naked fin-fold sharks, their contemporaries. These latter show a very interesting stage in the evolution of the fins, in which the skeletal rods supporting the primordial fin-fold, had begun to push outward well beyond the line of the body. Even our own arms and legs are only greatly enlarged and modified fin-paddles.

At the far end of the exhibit is a "fossil aquarium"—restorations in miniature of various well-known forms from the Old Red Sandstone of Cromarty, Scotland, as they would have appeared in life, more than three hundred million years ago.

They include *Pterichthys* and its allies of the distant past, when they were nearing the time of their extinction. Others represent "spiny sharks" and "joint-necks" which were then dominant groups. A third lot includes advancing types, the "fishes of the future," the ancestors of the swarming teleost or bony fishes familiar to us today. But the most interesting group are the "lobe-fins," which were the direct ancestors (or close relatives) of the later land-living vertebrates.

At that far-off period of the earth's history, some of the lobe-fins, or primitive ganoids, through their ability to suck atmospheric air into a moist internal sac or lung, finally emerged from the water at the edge of the swamps, using their stout paired paddles to push themselves up into the muddy margins. These evolved the first limbs, and thus the adventurous air-breathing fishes began the conquest of the land and became the ancestors of all land vertebrates, including man.

The great fish on the rear wall, opposite the entrance, is *Portheus molossus*, popularly called the Giant Bulldog Fish. It comes from the chalk beds of Kansas. This huge creature is 15 feet, 8 inches long and about 80,000,000 years old. At that time, Kansas, now in the midst of the continent, was submerged under a shallow sea, somewhat like the Mediterranean, swarming with giant sea-lizards, huge marine turtles, and great and small fishes of many kinds.

In the first alcove to the right, a wall-chart illustrates the stream of fish life in geologic sequence, 500,000,000 years of fishes. It gives at a glance the basic arrangement of the specimens shown, notable among which are Ostracoderms from the Silurian and Devonian, the giant *Portheus*, and the saw-finned *Protosphyræna* from the Cretaceous of Kansas.

FOSSIL REPTILES

The dinosaurs, the largest of the fossil reptiles, form the most spectacular part of the Museum's paleontologic exhibits. The more primitive reptiles and also those of such other groups as the fossil alligators and turtles are also well represented in the Museum's collections. They are displayed in a series of halls on the fourth floor of the Museum as described on the following pages.

THE GREAT THUNDER LIZARD (*Brontosaurus excelsus*). A huge water-living dinosaur of the Jurassic Period

A CARNIVOROUS DINOSAUR AND ITS PREY (*Allosaurus* and *Brontosaurus*). Though not as large as *Brontosaurus*, the *Allosaurus* was a formidable carnivorous reptile which, it is believed, was able to devour its larger but more sluggish dinosaur contemporary

HALL OF JURASSIC REPTILES

(Index Plan, p. 19, Fourth Floor, Hall 13)

The skeleton which dominates the center of the hall is that of the great *Brontosaurus*, or Thunder Reptile. This big bodied, small-headed dinosaur has massive limbs, whose joints, capped in life with cartilage, indicate that he lived in swamps and in the edge of streams where the great weight of his body—25 to 30 tons—would be supported in the water.

Near *Brontosaurus* is *Allosaurus*, "apparently turned into a fossil while munching on the tail of a defunct relative of that big beast." Looking closely, one sees that the tops of the vertebrae of the victim are scored with grooves where some millions of years ago they were marked by the teeth of the flesh-eating dinosaur that destroyed it.

In a case to the left of the *Brontosaurus* skeleton is displayed the skeleton of a splendid example of *Stegosaurus*. This curious creature had a small head with a brain weighing only a few ounces. The arching backbone is composed of vertebrae that increase rapidly in size toward the middle of the back where they are enormous, showing cavities for spinal ganglia many times the size of the brain. A double series of huge bony plates are supported upright along the back and were probably defensive in character. At the end of the tapering tail are four long spikes of bone with which the *Stegosaurus* is supposed to have struck at its enemies, the formidable weapons being brought into play as the dinosaur rotated upon its hind legs.

In the cases toward the end of the hall are found ancient Permian reptiles: *Diadectes*, *Edaphosaurus*, and *Dimetrodon* from North America, *Dicynodon*, *Moschops*, and *Scutosaurus* from South America and Russia. Here also are reptiles of Triassic age, some of them ancestral to the later dinosaurs. The most ancient types of land vertebrates, the stegocephalian amphibians, are also displayed in this portion of the hall. Eryops is of particular interest.

CORRIDOR OF MARINE REPTILES

(Index Plan, p. 19, Fourth Floor, Hall 12a)

This corridor, situated in the Roosevelt Memorial, occupies the angle to the right as one comes out of the Jurassic Hall. Here, on the wall, are displayed slabs of stone containing well-preserved fossils of the marine ichthyosaurs, including one specimen with embryos visible through the ribs as they lay in the body cavity of the mother. A fine specimen of *Plesiosaurus* is exhibited in a case at the foot of the staircase leading to the fifth floor. As one turns the angle of the corridor, on the wall to the left are the Flying Reptile Mural and slabs containing fossil foot-prints somewhat resembling huge bird tracks. These are in reality impressions left by great Cretaceous carnivorous dinosaurs which ran on their hind legs (see skeletons in the Cretaceous Hall adjoining).

HALL OF CRETACEOUS REPTILES

(Index Plan, p. 19, Fourth Floor, Hall 9)

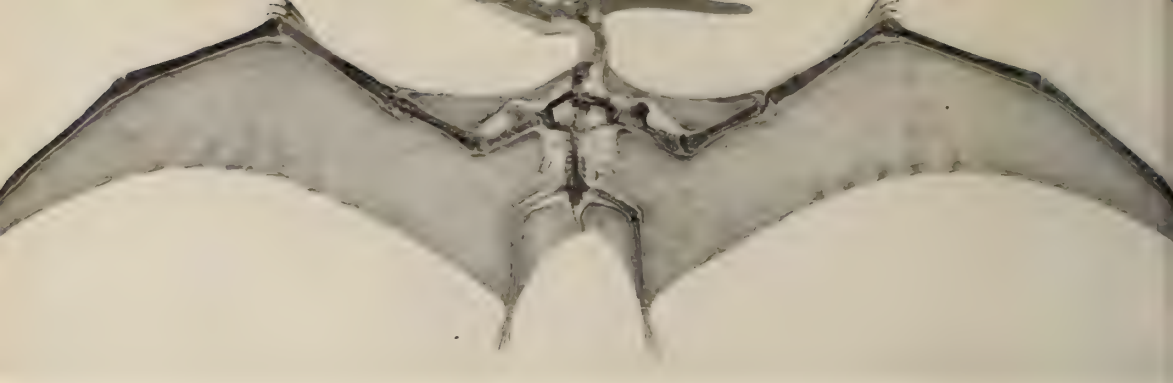
The Cretaceous Age was the period of the greatest development of dinosaurs, and at the close of that period they became extinct. At one end of the hall the visitor sees towering over his head the great *Tyrannosaurus*, the Tyrant Dinosaur, his head eighteen feet above the ground. This was the largest carnivorous land animal of all time and it doubtless preyed upon contemporaneous dinosaurs, many of which were protected by defensive armor and menacing horns.

A huge skeleton of *Triceratops* is seen at the left. This monstrous-headed creature doubtless fed on coarse vegetation. His jaws terminated in a great horny beak for clipping off branches and rushes, and his back teeth were adapted for shearing them. These teeth were arranged in several rows and as they wore out they were replaced by new teeth which pushed from below. The squatty fore-legs enabled the animal to lower his head to the ground with ease, and the big bony "frill" with which the skull terminated above the neck served as a protection, as a counterweight to the head and jaws, and as an attachment for powerful muscles.

To the right of *Tyrannosaurus* are the dinosaurs *Trachodon* and his relatives, *Corythosaurus* and *Saurolophus*. Note how the

STEGOSAURUS, a strange armored dinosaur of the past

THE DUCK-BILLED DINOSAUR (*Trachodon*). These remarkable herbivorous dinosaurs had a curious duck-like bill used in gathering aquatic vegetation. They walked on their hind legs or swam about using the tail as a propeller



A GIANT FLYING REPTILE (*Pteranodon longiceps*), the largest known American flying reptile with toothless skull and long, pointed beak

two large *Trachodon* skeletons are equipped with flat, expanded jaws which enabled them to strain out and crush the water plants and mollusks growing abundantly in the Cretaceous swamps where they fed. Nearby is a remarkable *Trachodon* specimen in which the impression of a large part of the skin has been preserved, giving us definite information as to the covering of the animal.

Two extraordinary armored dinosaurs are represented by parts of their skeletons. *Ankylosaurus*, which has been called "the most ponderous animated citadel the world has ever seen," was protected about its head and body by thick plates of bone, while the tail, instead of tapering to a point, ended in a great bony ball. Nearby is the fore part of *Palaeoscincus*, whose sides bristled with huge bony spines and whose back was protected by bony plates.

On the right and left of the entrance are two lightly but powerfully built flesh-eating dinosaurs known as *Gorgosaurus*. They were doubtless swift and fierce and preyed upon other dinosaurs.

Near these are examples of a small dinosaur

DINOSAURS AND THEIR EGGS (*Protoceratops andrewsi*). From the western Gobi

A RESTORATION OF BALUCHITHERIUM, a gigantic fossil rhinoceros 34 feet in length

whose general appearance suggests an ostrich, but with a long tail. On account of this resemblance it is known as *Struthiomimus*. This bird-like appearance, however, is purely superficial as it is not at all related to the ostrich. Nevertheless, primitive birds originated from light-boned pre-dinosaurs of a far earlier epoch (Triassic). Some examples of fossil birds are shown in the farther right-hand corner of the hall, including the giant long-legged *Diatryma* with its powerful beak, and the ancient swimming water bird, *Hesperornis*. In a neighboring case are casts of the famous *Archæopteryx*. This creature was actually transitional between reptiles and birds, having the skeletal characteristics, clawed fore-limb, and tapering tail of the former and the beak-shaped jaws and feathered covering of the latter. On the wall opposite are fossils and drawings of the great flying reptile, *Pteranodon*. A thin fold of skin extending from the elongated fourth finger to the outer edge of the feet enabled *Pteranodon* to fly through the air like a huge bat or vulture.

HALL OF MONGOLIAN VERTEBRATES

(*Index Plan, p. 19, Fourth Floor, Hall 5*)

Here are exhibits of specimens obtained by the Central Asiatic Expeditions. Among them are the famous dinosaur eggs and skulls and skeletons of the dinosaur, *Protoceratops*, that laid them. Here also is the skull of *Andrewsarchus*, the largest of carnivorous land-mammals; the shovel-tusk mastodon; and the skull and feet of *Baluchitherium*, an ancient relative of the rhinoceros, of titanic proportions. On the wall is a life-size model in low relief of this largest of all land-mammals.

FOSSIL MAMMALS

OSBORN HALL OF THE AGE OF MAMMALS

(Index Plan, P. 19, Fourth Floor, Hall 3)

This hall includes fossil remains of mammals of the Tertiary Period. To the left as one enters from the Hall of Mongolian Vertebrates, is a magnificent series of titanotheres, hoofed mammals related to the horses and rhinoceroses. This group has long been extinct but it embraces a remarkable series of evolutionary stages from creatures not much larger than a dog, up to great towering bulky animals with huge heads terminating in flat shovel-like horns of tremendous weight.

Opposite the titanotheres are the remains of condylarths and amblypods, very ancient hoofed mammals with no close relatives in the modern world. The most striking of these is the skeleton of *Uintatherium*, a six-horned amblypod with a tiny brain. This race became extinct early in the Age of Mammals.

Beyond the amblypods are cases devoted principally to the smaller fossil mammals. Although fragmentary, these are among the rarest and most interesting of fossils. The fossil primates (lemurs, monkeys, etc.) include unique specimens known throughout the world because of the light they cast on the earliest stages in the origin of man. Rodents (squirrels, rabbits, and their kin), insectivores (moles, hedgehogs, etc.), and marsupials (opossums, kangaroos, and their allies) are also typically represented here.

The ancestry of dogs, cats, and other living flesh-eating mammals and the various sorts of extinct carnivores including rare creodonts is shown near the middle of the hall on the right.

Fossil rhinoceroses are shown near the center of the hall on the left. A fine series of skeletons illustrates the diverse types of American rhinoceroses, and a synoptic series shows the evolution of this group of mammals. The large block in the central aisle is from Agate, Nebraska, and contains heaped-up bones, chiefly of the double-horned rhinoceros, *Diceratherium*, still in the original rock, as found. There are twenty-one skulls and innumerable other bones in this single block, giving a graphic conception of the enormous numbers of prehistoric animals that once roamed over our West. Near this, in the center of the hall, is the skeleton of *Moropus*, a most extraordinary mammal of bizarre proportions and equipped with great

TITANOTHERES. These long-extinct relatives of the horses and rhinoceroses began as small animals about the size of a small fox. The last of the titanotheres such as *Brontotherium*, on the left, were gigantic beasts with horns on the front of the skull

A GROUP OF MIOCENE CAMEL SKELETONS (*Stenomylus*). Some of these are mounted in characteristic attitudes as if they were alive, others are lying on the rock matrix as their remains were actually found by a Museum expedition. These camels inhabited America at the beginning of the Miocene Period

claws. Nevertheless, it belongs among the hoofed mammals and is related to the horses and rhinoceroses.

Also on the right side of the hall are specimens illustrating the evolution of the even-toed mammals, or Artiodactyls. Here are found the pigs and their relatives, the peculiar extinct oreodonts, the camels, deer, giraffes, and cattle.

The group of small camels in the central aisle forms a striking display. The graceful little animals, *Stenomylus*, lived in Nebraska during the middle of the Age of Mammals. Four skeletons are shown exactly as they were found in the rock, and five others have been mounted in various living poses.

Among the other cloven-hoofed mammals, the so-called giant pigs or entelodonts and the oreodonts are noteworthy. The latter, a totally extinct group somewhat pig-like in appearance but with teeth more like those of sheep, are strikingly represented by three complete skeletons huddled together, still intact in the rock just as death overtook them millions of years ago.

On this side of the hall are found skeletons of two extinct sea cows, one from Europe, the other from Florida. In addition at the end of the hall is a special exhibit of extinct proboscideans, mammals related to the modern elephants.

One of the most outstanding exhibits is

MAMMALS OF THE LOWER PLIOCENE PERIOD IN NORTHERN NEBRASKA. During this period short-limbed rhinoceroses lived with ancient camels and single-toed horses of small size. Murals by Charles R. Knight

the series of skeletons in the last alcove on the left showing the evolution of the horse. This display presents the story from the little Eocene mammal, *Eohippus*, through intermediate stages to the Pleistocene and modern horses, *Equus*. (See Guide Leaflet No. 36, *The Evolution of the Horse.*) As shown by skeletons of horse and man in another hall, the single toe of the horse corresponds to the middle finger or toe of man, and the same correspondence is seen in each of the other leg and arm bones. In the modern horse, all but the middle finger and toe have disappeared or have been reduced to "splint bones," but the remote ancestor of the horse had five toes.

THE HORSE UNDER DOMESTICATION

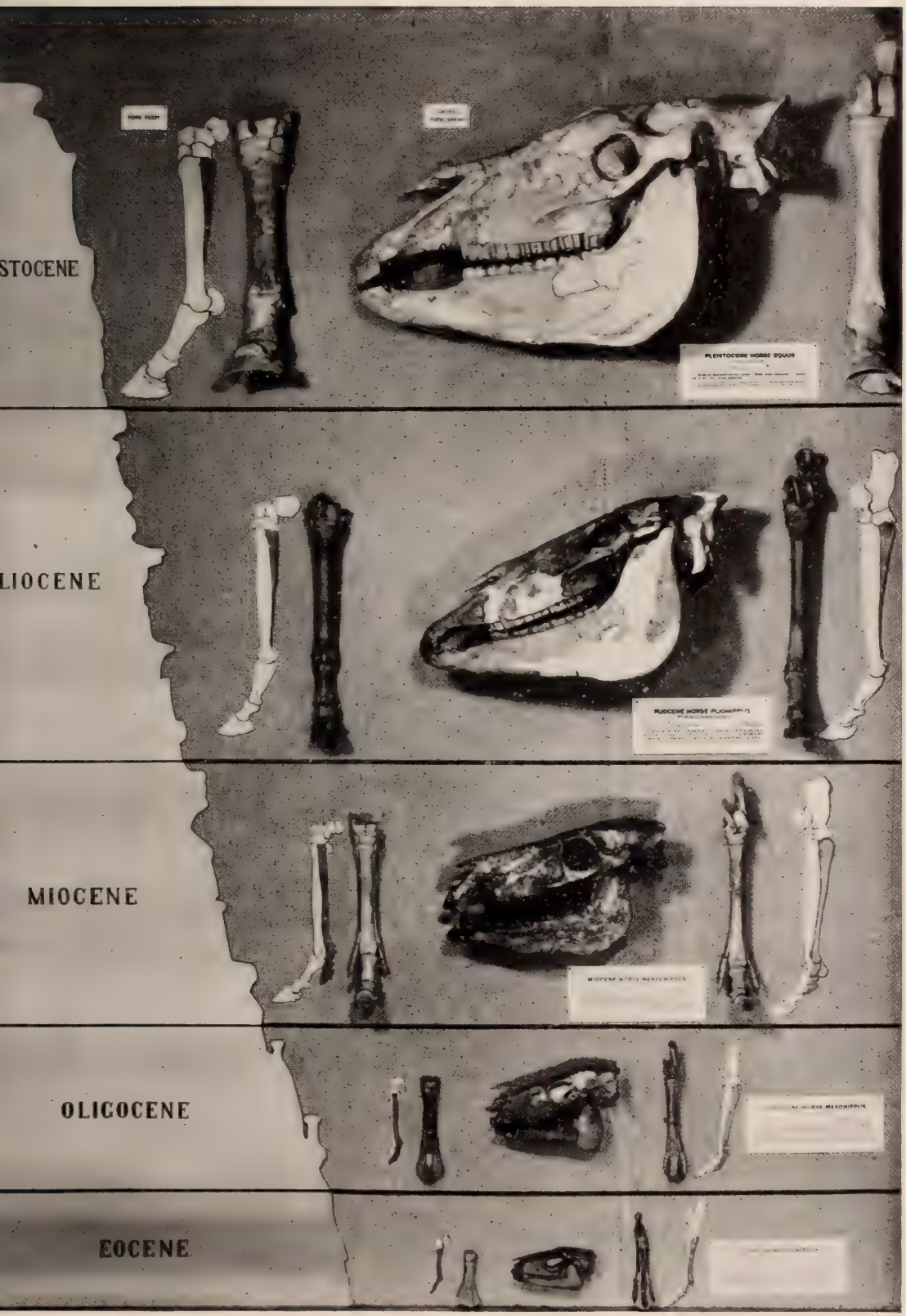
(*Index Plan, p. 19, Fourth Floor, Hall 2a*)

This hall is devoted to exhibits illustrating the great modifications that man has brought about by selection in adapting the horse to his various needs.

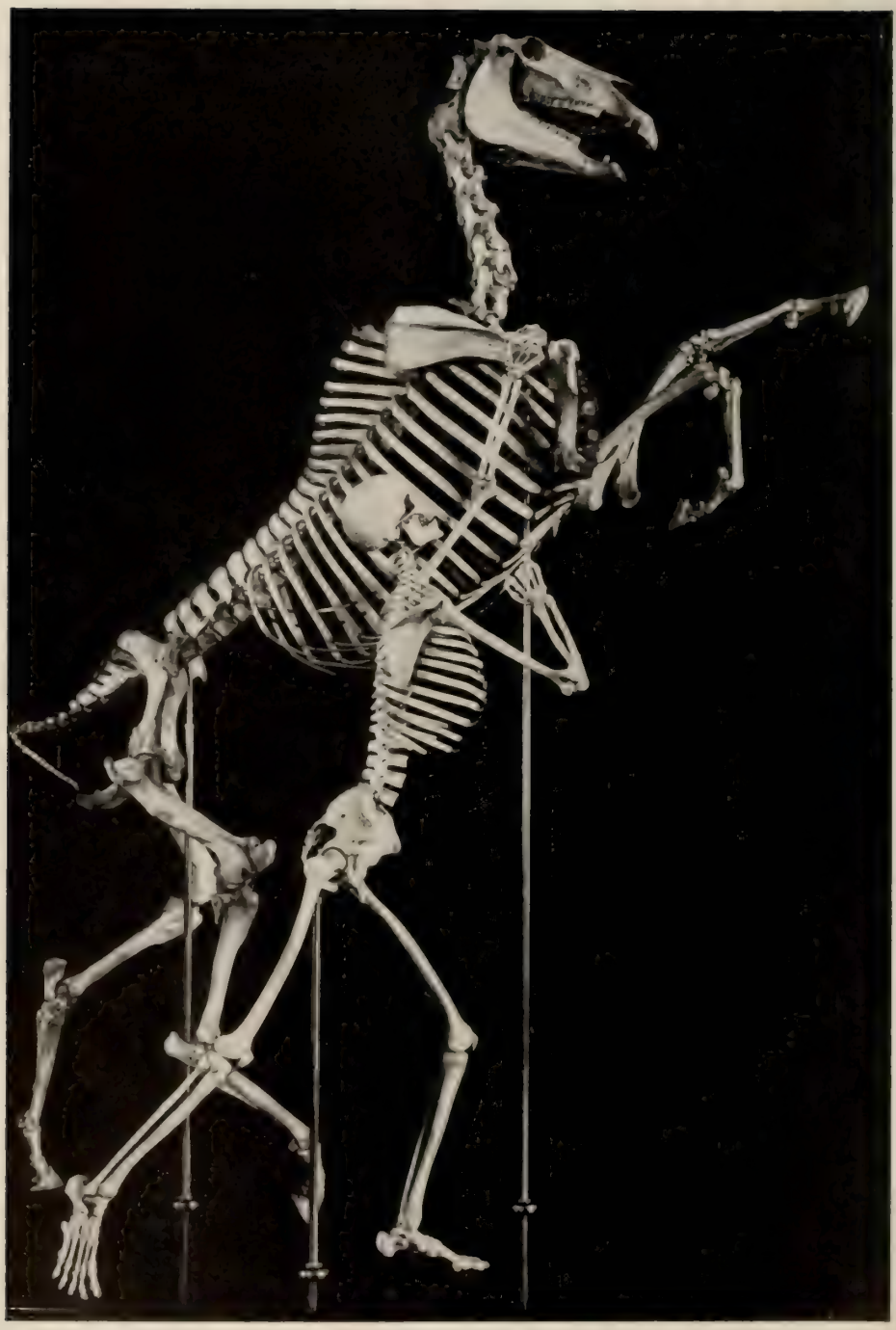
Under his management speed has been increased in the race horse, weight and strength in the draft horse, while the Shetland Pony has been reduced to a diminutive size. The modifications in the skeleton that have accompanied these changes are well shown in the notable series of beautiful skeletons mounted by S. H. Chubb.

The similarity in structure (homology) of the skeletons of horse and man is brought out in the exhibit of a rearing horse, controlled by man. It is interesting to note that both skeletons have the same principal parts, in spite of many conspicuous differences. In the horse the long upper and lower jaws, together with the high-crowned grinding teeth, form a very efficient mechanism for cropping and grinding the tough stems and hard kernels of grasses and similar vegeta-

MAMMALS OF THE UPPER PLIOCENE PERIOD IN NORTHERN TEXAS. The single-toed horses (*Plesippus*) were of larger size than those above, while the camels were more nearly like those of modern types. *Glyptotherium*, a gigantic armadillo-like animal, is shown in the lower left



EVOLUTION OF THE HORSE shown by skull and foot bones. (See text)



SKELETONS OF HORSE AND MAN COMPARED

on, whereas the short upper and lower jaws nd low-crowned cheek teeth of man are dapted for a mixed diet. Moreover, the orse's long jaws enable him to reach his ood, which is normally on or near the round, while the short jaws of man have ne food brought up to them by the hands.

The bony cranium or braincase of the orse is much smaller in proportion to the eight of the body than is the braincase of an, which is greatly enlarged by the enor- ous growth of the human brain. The bony ands of the remote ancestors of the horse ave become greatly modified during long ges of specialization for swift running. Thus ach "hand" of the modern horse has but ne finger, is very long and slender, and ter- inates in a thick horny hoof corresponding o the nail on the middle finger of the hand f man. Likewise the bone beneath the hoof orresponds to the last bone of the middle nger of the human hand. The visitor may njoy making similar comparisons for him- elf: for example, where is the so-called knee" of the foreleg of the horse and to hat does it correspond in man? (Answer: ne wrist.) Where is the true knee in the hind eg of the horse and where is its heel bone? What has become of the fibula or outer bone f the lower leg in the horse? Where is the cannon bone" in the foot of the horse and o what does it correspond in man?

But why do the skeletons of horse and an have so many parts that correspond to ach other? There can be no reasonable oubt that the remote common ancestors of orse and man were small mammals with five oes on all four feet The structural differ- nces have arisen as the result of gradually ncreasing differences in habits, the horse nally becoming highly specialized for run- ing and leaping on all fours, while man uses is fore limbs as arms and hands and balances is body on his hind legs.

SBORN HALL OF THE GE OF MAN

Index Plan, p. 19, Fourth Floor, Hall 2)

This hall is devoted to early man and his ontemporaries, the mammoths and masto- ons, and the giant ground sloths of South America. The collection displayed through the center of the hall illustrates what is known of the early history of our own race as shown by the remains of early man and the implements he used. As fossil remains of man are rare and usually very fragmentary, these are represented mainly by casts, but they include examples of all the more perfect and noteworthy specimens that have been found, from the Neanderthal and Gibraltar, to the Piltdown and Talgai. (See Guide Leaflet No. 52, *The Hall of the Age of Man.*) These are illustrated and further described on pages 125-126.

In the surrounding cases are some of the principal skeletons and skulls of animals mostly of Pleistocene Age, known to have been associated with man especially in North and South America. Skeletons and skulls on the right side of the hall show the evolution of the Proboscidea. They fall naturally into two groups; first the mastodons; and secondly, the mammoths and elephants. In the former division, beginning near the entrance of the hall, are the most primitive mastodons, with two upper and two lower tusks, and a very short proboscis. The succeeding cases show the gradual reduction of the number of teeth and the shortening of the front part of the skull for the accommodation of the longer proboscis found in all of the later stages of mastodons and mammoths.

On the left is a group illustrating the famous asphalt trap of Rancho la Brea at Los Angeles, California, and fossils from South America, the most striking of which is the group of giant ground sloths. There are also good examples of glyptodonts, gigantic relatives of the armadillo. Among other strange extinct animals are the camel-like *Macrauchenia*, and the rhinoceros-like *Toxodon*. These evolved in South America during the Age of Mammals when it was an island continent as Australia is today. Here, too, are the fossils of other mammals which evolved in South America during its period of isolation from the northern part of the Western Hemisphere.

On the walls are mural decorations painted by Charles R. Knight showing the typical groups of Pleistocene animals of North and South America and Europe that were associated with early man.

MOUNTED SKELETONS OF EXTINCT ANIMALS OF SOUTH AMERICA

PREHISTORIC saber-tooth tiger, dire wolf, and giant sloth, caught in the tar pools of La Brea California. (*Above*) as mounted skeletons; (*below*) as conceived by the artist, Charles R. Knight

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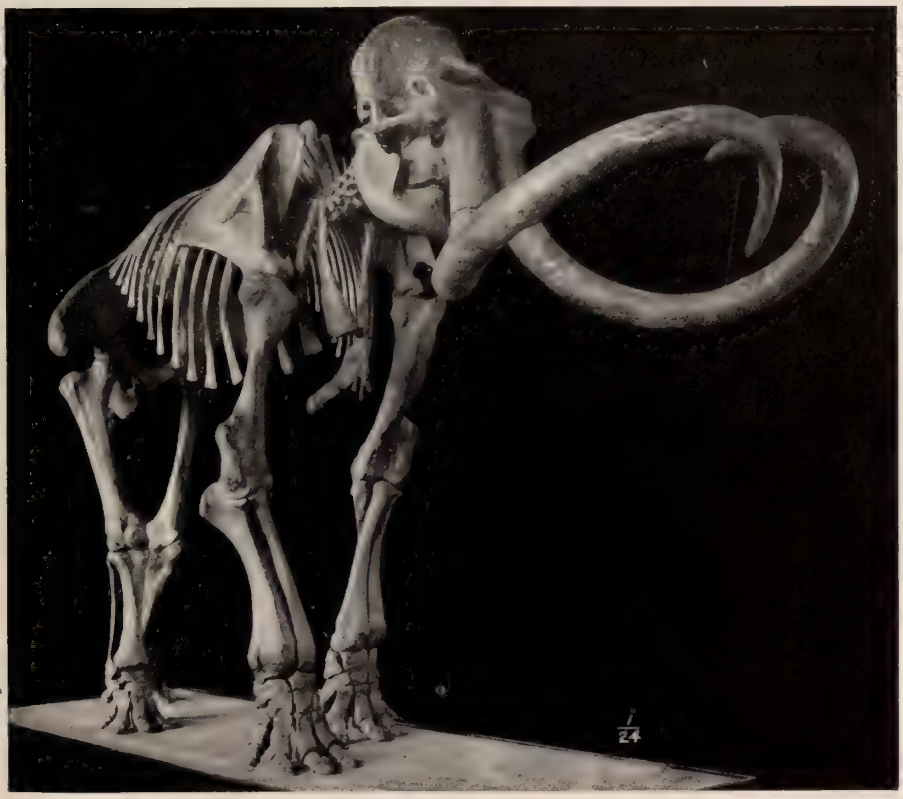


(Left)
SKELETON OF THE JEFFERSONIAN MAMMOTH from Indiana.

THE WOOLLY RHINOCEROUS DURING A GLACIAL WINTER IN NORTHERN FRANCE. The Murals by Charles R. Knight.

MODEL OF RHODODENDRON in the Forestry and Conservation Hall. Many of the trees in this Hall are accompanied by models of leaves, flowers, or fruit

Forestry and Conservation

(Index Plan, p. 16, First Floor, Hall 3)

Jesup Forestry Hall. The Forestry and Conservation Hall contains a nearly complete collection of the native trees north of Mexico presented by Morris K. Jesup. On the right is a bronze tablet by J. E. Fraser, the gift of J. J. Clancy, depicting Mr. Jesup as he walked in his favorite wood at Lenox, Massachusetts. In front is a bust of Charles Sprague Sargent, under whose direction the collection was brought together. At the farther end is a bust of John Muir, by Malvina Hoffman, presented by Mrs. E. H. Harriman.

To the left is a section of one of the Big Trees of California, sixteen feet in diameter and 1341 years old. (See Guide Leaflet No 42.) It began its growth in the year 550, s that it was nearly a thousand years old be fore America was discovered. The label illustrating the conclusions reached by Ells worth Huntington as the result of lon study, shows how the climate of the past i recorded by the trees and how great histori cal events are related to great changes i climate.

In the center of the hall near the entranc from the 77th Street Foyer is a splendid life size model in wax of a magnolia blosso belonging to the species *Magnolia macro phylla*, surrounded by its long taperin leaves.

In the last alcove to the right is the Menke Collection of Glass Flowers, representin many of the common species of America flowers. They are modeled skillfully in glas with their colors faithfully copied fro nature.

In the center of the hall (Case D) wi

be found a dissolving diorama, the first of a series on forest conservation. The first scene represents a forest area of Colorado White Pine in Idaho and shows the early glow of a forest fire in the distance. This dissolves into a scene of the same area after the fire, showing the burned trees, destroyed surface coverage, and general desolation.

The other specimens in the hall show cross, longitudinal, and oblique sections of the wood of North American forest trees, finished and unfinished. The labels adjacent give the distribution of the species, the characteristics of the wood, and its economic uses. The trees are grouped by families, and the location of each family will be found on the floor plans in the first case on either side of the hall. The reproductions of the flowers, leaves and fruits are made in the Museum laboratories.

A DISSOLVING-VIEW EXHIBIT in the Forestry and Conservation Hall. The disastrous effects of a forest fire are depicted when the three-dimensional scene above fades into the one below

Living Invertebrates

THE DARWIN HALL OF THE EVOLUTION OF LIFE

(*Index Plan, p. 16, First Floor, Hall 5*)

THIS hall is devoted chiefly to invertebrates and exhibits illustrating biological principles, especially those concerned with the evolution of life. It is, therefore, dedicated to Charles Darwin. Facing the entrance is a bronze bust of Darwin by William Couper, presented by the New York Academy of Sciences on the occasion of the Darwin centenary in 1909.

THE TREE OF LIFE

In the first upright case at the left is a Family Tree of the Animal Kingdom. Each class of animals is represented by a color sketch, and the branches show the relationships of the various classes and indicate the evolution of each group from the parent stem.

SYNOPTIC SERIES

The exhibits in the succeeding upright cases comprise examples of the various groups or orders included in the Classes shown on the Family Tree. Passing around the hall from left to right, the progress of evolution is illustrated from the lowest forms, the Protozoa, to the highest, the Primates, which include man.

ALCOVE 1, *Protozoa.* This alcove contains the lowest forms of animal life. All are single-celled individuals. Some are abundant in swamps and stagnant water, others are found in the sea. These exhibits are mainly models, some of which represent Protozoa enlarged more than a thousand diameters.

ALCOVE 2, *Sponges.* Sponges are principally of three kinds—distinguished from each other by their skeletons of lime, silica (i. e., flint) and of horny fiber. The sponges of commerce belong to the latter class. In the dry specimens exhibited, the skeleton only can be seen, the living tissue having been removed. Sponges range in size from the tiny *Grantia* of the New England coast to the gigantic "Neptune's goblets" of the eastern seas.

ALCOVE 3, *Polyps.* Here are shown coral animals and their relatives: among them are the colonial hydroids; jellyfishes, brilliantly colored sea anemones, sea fans and sea plumes; the stony corals, and the precious coral.

ALCOVE 4, *Flatworms.* The best known species include the tapeworms, whose development and structure are shown by models in the left-hand alcove case. The less familiar free-living flatworms, which inhabit both salt and fresh water, are represented by enlarged models.

ALCOVE 5, *Roundworms.* The roundworms are parasitic, since they live in the digestive canal of mammals. The most familiar is the common stomach worm, *Ascaris*, of which an enlarged model shows the internal structure.

ALCOVE 6, *Rotifers.* The minute wheel animalcules, otherwise called rotifers, comprise many exquisite and grotesque forms, some of which construct tubes of a gelatinous substance, sand-grains, etc. A few species are parasitic, but most of them live a free, active life. They are found mainly in fresh water. See group in window showing rotifers in their natural environment and the comparative series of enlarged models of typical rotifers in the case to the left.

ALCOVE 7, *Sea-Mats and Lamp-Shells.* The sea-mats are minute, colonial animals of plant-like growth, often occurring as encrustations on shells and seaweed. A few species also occur in fresh water. The lamp-shells shown in this alcove superficially resemble clams, but by structure are more closely related to the sea-mats.

ALCOVE 8, *Sea-Stars and Their Relatives.* Here are shown sea-stars, brittle stars, sea-urchins, sea-cucumbers and sea-lilies. The sea-star is the pest of the oyster beds, where it feeds on oysters and destroys them in large numbers.

ALCOVE 9, *Annulates.* As typified by the familiar earthworm, these are worms whose bodies are made up of rings or segments. They are inhabitants of both fresh and salt water, many kinds living in the mud and

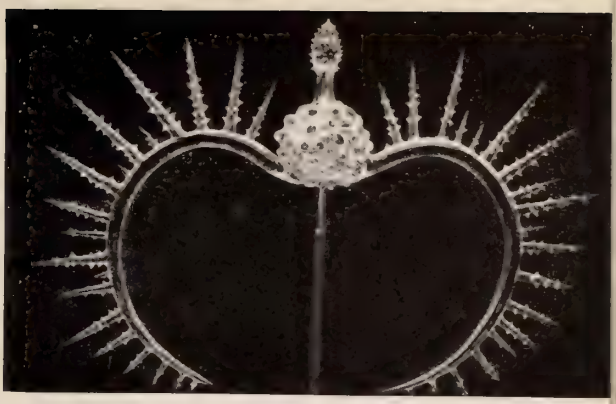
A CORNER OF THE NAHANT TIDE POOL GROUP. On the rocky northern New England Coast are numerous basin-like crevices in the cliffs. At high tide, many of these are totally submerged, but as the water recedes they are left as stranded pools richly populated with marine animals and plants. In the Tide Pool Group in the Darwin Hall, sea-anemones and hydroids are disclosed among the rockweed, sea-lettuce and kelp

A DETAIL FROM THE ROTIFER GROUP. A world of microscopic life magnified a million times shown in the Darwin Hall

(*Left*) The curious HORSE SHOE CRAB is a "living fossil" with ancestors dating back 700,000,000 years. A detail from the Sound Bottom Group

ODEL OF A ROCK-FORMING PROTO-AN (*Globigerina*). The microscopic creature wn above builds tiny shells from lime dissolved ea water. These become compacted into lime-ne layers on the sea-bottom. The Chalk Cliffs Dover are composed of elevated masses of this rock

LARGED MODEL OF THE PLUMED WORM (*Diopatra*)



GLASS MODEL OF A TYPICAL RADIOLARIAN. These tiny floating marine creatures make glassy shells of intricate patterns and, when they die, sink to the sea-bottom to form radiolarian ooze, a flinty sand used for polishing precious stones

GLASS MODEL OF THE PORTUGUESE MAN-OF-WAR IN THE DARWIN HALL

sand of the shore while others bore into wood and shells. Their body structures are often very beautiful and interesting examples of ingenious adaptation.

ALCOVE 10, *Arthropods.* Here are included the familiar crabs, lobsters, myriapods, insects, spiders and their relatives. The number of existing species in this group is greater than that of all the rest of the animal kingdom.

On the wall are the two largest lobsters ever taken. They weighed when alive thirty-one and thirty-four pounds, respectively. The largest of the arthropods is the giant crab of Japan, which, like that placed on the wall, may have a spread of about ten feet.

A series of models of insect heads, carefully wrought in wax and glass, shows, greatly enlarged, their comparative anatomy.

ALCOVE 11, *Mollusks.* The mollusks are next to the arthropods in the diversity and vast number of forms which they embrace, including marine, fresh-water and land animals. All mollusks have soft bodies, but nearly all secrete a shell which is often of pearly material (mother-of-pearl). Well-known examples of this group are the common clam and oyster. Enlarged models show the anatomy of these species. The main collection of mollusks is shown in the Hall of Ocean Life.

ALCOVE 12, *Chordates, including Vertebrates.* Vertebrates include the largest, most powerful and most intelligent of animals, the group culminating in man. Among the ancestral forms suggesting transitional stages from invertebrates are the "acorn-worm," *Dolichoglossus;* the Sea-squirts, or Ascidians; and the Lancelet, *Amphioxus.* Enlarged models showing, carefully dissected, their comparative internal anatomy are exhibited in the case to the left. Various species of Ascidians with their associated environment are shown among the animals on the wharf-piles in the window group. Other models in a case toward the front of the hall show the development of the egg of certain typical vertebrates.

WINDOW GROUPS

In several of the alcove windows are habitat groups of invertebrates illustrating the natural history of the commoner and more typical forms.

Marine Worm Group. In the Annulate Alcove is shown the Marine Worm Group, reproducing these animals with their associates in their natural surroundings, as seen in the harbor of Woods Hole, Massachusetts.

Shore Mollusk Group. In the Mollusk Alcove is shown the natural history of a sand-spit at Cold Spring Harbor, Long Island, including some of the shore mollusks and their associates.

Wharf Pile Group. This shows the submerged piles of an old wharf at Vineyard Haven, Massachusetts, covered with flower-like colonies of sea-anemones, hydroids and other stationary animals.

Rock Tide-Pool Group. In the farther left-hand corner of the hall, a window group shows the animals and plants of a rock tide-pool, the "Agassiz Cave," at Nahant, Massachusetts. The falling tide has left a pool in a rocky basin, sheltered within which is a community of sea-anemones, sea-stars, and other invertebrates.

Sound Bottom Group. In the Arthropod Alcove, a group shows the struggle for existence among Crustacea on the sandy bottom of Vineyard Sound, Massachusetts. Here is a den of lobsters in a crevice beneath the seaweed-covered granite boulders forming the reef known as the Devil's Bridge.

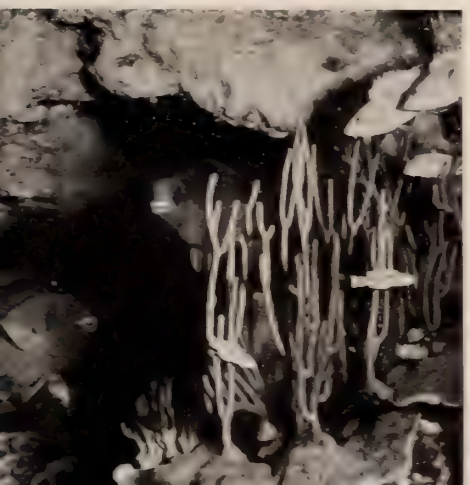
Bryozoa Group. Another group represents two square inches of sea bottom as though enlarged under a microscope to an area five feet square. The front of the case is built to represent a huge magnifying glass, through which the visitor sees marine plants magnified to tree-like proportions, encrusted with colonies of Bryozoa or "sea-mats," composed of thousands of individuals, each of which builds a shell of vase-like form. Associated animals, such as the flower-like, tube-building worms and sea spiders, are enlarged to grotesque proportions.

Rotifer Group. A companion exhibit represents a cubic half-inch of pond bottom enlarged one hundred diameters or cubically a million times, transforming a minute area into a towering aquatic forest peopled by rotifers and myriads of other strange creatures ordinarily invisible to the naked eye.

A PORTION OF THE BAHAMAN CORAL REEF GROUP IN THE HALL OF OCEAN LIFE. This group, the largest in the Museum, contains more than forty tons of coral from Andros Island in the Bahamas and faithfully depicts a portion of the magnificent barrier reef as it appears from the sea bottom

(*Right*) BLACK ANGEL FISHES swim in stately fashion among the corals

(*Below*) BLUE PARROT FISH peer out from a mysterious cavern in the heart of the reef



SPINDLE SHELL (*Fusinus*). These graceful shells are characterized by the long twisted spire and slender tapering canal terminating the body whorl

THE CORAL REEF GROUP

(*Index Plan, p. 16, First Floor, Hall 10*)

As you enter the Hall of Ocean Life on the gallery level the *Bahaman Coral Reef Group* is seen at the farther end. Its proscenium arch rises from the main floor, passes through the gallery, and frames the upper part of the group in a half-circle 35 feet high.

The portion of the group above the gallery presents a vista of coral island, quiet lagoon, and tropical sky. On the distant horizon the low-lying Bahaman Island of Andros is visible, soft with its fringe of coconut palms. Here the finest coral barrier reef in the West Indies parallels the shore. The small island in the foreground is Goat Cay, just back of the barrier reef.

The section of the group below the gallery obviously depicts the coral forest as seen from the bottom of the sea. On either side, staircases permit visitors to descend from the gallery, to find themselves standing on the ocean floor, gazing into the heart of a magnificent coral forest. The branching trees of elkhorn coral (*Acropora palmata*) rise to the water surface sixteen feet above. A rocky arch at the right leads into the Cave of the Blue Parrot-fishes, inhabited by three of these magnificent creatures.

Between the rocky wall and the spreading tangle of the coral forest a vista opens out into a clearing where a school of black-angel fishes swims by in the distance. In the foreground are squirrel-fishes, striped and gray grunts, blueheads, slippery dicks, and spotted hinds. Above a school of yellow-tails swims around the coral cliff, and houndfishes dart about, alarmed by the approach of a barracuda visible just beneath the water-surface at the upper left. Rock beauties, butterfly fishes, and blue angel-fishes swim among the sea fans, sea-bushes and sea-plumes; while a large rainbow parrot-fish, Nassau groupers, and a huge green moray lurk in the crevices and caverns under the coral. The latter is gay with encrusting and chimney sponges of scarlet, green, purple, yellow, and gray. To the left, queen triggerfishes, numerous butterfly fishes, and a grotesque trumpet fish swim above the great heads of brain coral, orb coral, and star coral.

PEARL DIVERS GROUP

(*Index Plan, p. 16, First Floor, Hall 10*)

This group represents a scene on the ocean floor within the enclosed lagoon of the coral atoll of Tongareva, or Penrhyn Island. This is a small ring-shaped island, eleven miles in

ameter, situated in the South Pacific Ocean out 2,000 miles due south of Honolulu. the central panel of the group, two Tonrevan pearl divers are seen plunging down to a gorge in the heart of one of the magficent coral reefs which form the island. hey are engaged in gathering shells of eleagrina, the "oyster" in which are found e precious pearls. They go about their work despite the dangers evidenced by the large shark swimming in the background, by the octopus lurking near the entrance of a near-by cave, and by the scarlet sixteen-rayed sea-star with its hundreds of poisonous sharp spines which is lying under the giant spiral mass of the acropore coral in the center of the group. As they work, fishes of every gaudy hue dart past them.

A DETAIL OF THE PEARL DIVERS GROUP. A coral fairyland of Tongareva Island, teeming with variegated undersea life, is the scene in which this native diver is shown searching for pearl shell.

In the panel to the right, we look into a cavelike opening in the coral which has been pre-empted by the octopuses. One glides down from a ledge above the cave, another lurks in a shadowy crevice, while a third swims out through an arched tunnel, trailing its tentacular arms behind.

The panel on the left side of the group depicts the clifflike coral wall of the gorge, on which is grouped a colony of man-trap clams, *Tridacna*. The sinuous apertures of the shells are partially opened, revealing the gaily-colored mantle edges.

The group serves to emphasize the beauty of the delicate fronds and finely divided clusters of coral found in the Pacific reefs, as contrasted with the wierd branching species of the Atlantic coral faunas depicted in the adjacent Bahaman Coral Reef Group.

In cases near by are shown undersea paintings which were used in the creation of this realistic exhibit and other related ones.

Directly above the Pearl Diver Group is a mural by F. L. Jaques depicting the native divers in their outrigger canoes.

The corresponding position at the left of the Coral Reef Group is occupied by a mural

THE GLORY OF THE SEA (*Conus gloria-maris*). This is the rarest and most romantic of shells. Only a dozen specimens are known, and none have been collected for more than a century. The Museum possesses two specimens

THE PEARLY OR CHAMBERED NAUTILUS (*Sectioned shell with animal in place*). This remarkable creature belongs to a bygone age. It is the only surviving species of a long line of fossil forms reaching back 500,000,000 years or more

showing Florida sponge boats and their diving crews.

Other exhibits in the Hall of Ocean Life are described on pages 116-120.

GALLERY OF SHELLS

(Index Plan, p. 16, First Floor, Hall 10, balcony)

Around the gallery of the Hall of Ocean Life is one of the largest and finest shell collections on display in any museum. Together with the study collections it comprises more than 760,000 catalogued specimens. It includes many shells of unusual beauty and rarity, as well as important private collections donated to the Museum.

The largest shell is that of the giant clam, *Tridacna,* weighing 579 pounds, exhibited in the small foyer as one enters from the Hall of Fishes. The largest mollusk known, however, is represented by the model of the Giant Squid (*Architeuthis princeps*) which is suspended above the balcony just inside the entrance. This species has been known to reach a length of over 50 feet.

The mollusks are classified in five main groups, as follows:

The *Amphineura* or Chitons and their relatives. These are the most primitive of living mollusks, the larger number of them having an oval, creeping body with a jointed shell of eight transverse plates. They have a certain serial repetition of body-parts and breathe by means of a double row of plume-like gills.

The *Gastropoda* or Snails. This is the most important group in number of species, distribution, and extent of diversification. They are the most ancient from the standpoint of fossil remains. The earliest shells resembled a "liberty cap," being cone-shaped with the shell uncoiled. Soon forms appeared with a one-sided roll. A little later the spirally twisted and usually right-handed shell was established, which has been generally characteristic ever since. The twist of the shell is reflected in the internal anatomy. In some gastropods the shell has become reduced, in others it has disappeared entirely.

The *Scaphopoda* or Tusk-Shells are relatively unimportant, comprising only a few species. They possess a shell shaped like an elephant's tusk open at both ends.

The *Pelecypoda* or Bivalves, including oysters, clams and their relatives, have the mantle divided into two halves, each of which secretes a shell. These, nearly equal in size, are hinged together. The foot is flattened vertically and extends down from the enclosed body-mass. It may be protruded from between the two shells for digging or swimming. Delicate, flattened and fine-meshed gill-flaps on either side furnish breathing organs and an arrangement for filtering out food-particles.

The *Cephalopoda* include the swiftly moving squids, cuttlefishes, and octopuses. This highly organized and specialized group is composed of predaceous species with efficient eyes and a peculiar method of propulsion. The Pearly Nautilus is the most ancient type.

The arrangement of the shells in the gallery is as follows: The Amphineura, Marine Gastropoda, and Scaphopoda are exhibited in the series of "A-cases" along the two sides of the gallery in the order of their families. The A-cases are numbered from 1 to 40.

The Pulmonates or Land Gastropoda are displayed in the tops of eight table-cases, of which four are at either end of the hall in the transverse galleries. They are also arranged by families.

The Pelecypods, or bivalves, and the Cephalopoda are in the "wall-cases" on either side-gallery, beneath the murals.

In the wall-cases on either side of the entrance are shells especially selected for their size and beauty, those to the right as one enters the hall, being from the Constable collection, and those to the left mainly from the Steward collection.

In the wall-case at the farther end of the gallery to the right of the Coral Reef Group is a series showing the commercial uses of shells and shells with unusual deformities. Continuing around the angle of the gallery is an exhibit illustrating the fisheries of fresh-water pearl shells and the pearl button industry.

In the shell laboratory to the right of the entrance foyer an attendant is ready to give information about shells and their location in the hall.

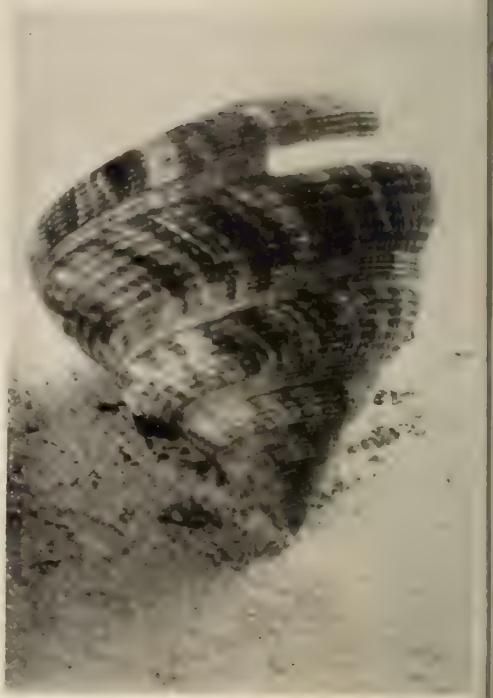
STRIKING SPECIMENS FROM THE MOLLUSK COLLECTIONS

(*Right*) THE IMPERIAL HARP SHELL (*Harpa costata*). The graceful shape of this shell suggests its name. Variegated with rich coloring, it is one of the most attractive of mollusks. It is distinguished by the close-set prominent ribs

(*Right*) THE RARE SLIT SHELL (*Pleurotomaria*). A nearly extinct shell from deep water in the West Indies and near Japan, characterized by the broad slit extending partly around the outer whorl

(*Below, right*) NORTHERN SCALLOP (*Pecten islandicus*): A form first discovered in Iceland

(*Below, left*) THE PAINTED THORNY OYSTER (*Spondylus pictorum*). A beautifully tinted bivalve from Lower California. The spines are rose-red, orange or yellow



THE SEVENTEEN-YEAR CICADA (*Cicada septendecim* Linnaeus): from a Group in the Insect Hall. During May or June of a "locust year," the immature seventeen-year-old Cicadas emerge from underground and ascend tree-trunks. Within a few hours their skin splits along the back and the adult emerges. The female deposits her eggs in a succession of slits in the slender twigs. The song is produced only by the male

INVERTEBRATES OF NEW YORK STATE

A series of the principal invertebrates except insects found within the boundries of New York State and its neighboring waters is exhibited in the corridor of the first floor of the Roosevelt Memorial to the right as one enters from the Fish Hall (Index Plan, p.16, First Floor, Hall 12a).

Insects

HALL OF INSECT LIFE

(Index Plan, p. 18, Third Floor, Hall 5)

THIS interesting hall is virtually a textbook of Entomology. A series of "A-cases" surrounds the hall giving a vivid presentation of insect biology, including the relations between insects and vegetation, the importance of insects as carriers of disease, and general biological facts and theories as illustrated by insects. These cases are numbered to facilitate the work of teachers sending students here for information.

In the center of the hall is a circle of exhibits, some of which show mounted insects in life-like artificial surroundings. Among the habitat groups is a series illustrating the life-histories of common butterflies. The very beneficial Lady Beetles are shown next to the very injurious Japanese Beetle. Other groups are concerned with such tropical insects as the Leaf-cutting Ants. Exhibits of Mole Cricket and Dragonfly larva show the insects and environment magnified five diameters.

A GATHERING OF MONARCH BUTTERFLIES. In early autumn the Monarch Butterfly, *Anosia plexippus*, assembles in great swarms in the northeastern United States. At nightfall, large numbers crowd the leaves and branches of trees or shrubs. These flocks move southward, much as birds migrate. Individual females come north the next spring and reestablish the northern population

MODEL OF A MOLE CRICKET (enlarged five diameters). An insect with fore-legs especially adapted for digging

The walls of the hall are used for supplementary exhibits. One of these displays strikingly beautiful butterflies and moths from all parts of the world. Another demonstrates the wealth of insect life at our very doors. The commercial use of insect silk and the use spiders make of their silk occupy the wall on either side of the entrance to the Reptile Hall. On the wall around the corner to the right are shown some of the results of the research work of the entomological department, especially in the field of experimental biology.

INSECTS IN A SUBURBAN YARD

The insects in the railing cases of the adjoining Synoptic Hall of Mammals (Index Plan, p. 18, Third Floor, Hall 3) are placed there temporarily.

The collections in general are arranged with special reference to the insects found

MASSING OF LADY BEETLES ON MOUNTAIN TOP. From a group in the Insect Hall. With few exceptions Lady Beetles (Coccinellidae), both larvae and adults, eat either plant-lice or scale insects. The species of *Hippodamia* specialize on plant-lice. In the West, the adults often gather in large masses under rocks on the tops of mountains to pass the winter. Such a gathering near Boulder, Colorado, is shown here

BUMBLE-BEE POLLINATING APPLE BLOSSOMS. From an exhibit in the Insect Hall. A few insects cause a loss of about one-fifth of our fruit, but we should have little or no fruit were it not for other insects pollinating the blossoms

DRAGON FLY LARVA CATCHING A MOSQUITO LARVA by means of a curiously modified lower lip, which is jointed and has a pair of pincers at its tip. (Insect Hall)

near New York City. They are presented in two series:

General Series. This is arranged in a definite order which should be followed as indicated by numbers.

The topics treated are: Importance of Insects, Geological History and Relationships, Anatomy and Physiology, Development from Egg to Adult, Variation in Form and Color, Natural Selection, Inheritance, Collection and Identification, Habits, Enemies, Injuries to Man, Benefits to Man.

Butterflies of New York State. A striking exhibit of some of the butterflies found in the State of New York is installed in the corridor of the Roosevelt Memorial Building (Index Plan, p. 16, First Floor, Hall 12a) just to the left of the entrance from the Fish Hall on the first floor of the Museum.

Living Fishes

HALL OF LIVING FISHES

(*Index Plan, p. 16, First Floor, Hall 9*)

ON ENTERING the Hall of Fishes from the Darwin Hall one faces a group of sharks, sweeping down upon a helpless logger-head turtle. The following sharks are represented in this group:

(1) *White Shark* or *Man-eater.* One of the largest sharks, growing to a length of 30 feet or more. This ferocious shark feeds on large fish and sea-turtles. It has been known to attack men and even small boats. Fortunately it is apparently rare everywhere and usually remains on the high seas.

WHALE SHARK (*Rhineodon typus*). This is the largest species of shark; represented here by an eighteen-foot specimen. Note the wide mouth rectangular jaw, light spots, and the parallel ridges extending toward the tail

THE SEA ROVERS. An undersea scene, showing a number of sharks attacking a sea turtle. In the lead is a twelve-foot Tiger Shark; on the left, a Hammerhead; and in the background, the White Shark or Man-Eater

MODEL OF THE MANTA OR DEVIL FISH (*Manta birostris*). From specimen taken off the west coast of Florida, measuring 17 feet across

2) *Spot-fin Ground Shark* or *Shovelnose.* lay be recognized by its small second dor- il fin and very long tapering pectorals, in ombination with a flattened shovel-like ose. It produces living young, feeds chiefly n fish and squid, and is harmless to man.

3) *Southern Ground Shark.* Somewhat re- mbles the Tiger Shark but differs in its ery blunt snout, stouter body, very large ectoral fins, and complete absence of spots. inhabits coastal waters and feeds on fish, c. It is common about wharves, where it icks up refuse, but is not dangerous to man.

4) *Tiger Shark.* This fish sometimes reaches length of 30 feet and is a very active, pre- aceous shark of the high seas. It has wide ws and powerful sickle-shaped teeth, and preys upon large sea turtles, other sharks, sh, and invertebrates. The tiger shark is uch dreaded in the West Indies, but there no authentic record of attacks on human eings.

5) *Hammer-head Shark.* The strange flat- tened and widened face of this shark seems to serve as a bow-rudder, which is used in making very quick turns in pursuit of fish. It occasionally reaches a length of 12 feet.

(6) *Sand Shark.* This shark may be recog- nized by its combination of a delicate nose and unreduced second dorsal fin. The sand shark captures great numbers of small fish, which are its chief diet. There is no record that it attacks man.

The *Systematic Exhibit* includes a rep- resentative series of fishes, from the lowly "cartilage fishes," such as the sharks and rays, to the highest or most complexly constructed bony fishes. Noteworthy in this series are the mounted groups of "ganoids," including the sturgeons, spoonbills, bony gars, and bowfins, all of special scientific interest, since they are "living fossils," or descendants of the now extinct fishes of earlier geologic times. In the alcoves and wall cases on the right, the visitor will find many curious forms, such as the giant catfishes, the hand-

(*Above*) DEEP SEA ANGLERS. Note fishing rod with luminous tip

some rooster fish, the brilliant parrot wrasses, and butterfly fishes.

On the right side of the entrance to the inner enclosure is the *Biological Exhibit*. This considers the fish as a machine—its stream-line form, its main principles of construction, its locomotor machinery, and the mechanism of its jaws.

The *fish life of warm seas* is represented in the inner enclosure, including the giant Manta, or Devilfish, a small individual of the spotted Whale Shark, largest of fishes, and in the foreground a bit of sandy bottom with small species as it would appear about Bimini, Bahamas.

The model of a *Manta* or *Devilfish* (*Manta birostris*) was made from a specimen taken in 1915 near Captiva Islands, off the West Coast of Florida, by Russell J. Coles. It measures 17 feet across the out-stretched wings. Still larger specimens up to 22 feet wide are on record. The Manta, like other skates and rays, may be regarded as a "winged shark" in which the body has become depressed and the breast fins enlarged into "wings" which are the chief organs of locomotion.

The *Whale Shark* (*Rhineodon typus*) is an 18-foot specimen taken at Acapulco, Mexico, March 2, 1935. This species is the largest and most characteristically marked of living sharks. In 1935, 76 specimens had been recorded. Among these a measured specimen reached 45 feet in length, but there are reliable estimates of 60 to 70 feet. The markings form a striking pattern of vertical yellow bars separating vertical rows of yellow spots.

(*Below*) VIPER FISH (*Clauliodus*) PURSUING BIGHEADS (*Melamphaes*)

The *Deep Sea Fishes* form a special exhibit in an inner room. Here in the semi-darkness we view some of the hobgoblins of the ocean depths—many of them covered with jewels of phosphorescent light.

Fishes that live at great depths have to be able to endure enormous water pressure, low temperatures and total darkness. At one mile depth each square inch of surface of a fish's body is under a pressure equal to about one ton. But the pressure is equal in all directions. It permeates the whole body of the fish inside and outside and evidently does not injure the most delicate tissues.

A small exhibit in the left-hand corner of the central darkened room tells of the remarkable life-history in which there is a striking transformation of the "stalk-eyed fish" into a "Gleaming-tailed Sea Dragon." This exhibit is based on the investigations and material of Dr. William Beebe in connection with deep sea fishes taken off Bermuda. He proved that the minute "stalk-eyed fish," which carries its eyes out at the ends of long stalks, really grows up into the "Gleaming-tailed Sea Dragon" (*Indiacanthus fasciola*), formerly supposed to be a different species.

The deep sea life is dependent ultimately upon the rain of food-bearing particles from the richer waters of the surface. The countless myriads of microscopic plants are absorbed by the microscopic animals and these by the billions of tiny copepods or shrimps, which in turn are devoured by the ravenous small fishes.

Many different kinds of deep sea fishes have the power of luminescence. In some fishes the surface of the body is studded with little glow lamps, each of which has a lens, a reflector and a gland for producing a substance called luciferin which emits a light when supplied with oxygen from the blood. The little shrimps and other creatures upon which the fish feeds are attracted toward the lights as the moth to the flame. The lights also enable fishes of the same kind to find each other and keep together in schools.

Big Game Fishes. At the end of the Fish Hall toward the Roosevelt Memorial is the exhibit of Big Game Fishes, including many of great size taken with rod and line chiefly

TUNA (*Thunnus thynnus*). A magnificent mounted tuna fish from the Exhibit of Game Fishes

by Zane Grey and Michael Lerner. The huge ocean sunfish, caught by Mr. Grey with harpoon and gaff, weighed nearly a ton. A 74-pound channel bass, a 668-pound broadbill, and a 758-pound tuna look down from the walls.

The central feature of the *Sailfish Group* is the mounted skin of a fish caught off the rocky coast of Cape San Lucas, Lower California. It is shown in the act of leaping from the water in a desperate effort to shake the hook from its jaws.

Many other fishes well known to anglers and sportsmen, or greatly desired as closer acquaintances, hang in these cases, such as salmon, trout, perch, muskellunge, barracuda, yellowjack, bonefish, etc.

Three fine specimens of the fishes caught and presented by Michael Lerner are exhibited in special cases as if rising through the water. One is the mounted skin of a tuna (*Thunnus thynnus*) which measured 8 feet, 3 inches in length and weighed 555 pounds. It was caught on a rod and reel off Wedgeport, Nova Scotia. This is the common or *Bluefin Tuna*, also called Tunney and Horse Mackerel. It occurs in both the Atlantic and Pacific, and huge individuals may reach a weight of over 1000 pounds.

The second specimen, a *Blue Marlin* (*Makaira nigricans ampla*), weighed 305 pounds and measured 10 feet in length, It was caught on rod and reel off Bimini, Bahamas, on July 2, 1934. A *Mako Shark* (*Isuropsis mako*), caught off Bimini, is shown making one of its characteristic leaps above water in search of food.

The tuna, the swordfish, the marlin, the sailfish, and the mackeral are all related, belonging to the same suborder of fishes, the Scombroidei, a group which attains the acme of speed and streamlined form. There is probably more confusion about the marlin than about any other large game fish.

This is due, first, to its similarity to its close relatives, the swordfish, the sailfish, and the spearfish; secondly, to the number of different kinds of the marlin itself. The sail of the sailfish is much higher and longer than that of the marlin.

The swordfish in Case 42 shows a distinctly heavier body, longer and stouter sword, and shorter dorsal fin.

The spearfish (Case 42) is a somewhat intermediate form. Its long dorsal fin is considerably lower than that of the marlins. On the wall in connection with the Big Game Fish exhibit may be found charts of the world record rod and reel catches.

BLUE MARLIN
(*Makaira nigricans ampla*)

Living Reptiles

HALL OF LIVING REPTILES

(Index Plan, p. 18, Third Floor, Hall 9)

AS ONE enters this hall from the Insect Hall, the attention is attracted by four floor exhibits containing some of the largest living reptiles—the alligator, king cobra, and Galápagos tortoise. A fine exhibit showing the largest living lizards is at the right of the entrance. These are the *Dragon Lizards of Komodo*. The species *Varanus komodoensis* occurs only on Komodo and adjacent small islands in the Dutch East Indies. The scene in the group is laid on Komodo. A large male dragon lizard has just killed a wild boar, while another dashes forth from a nearby jungle to dispute ownership with the first.

Dragon lizards feed on deer, wild boar and water buffalo, possibly also birds and their eggs. They readily attack each other and have been known to seize a wounded comrade.

The smaller lizard feeding on the boar is a female, the largest recorded individual of this sex. Few species of lizards show such a pronounced difference between the sexes.

Komodo Island is uninhabited except for a convict village of Malays. Dragon lizards quickly secrete themselves on the approach of man. They apparently use vision alone in detecting their enemies, as they fail to react to sounds, and, in fact, appear to be deaf.

The species is diurnal and hides away at night in large dens which it digs under the roots of trees or under rocks in the open.

Varanus komodoensis is a large monitor lizard of the family Varanidae. It is closely related to certain monitor lizards of Australia, particularly to giant forms known only as fossils from the Pleistocene of that continent. These fossil species seem to have reached fifteen or more feet in length. *Varanus komodoensis* does not exceed ten feet, but large specimens may weigh over two hundred fifty pounds. It is therefore very much heavier than any other living lizard.

The specimens and materials for the dragon lizard exhibit were secured by an expedition of the American Museum under the

THE DRAGON LIZARD OF KOMODO ISLAND (*Varanus komodoensis*)

RHINOCEROS IGUANA. This great Iguana from Santo Domingo is the most powerful lizard in the Americas. It is terrestrial, digging burrows in limestone

leadership of Mr. William Douglas Burden.

Near by a large chart outlines the history of all the vertebrate animals, including the dragon lizards.

The central part of the hall is devoted to a large series of *floor groups*, showing various species of reptiles and amphibia in their natural environments. The cases on the right of the hall answer questions frequently asked, such as, "How do reptiles and amphibians feed?" "How do they protect themselves?" and "How do they breed?" also, "What is the economic value of reptiles and amphibians?"

The left wall of the hall contains a series of exhibits installed in sunken panels, in which some of the principles controlling the existence of reptiles and amphibians are illustrated. Among them are "Natural Selection, the Directing Principle of Evolution," "Isolation, a Major Factor in the Origin of Species," "Concealing Coloration and Form," and "Parallel Evolution."

Other exhibits are devoted to snake yarns, the structure of reptile skeletons, and to snake poisons and their treatment.

On the left of the hall, in an enclosed corridor, is a series of *habitat groups* portraying the home life of American reptiles and amphibians. The subjects of these in order from the front of the corridor are:—The Leather-back Tortoise; The Giant Salamander; The Bullfrog; A New England Marshland in Spring; West Indian Tree Frogs; Reptiles of the Southwest; Galápagos Iguana; Rhinoceros Iguana; Gila Monster; and the Florida Cypress Swamp. A few of these are described briefly.

The Rhinoceros Iguana Group illustrates the complete life history of a typical lizard. It inhabits the desert regions of Santo Domingo and is the most powerful lizard in the Americas.

It is a terrestrial animal, living in burrows which it digs through banks of limestone. The eggs are deposited during July in hills dug by the females in adjoining sand flats. The young iguanas hatch out and frequently

pull their egg shells with them to the surface. The Rhinoceros Iguana, like most other large iguanas, is a vegetarian, feeding on *Acacia* beans, *Saona* berries, and other products of the desert.

The group depicts the western shore of Lake Enriquilla, a dead sea in Santo Domingo, over 130 feet below the surface of the ocean.

The Reptiles and Amphibians of a Cypress Swamp. The primeval cypress swamps of northern Florida afford a home for the alligator, numerous turtles, lizards, snakes, and frogs. The large alligator on the left is a female guarding her nest (shown in cross section). Young turtles are hatching from eggs which have been hidden by the mother in the alligator's nest. The group is a reproduction of a Florida cypress swamp and river cove in September. It portrays the feeding habits of several snakes, the breeding habits of various turtles and toads, and many other reptiles and amphibians.

A New England Marshland in Spring. Toads and frogs come to the marshes and ponds in the spring to breed. The males call loudly to attract mates. The shrill peeping which arises from so many ponds of eastern United States is made by a diminutive tree frog, while the trill which resounds from many orchards and water lily ponds is the voice of the gray tree frogs. Each species of frog and toad has a distinctive voice. In calling, the throat of many species is blown out into a balloon-like sac and acts as a resonating organ. The group represents a small section of a swamp in southern New England during early May.

A CYPRESS SWAMP IN NORTHERN FLORIDA. Detail of a group in the Reptile Hall

Gila Monsters. The Gila Monster is well known as the only poisonous lizard in the United States. In the group but one species, *Heloderma suspectum*, is shown. The only other poisonous lizard known, the Mexican Gila monster, *Heloderma horrendum*, is exhibited in a floor group in the adjacent main hall. The present group shows a small section of one of the canyons of the Santa Catalina Mountains, Arizona. The snake gliding over the rocks is the Sonoran Racer, *Masticophis bilineatus*. The desert tortoise, *Gopherus agassizii*, illustrated below, is seeking a hiding place for the night.

AMPHIBIA AND REPTILES OF NEW YORK STATE

An exhibit showing the species found within the State of New York may be seen in the corridor of the Roosevelt Memorial on the first floor. (Index Plan, p. 16, First Floor, Hall 12a).

DETAIL OF A GROUP SHOWING THE AMPHIBIANS OF A NEW ENGLAND MARSHLAND IN EARLY SPRING

(Below)

DESERT TORTOISE (*Gopherus agassizii*). A detail from the "Gila Monster Group," depicting the reptilian fauna of one of the Arizona canyons

Living Birds

THE WHITNEY WING

(*Index Plan, pp. 16-19, First-Fourth Floors, Hall 19*)

THE Whitney Wing of the Museum, newest section of our structure, was a joint gift of the late Harry Payne Whitney and the City of New York. It is wholly occupied by the Museum's Department of Birds. Three of its eight floors are devoted completely or in part to public exhibits.

The main entrance of this wing leads into Whitney Memorial Hall from the New York State Theorore Roosevelt Memorial. The display represents bird life on islands in the Pacific Ocean, covering an expanse from the Hawaiian Islands southward beyond New Zealand and from the Galápagos Archipelago and small islets off the coast of Peru westward to the Australian barrier reef and New Guinea. Foyers at the ends of the hall contain maps and mural texts which describe both purpose and plan of the exhibits. Near the ends of the main hall are bronze busts of the late Messrs. William C. Whitney and Harry Payne Whitney, father and son, to whom the building and its contents are dedicated.

WHITNEY MEMORIAL HALL

(*Index Plan, p. 17, Second Floor, Hall 19*)

The design of Whitney Memorial Hall is intended to give Museum visitors the illusion that they are standing in the middle of the Pacific Ocean and viewing scenes in every direction throughout hundreds or even thousands of miles. In other words, the hall represents the Pacific itself, reduced to extremely small compass. A common horizon crosses the background of all 18 habitat groups, and from these the sky appears to rise behind the fronts of the cases and to be continuous with the blue dome that forms the ceiling of the hall. Suspended by invisible wires in this vault are examples of oceanic birds which inhabit the Pacific from the tropical environment depicted near the northern end of the hall to the edge of the Antarctic toward the south end. It is through the latter that the visitor approaches from the Roosevelt Memorial building.

At the present time only about three-fourths of the exhibits are completed. In addition to the dome and the decorations in the two foyers, nine groups on the right-hand side of the hall and four on the left and two center cases are on display. These are as follows:

Ship-Followers. The point of view is from the deck of an old-fashioned sailing vessel in the open ocean south and east of New Zealand, in the zone of the westerly winds. In the background is the Whitney South Sea Expedition schooner, the "France," which served the American Museum during ten years in Polynesia. The expedition collected most of the specimens used throughout this hall.

Pelagic birds shown in the exhibit comprise a variety of albatrosses and petrels, especially characteristic of the higher southern latitudes.

Samoa. A view from the hills of the island of Savaii toward the ocean. The site is at the point where forest meets more open slopes. The birds include those of both woodland and grassland, such as fruit pigeons, ducks, members of the parrot family and many smaller forms. Especially noteworthy is the tooth-billed pigeon (*Didunculus*), a very peculiar member of the pigeon family, confined entirely to a few islands of the Samoan group.

Tuamotu. The island of Hao, an atoll, with the coral-grown lagoon at the left and the surf of the open ocean on the right. In the distant background can be seen tree- and shrub-covered segments of the island ring. Among the coconut palms and other typical beach vegetation of a coral island are man-o'-war birds, boobies, a nesting red-tailed tropic-bird, several terns, including the white fairy tern which lays its egg on rough bark or in the crotch of a bush, and also a number of shore birds of both migratory and resident species. The example of the latter is the rare or nearly extinct Polynesian sandpiper, one of the smallest members of its family, of which two stand in the left foreground.

PERUVIAN GUANO GROUP IN THE WHITNEY HALL OF OCEANIC BIRDS. This exhibit shows several guano islands in the Bay of Pisco, Peru, with their bird life. The guano-producing birds represented are the Peruvian pelican, booby and cormorant. Also included are the Peruvian penguin, Inca terns and two species of gulls

The Tuamotu archipelago occupies a huge rea in the central South Pacific and is one f the most extensive island groups on earth. *Iarquesas.* A scene in the volcanic Island f Nukuhiva, showing a rugged shore line nd ridges dissected by the sea, as viewed om a height of nearly 2000 feet. On the ght is the Valley of "Typee," famous as ie locale of Herman Melville's romance of ie same name.

The birds include the giant pigeon (*Ser-sius*), which exists only at the island of Tukuhiva, a smaller native fruit pigeon, vifts of the "edible-nest" group, warblers nd old world flycatchers peculiar to this land, a forest rail, a ground dove and a pair wild chickens or jungle fowl, the ancestors which were widely distributed in the acific by the original Polynesian immi-rants.

eruvian Guano Islands. Looking southward ross the Bay of Pisco, Peru, from the south-n island of the Chincha group. The scene presents the rainless coast of Peru, where imatic conditions are responsible for the cumulation on such islands of sea bird anure known as guano, which was the fer-izer of the Incas and other ancient agri-ultural peoples of the west coast of South merica.

Despite the exhaustion of the old supplies guano, it has again become an important mmercial resource in Peru, and the in-ustry is now operated upon a scientific con-rvational basis.

The three principal species of guano-pro-cing birds, all of which are peculiar to e coasts of Peru and northern Chile, are own. These are the Peruvian cormorant, oby, and pelican. Other birds of interest e the white-moustached Inca tern, two ecies of gulls, and on the rocks of the inted background a distant cluster of ruvian penguins.

alápagos. This scene is in the heart of the alápagos archipelago looking from James land across the water toward Albemarle, e largest island of the group. The Galá-gos lie on the equator about 600 miles west the South American coast. They are fa-ous as the native home of many peculiar d long isolated species of both plants and imals, and they received their first notable scientific fame as a result of the visit of Charles Darwin in H.M.S. "Beagle" about 1834.

Man-o'-war birds, herons, an owl, mock-ingbirds and hawks are among the birds shown in the exhibit. Most of these are remarkable because of their total lack of shyness in the presence of man, a trait doubtless acquired during residence throughout a very long period in a land without man or other mammalian enemies. The most important of the Galápagos birds from a biological point of view are several species of small finches which show a great variation in the size of the bill. These mostly belong to the genus *Geospiza*, and Darwin's observations of them in the field are believed to have had much to do with his original ideas on the principle of natural selection as an explanation of evolutionary change.

Hawaii. This exhibit shows a deep and steep valley on the Hawaiian island of Kauai, with slopes and gorges descending about 4000 feet from the high plateau of the island toward low banks above the beach. The opposite or windward side of Kauai is extremely rainy and, on the right, fragments of storm clouds are shown whisking out over the valley which, however, is not very humid because most of the rainfall is precipitated farther to windward.

The Hawaiian archipelago, like that of the Galápagos, has been isolated from other land areas throughout many ages, and some of the native birds and other animals show even more peculiar and pronounced evolutionary changes. The Hawaiian honeycreepers (*Drepanididae*), for example, are obviously members of a single family of small land birds, yet the specializations in the bills of several species range from short, stout, almost parrot-like beaks to extremely long, pointed and sickle-shaped organs. Feeding habits are, of course, correlated with such structures, for the stoutest-billed species can manipulate hard seeds and fruits, whereas those with long slender bills must use them in extracting nectar or small insects and spiders from the corolla of flowers. Several examples of these honeyeaters are exhibited, but it would be impossible to show the whole range of variation in bills without drawing upon species inhabiting other islands of the Hawaiian group.

BROWN PELICANS (*Pelecanus occidentalis*). Brown Pelicans inhabit our coasts from South Carolina to the West Indies. They often fly in diagonal files and under favorable conditions sail long distances on set wings. Facing the wind, they travel high, but at times they skim just above the crest of curling breakers

EMPEROR PENGUIN (*Aptenodytes forsteri*). This is the largest of the existing species of the penguins. The mounted bird here shown, a male, weighed seventy-nine pounds. The Emperor Penguin is excusively Antarctic, inhabiting the fringing ice of the south polar continent and the adjacent islands. It rarely sets foot upon land or rock. The single egg is laid on the ice in midwinter and is carried on top of the bird's foot until it hatches, the male and female taking turns at incubation

At the right of the group three geese are shown in flight, the species being peculiar to Hawaii. In the air, down the valley, are two white-tailed tropic-birds, and the small land birds include one or more species having tufts of brightly colored feathers which were used by the ancient Hawaiians in manufacturing the famous feather cloaks worn by chiefs of high rank.

Lysan. Albatrosses, of which there are some seventeen species in the world, resort during the nesting season to remote oceanic islands. There they carry on their remarkably elaborate courtship precedure, lay the single egg, and rear their chick before they depart once more on the oceanic wanderings which they continue until the return of the next breeding season.

Most albatrosses inhabit the higher latitudes of the southern oceans, and no species regularly enters the North Atlantic. The North Pacific Ocean, however, is the home of three kinds of albatrosses, two of which

are here shown on the nesting ground of Laysan Island, a leeward outlier of the Hawaiian archipelago.

The two species shown are the white-breasted Lysan albatross and the all dark black-footed albatross. Both carry on an extraordinary ritual, commonly known as a courtship dance, although it really partakes of community behavior. The birds on the nesting ground salute, cross bills, and bow not only to their own mates but to other albatrosses of both sexes.

A pair of the small native teal of Laysan, found nowhere else in the world, is also shown in this exhibit. Others displayed are nesting sea birds, such as boobies, man-of-war birds, and petrels (which occupy burrows in the sandy soil), and shore birds that make the island a resting place during their long migration from Alaskan breeding grounds to a winter home among islands of the south seas—bristle-thighed curlews, golden plovers, and others.

New Caledonia. This large island, which is east of Australia, lies on one of the western Pacific arcs or submerged mountain ranges. It has had no connection with any other land area since it arose from the ocean in the early part of the Age of Mammals.

Because its life has been obtained by natural means from places across the sea, it is interesting to note that, among the 64 species of New Caledonian land birds, six belong to widespread Pacific species, 35 appear to have come from Australia, and 23 from the New Guinea region.

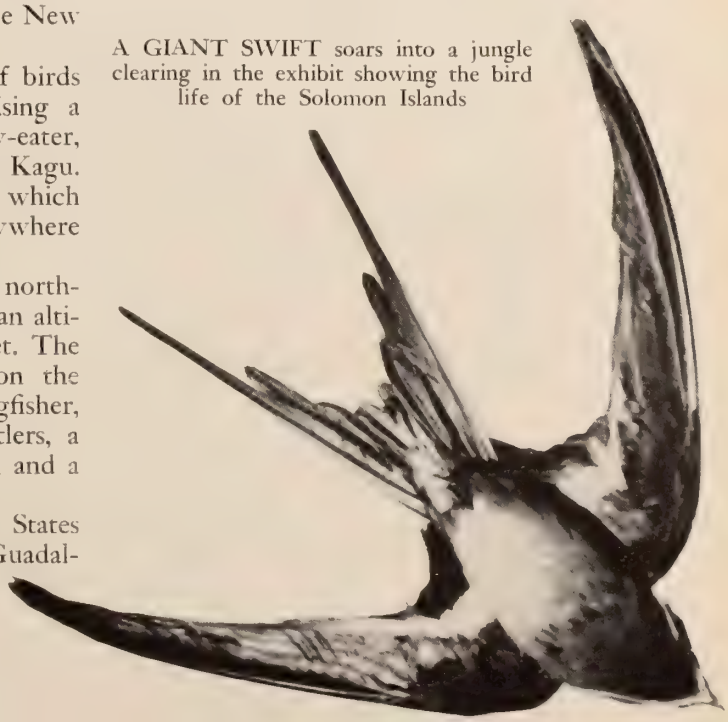
New Caledonia has five genera of birds found nowhere else, these comprising a pigeon, a parrot, a warbler, a honey-eater, and the strange, flightless, heron-like Kagu. The last is a very extraordinary bird, which appears to have no near relatives anywhere else in the world.

The site of this exhibit is on the northeasterly coast of New Caledonia, at an altitude of slightly more than 1000 feet. The birds, in addition to the Kagu (on the ground), include a fruit dove, kingfisher, cuckoo, warblers, flycatchers, whistlers, a wood-swallow, starling, honeyeaters, and a parrot finch.

Solomon Islands. Since the United States armed forces have made history at Guadalcanal Island, the savage Solomons no longer seem so far away as they formerly did. In this exhibit of bird life in a hot, humid, and mountainous archipelago, the background shows Guadalcanal itself. The foreground represents a small islet off the southeastern end of Guadalcanal, with a cluster of native huts, and a garden in which coconut palms, bananas, papaya, cassava, breadfruit, taro, and sweet potato are growing on the site of a recently-felled tropical forest.

The Solomon Islands have a rich bird fauna, with 128 species of land birds alone. The 21 species shown in the exhibit can therefore be only a representative selection. They include the following: the Brahminy kite, a bird of prey; the brush fowl or megapode, which lays its eggs in mounds or rotting vegetation, so that the heat of fermentation may hatch them; several species of doves, parrots, lories, and cockatoos, including the king parrot, of which the male is green and the female vivid red; the giant swift, a relative of our American chimney swift; and various colorful representatives of Old World families, such as rollers, cuckoo-shrikes, flycatchers, sunbirds, and flower-peckers.

Australian Barrier Reef. The Great Barrier Reef, which for more than 1200 miles guards the east coast of Australia, is the largest coral reef in the world. In the extensive lagoon between the Barrier and the mainland are countless lesser reefs, islets of coral limestone



A GIANT SWIFT soars into a jungle clearing in the exhibit showing the bird life of the Solomon Islands

and, near shore, higher islands which are detached fragments of the continental rock. Many of these haave collected wind-blown soil and have acquired a luxuriant, even if limited, plant life. Others remain relatively bare but are still for enough above the reach of the ocean to furnish breeding grounds for great colonies of sea fowl.

The birds of the Great Barrier are mostly of widespread types, as is characteristic of the avifaunas of beaches and small islands. They include a noisy colony of brown noddies and sooty terns, the fledgling young of the latter being the dark speckled birds which look so unlike their parents, Australian silver gulls, crested terns, reef herons in both gray and white phases, and man-of-war birds complete the list of residen oceanic species. The sandpipers or tattlers i the beach pool are winter migrants fro northern Asiatic nesting grounds. The whit land birds painted in flight are nutmeg pig eons bound, perhaps, toward fruit tre growing on the islets.

New Guinea. Among its 650 species Ne Guinea has many birds not known in Aus tralia, though the two land masses are onl 100 miles apart at Torres Strait. A drop of 5 feet in the sea level would probably joi them. On a map of the United States, Ne Guinea would reach from New York Cit to Colorado, and its interior offers some o the largest unexplored areas on earth. Thi exhibit depicts a scene on Lake Habbem

THE GREAT BARRIER REEF. Most of the flying birds in this view are sooty terns. The darker ones are part of a colony of brown noddies

BIRDS OF NEW GUINEA. Three Alpine Lories, brilliantly colored New Guinea Parrots, are perched above two Macgregor's birds of paradise

11000 feet above sea level, looking southward toward Mount Wilhelmina.

Fiji. The Fiji archipelago is one of the largest, most beautiful, and most important in the Pacific. It forms part of one of the several great island arcs to the east of Australia and New Guinea and comprises more than 200 separate islands and islets. The larger members are mountainous, and many are surrounded by fringing reefs of coral.

Fiji has about 54 species of land birds, or only half as many as the Solomon Islands, which are hundreds of miles nearer the ultimate source of supply in the Australasian region. The principal Fijian types are birds of families known to be able to make long colonizing flights across the ocean, such as parrots, pigeons, kingfishers, starlings, and white-eyes.

In the silky dove and the golden dove, Fiji has two of the most spectacular of all birds. Both species are peculiar to this group of islands, and one of them only to Viti Levu Island, the site of the exhibit. The thirteen additional birds shown all belong to families found at other Pacific islands, but the species are mostly peculiar to Fiji. Most of the aboriginal Fijian birds are confined to mountain

districts, while the common birds of town and village are more widespread or recently introduced kinds.

Birds of Paradise. The first case consists of two exhibits, one on the Plume-Bird-of-Paradise, and one on South Sea Lories, a group of parrots. The second case contains an exhibit on the Rifle Birds (Birds-of-Paradise) and one on various birds of the Malay Archipelago.

HALL OF BIOLOGY OF BIRDS

(*Index Plan, p. 16, First Floor, Hall 19*)

The Hall of Biology of Birds, on the first floor of the Whitney Wing, is devoted to diagrammatic exhibits illustrating the bird's place in nature and many different aspects of the structure, descent, relationship and behavior of birds. Other animals will be made use of when desirable. For example, in the consideration of flight, the plan and technique of the flight of insects, bats, pterodactyls, etc. will be shown in conjunction with various types of bird flight.

At this date, the construction of exhibits in the Hall of Biology of Birds has just begun and the hall is still closed to the public except for the first two alcoves. In these are shown an exhibit devoted to the relationship of birds to their reptilian ancestors and the varying course that evolution has taken in different orders and families of modern birds, together with an exhibit entitled "Birds and Man."

GALLERY OF BIRD ART

(*Index Plan, p. 19, Fourth Floor, Hall 19*)

A collection of original drawings and paintings of birds by Louis Agassiz Fuertes is installed in the Gallery of Bird Art on the Fourth Floor of the Whitney Wing. These works cover most of Fuertes' life as an artist, from a painting made while a young boy to his mature work of the later years preceding his untimely death. The collection includes numerous studies made in the field, many of them while on expeditions of the American Museum, and finished pictures, both published and unpublished.

The same hall contains a series of original water-color paintings by Joseph Wolf which were published as illustrations of various of the ornithological monographs of D. G. Elliot, particularly the Monograph of the Pheasants.

Included in this hall, also, are two large oil paintings from the collection of Audubboniana, most of which is installed in the ambulatory of the Theodore Roosevelt Memorial Wing immediately adjoining. One of these paintings is by John James Audubon, showing a dog surprising a group of pheasants. The other is a portrait of Audubon with his dog, horse, and gun from the brushes of his sons Victor and John Woodhouse Audubon.

AUDUBON GALLERY

(*Index Plan, p. 19, Fourth Floor, Hall 12a*)

A noteworthy collection of objects relating to the life and work of John James Audubon is exhibited in the corridor on the fourth floor of the Roosevelt Memorial leading into the Whitney Wing. These include original sketches and paintings by Audubon, and by his son, John Woodhouse Audubon, mainly of the Quadrupeds of North America; some of the copper plates from which the Birds of America were printed, and a portrait of Robert Havell, their engraver and publisher of the first edition of the "Birds." Of special interest are the portraits of Audubon, one of which is displayed on the right-hand wall of the Whitney Gallery of Bird Art, just inside the entrance. Of more personal interest are the guns carried by Audubon on many of his expeditions and the buckskin suit he wore.

These objects were presented mainly by his grand-daughters, Maria R. and Florence Audubon, but the largest piece, a covey of pheasants, was given by Miss M. Eliza Audubon. Gifts have been received also from Dr. Edward H. Rogers, Miss Anne E. Roelker, Robert Havell Lockwood, and others.

BIRDS OF THE WORLD HALL

(*Index Plan, p. 17, Second Floor, Hall 2*)

This hall is devoted to a projected series of twelve habitat groups to show the major faunal areas of the world and their characteristic birds. Eleven groups have been completed. The backgrounds, by Francis Lee Jaques, Frank McKenzie, and Arthur A.

Jansson, are reproductions of actual scenes made from color sketches and photographs taken on the spot. Beginning at the right of the entrance, the completed groups are as follows:

Pampas Group. The pampas and lagoons of the South Temperate Zone of South America harbor a varied assemblage of birds. These include some twenty species of North American sandpipers and plovers that migrate to this region to spend the northern winter. Some of the birds are permanent residents. The scene is laid at Lake Chascomus, near Buenos Aires, Argentina, a region made famous by the writings of William Henry Hudson, to whom the group is dedicated. It is a gift of Mrs. Anna E. Erickson.

High Andes Group. The Paramo Zone of South America is found at sea level at the southern end of the continent but occupies increasingly high elevations in the Andes, below the snow line, as the equator is approached. In the neighborhood of Mt. Aconcagua, Chile, shown in the background, this zone is reached at 10,000 feet elevation, but the birds are still closely related to those of the lowlands of Patagonia and southern Chile. The giant Condor is a characteristic species.

American Tropical Zone. Barro Colorado Island, in the Canal Zone, was once a hilltop and part of the unbroken humid tropical forest of the Panamanian lowlands but it was cut off from the surrounding forest when the valley of the Chagres River was flooded by the closing of Gatun Dam. It is now preserved as a natural laboratory under the care of the Institute for Research in Tropical America. It has been made known to many through the writings of Dr. Frank M. Chapman, particularly by his books, "My Tropical Air Castle" and "Life in an Air Castle."

South Georgia Group. The bird-life of the Antarctic regions is not as rich in species as that of the tropics but possesses certain very interesting forms, among which the penguins are outstanding. The group shows an assemblage of King Penguins on the island of South Georgia, 1200 miles east of Cape Horn. Among the other characteristic species are the Wilson's Petrel (one of the birds known to sailors as "Mother Carey's Chickens"), the Kelp Gull, Giant Fulmar, the curious Sheathbill, and (painted) the Wandering Albatross.

East African Plains. The easterly third of Africa is largely a grassy country dotted with thorny bushes and trees. The Kidong Valley, scene of the group, lies some 40 miles northwest of Nairobi, Kenya Colony, in the Great Rift Valley that extends from northern Tanganyika to the Red Sea and southern Palestine. The Ostrich, Marabou, Bustard, Courser, Secretary Bird, Hoopoe, Coly, and Lark shown in the group are typical of the plains region, though some of the other birds shown have close relatives in the forests. Gift of Henry W. Sage.

Congo Forest Group. The equatorial forests along the Congo River in western Africa are rich in bird-life. As in other tropical forests, many species of birds often band together in loosely mixed flocks that roam the woods for insects and other food, searching from the ground to the tops of the trees. The exhibit shows such an assemblage together with other inhabitants of the region. The scene is at Lukolela, about 500 miles upstream from the mouth of the Congo River. Presented by Mrs. Dwight Arven Jones.

Australia. This is a scene in the Blue Mountains of New South Wales, about 100 miles west of Sydney, at the edge of the forest looking out over the eucalyptus-dotted savanna. Two Lyre Birds (male and female) have come to the forest margin. A flock of Crimson Rosella Parrots has settled on the ground and in the trees, and two Eastern Rosellas are near-by. Several Black-backed Magpies are on the ground or (painted) flying, and a Laughing Jackass is perched in a tree overhead. Various characteristic birds of eastern Australia are shown, such as the Peaceful Dove, Satin Flycatcher, Broad-billed Roller, Gang-gang Cockatoo, and others. In the distance (painted) are scattered the ostrich-like groups of Emus. The group was the gift of Archer M. Huntington.

Gobi Group. The extensive desert of central Asia, known as The Gobi, contains a number of brackish lakes, without outlets and fed by surface and underground streams from mountains such as the Altai Range shown in the background. The climate is cold except for a brief summer, and the bird-life consists largely of migrant species that go south for

MACAWS (*Ara macao*). From the exhibit showing the bird life of Barro Colorado Island in the Panama Canal Zone. This island, made by the spreading of Gatun Lake, has cut off a portion of the continental tropical jungle with its abundant mammal and bird life

A DETAIL FROM THE SAN JOAQUIN VALLEY, CALIFORNIA, BIRD GROUP. This valley, once a vast desert, has now been irrigated. Well-watered grass lands have resulted, inhabited by birds in great abundance and variety

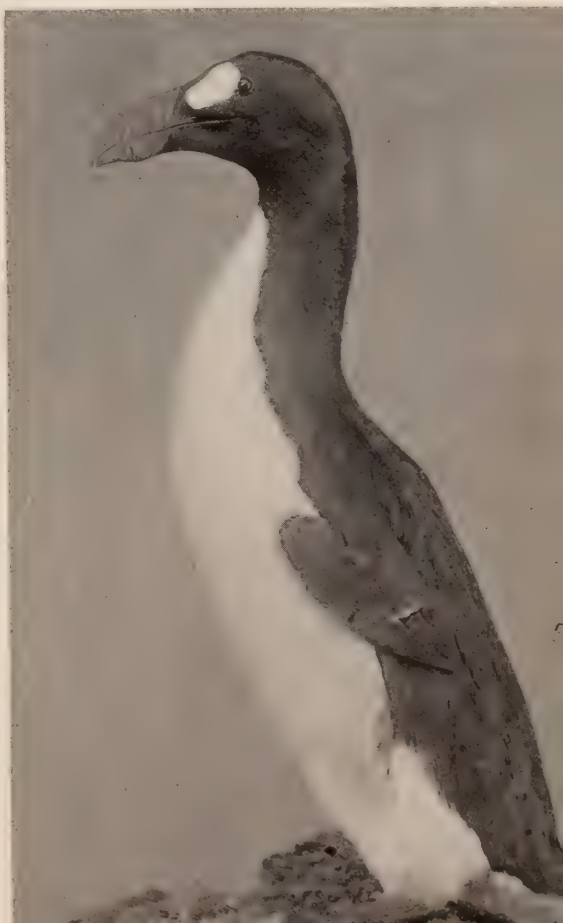
BIRD LIFE OF THE GOBI

the winter, as the Demoiselle Crane, Great Bustard, and Ruddy Sheldrake. The Raven remains throughout the year. The interesting Sand-Grouse often travels long distances daily for water and has an irregular local migration.

Palaearctic Alpine Group. The Zermatt Valley and the Matterhorn, in Switzerland, are shown with some of the characteristic birds of the upper Alps at timberline at 7000 feet elevation. Some of the species, like the Wall Creeper and the Snowfinch, probably reached the Alps from the Himalayas in prehistoric times when these two now distant mountain ranges may have been continuous. Others, like the Arctic Ptarmigan and Redpoll, may have come from the north, driven by the advancing ice of the Glacial Period. Still others are inhabitants of the lower elevations that have extended their ranges upward to the timberline.

New Forest Group. The Palæarctic Zone or Old World North Temperate Zone corresponds to the Nearctic or North Temperate Zone of North America. The families of birds found in the two regions are much the same and some of the species are identical although their local names may differ. Occasionally the same name is applied to quite different species as in the case of the European and American robins. The group shows the famous "Roosevelt Walk" in the New Forest, in the Valley of the Itchen, in Hampshire, where Lord (then Sir Edward) Grey and Theodore Roosevelt watched the birds together in 1910. The group is dedicated to Lord Grey and was the gift of Mrs. Carll Tucker.

Tundra Group. Churchill, Manitoba, on the western side of Hudson Bay, lies in what the



GREAT AUK, or Gare Fowl, a bird now extinct. No living specimens have been recorded since 1844. (A mounted specimen in the American Museum)

Indian called the "land of little sticks." Here the Canadian forests to the southward are giving way to the treeless tundra that reaches northward to the Arctic Ocean. In summer the tundra is dotted with innumerable insect-filled ponds. Hither to nest come myriads of migratory water birds—sandpipers, plovers, gulls, ducks, and geese—that have wintered in warmer lands to the southward. A few land birds also nest on the tundra. One of these, the Arctic grouse or Ptarmigan, is able to endure the long Arctic winter and, unlike most of the tundra birds, does not migrate. A number of forest- or bush-dwelling birds reach the northern limit of their distribution near Churchill. Some of these may be seen in the group, the gift of William A. Rockefeller.

HALL OF NORTH AMERICAN BIRD GROUPS

(Index Plan, p. 18, Third Floor, Hall 1)

Here are the Habitat Groups of North American birds, prepared under the direction of Dr. Frank M. Chapman, Curator of Ornithology, who collected most of the specimens and made practically all the field studies. The backgrounds are reproductions of specific localities, painted from sketches made by the artist who usually accompanied the naturalists when the field studies for the groups were made. Practically all sections of the country are represented; thus the series depicts characteristic North American scenery as well as the bird-life. The backgrounds of the groups were painted by Bruce Horsfall, Charles J. Hittell, Hobart Nichols, Carl Rungius, W. B. Cox, Louis A. Fuertes, and Francis L. Jaques. The foliage and flowers were reproduced in the Museum laboratories from material collected in the localities represented. (See Guide Leaflet No. 28.) The visitor should follow the series to the right around the hall.

Orizaba Group. The distribution of birds, notwithstanding their powers of flight, is limited in great measure by climate. Thus in traveling from Panama north to Greenland there are zones of bird-life corresponding to the zones of temperature. This condition is illustrated on the mountain of Orizaba in Mexico, where in traveling from the tropical jungle at its base to its snow-clad peak the naturalist finds zones of life comparable with those to be found in traveling north on the continent. Thus the Orizaba group, so far as the distribution of life is concerned, is an epitome of all the groups in the hall.

Cobb's Island Group. Among our most beautiful and graceful shore-birds are the terns and gulls, which (because of their plumage) were once ceaselessly hunted and slaughtered for millinery purposes. Thanks to protection, they have now greatly increased in numbers. The group represents a section of an island off the Virginia coast where the birds are now protected by law.

Duck Hawk Group. The Duck Hawk may be found nesting on the Palisades of the Hudson almost within the limits of New York City. It nests on the ledges of the towering cliffs. This hawk is the Peregrine Falcon which was so much used for hunting in the Middle Ages. It often comes into the city for pigeons.

Hackensack Meadow Group. In August and September the meadows and marshlands bordering the Hackensack River, New Jersey, formerly teemed with bird-life, but this is rapidly disappearing before the march of "improvements." In the group are swallows preparing to migrate southward, Bobolinks or "Rice Birds" in autumn plumage, Red-winged Blackbirds, Rails, Wood Ducks and Long-billed Marsh Wrens.

Wild Turkey Group. The Wild Turkey is a native of America and was once abundant in the wooded regions of the eastern portion of the United States, but is now very rare. It differs slightly in color from the Mexican bird, the ancestor of our common barnyard turkey, which was introduced from Mexico into Europe about 1530 and was brought by the colonists to America. (Reproduced from studies near Slaty Forks, West Virginia.)

Florida Great Blue Heron Group. The Great Blue Heron usually nests in trees. The bird flies with its neck curved back on its body, and because of this habit it can readily be distinguished from cranes, with which it is frequently confused. (Reproduced from studies near St. Lucie, Florida.)

Water Turkey, or "Snake-bird," Group. In the yellow pond-lily swamps grown with cypresses and cabbage palmettos, the shy

ARCTIC SEABIRD LIFE. From a group in the Gallery of North American Birds. The group depicts the lower part of a 1000-foot cliff on Little Diomede Island in Bering Sea. Here myriads of sea birds come each summer to lay their eggs and rear their young

Water Turkey builds its nest. It receives the name "turkey" from its turkey-like tail, and the title "snake-bird" from its habit of swimming with only the long slender neck above water. (Reproduced from studies near St. Lucie, Florida.)

Sandhill Crane Group. Unlike the herons, the Sandhill Crane builds its nest of reeds in the water. It differs also in its manner of flight, always fully extending its neck when on the wing. (Reproduced from studies on the Kissimmee Prairies of Florida.)

Brown Pelican Group. Pelican Island, on the Indian River of Florida, has been made a reservation by the United States Government, and these grotesque birds now breed there in comparative safety. The view shows a section of the island at the height of the nesting season. (Reproduced from studies at Pelican Island, Florida.)

American Egret Group. This beautiful bird has been brought to the verge of extinction in this country through the use of its "aigrette plumes" for millinery purposes, and is now confined to a few protected rookeries in the South. The birds have these plumes

only during the nesting season, at which time the death of the parent means the starvation of the young. (Reproduced from studies in a rookery of South Carolina.)

Turkey Vulture Group. The Turkey Vulture, or "buzzard," is one of the best-known birds of the South, where it performs a valuable service in acting as scavenger. On this account it is protected by law and by public sentiment and has become both abundant and tame. (Reproduced from studies at Plummer Island in the Potomac River, near Washington.)

California Condor Group. The California Condor is the largest and one of the rarest of North American birds. It is not so heavy as the condor of the Andes, and has a slightly smaller spread of wing. In the group the visitor is supposed to be standing in the interior of the condor's cave, and is looking down on the river of the cañon. (Reproduced from studies in Piru Cañon, California.)

Brandt's Cormorant Group. The foreground of the group shows a detail of the island that is painted in the background. The young birds are feeding, and it will be noticed that one fledgling is reaching down the mother's throat after the predigested food. (Reproduced from studies at Monterey, California.)

San Joaquin Valley Group. Formerly this area was an arid place with a characteristic desert bird fauna. Now the ranchmen have irrigated the land, and aquatic bird-life abounds. This group is a good illustration of the influence of man on the bird-life of a region.

Bering Sea Bird Group. Little Diomede and Big Diomede form a group of two islands which lie in Bering Sea, fifty miles south of the Arctic Circle and about midway between Alaska and Siberia.

The site of the group is the lower part of the 1000-foot cliff at the south end of Little Diomede. Here, protected by isolation, as well as by the nature of their haunts, myriads of murres, guillemots, puffins, auklets, gulls, and cormorants come each summer to lay their eggs and rear their young.

Flamingo Group. There were estimated to be two thousand nests in this colony. The Flamingos construct their nests by scooping up mud with their bills and packing it down by means of bill and feet. The nests are raised to a height of twelve or fourteen inches. This protects eggs and young from disasters due to high water. Only one egg is laid, and the young, covered with down, is fed by the mother on predigested food. (Reproduced from studies in the Bahama Islands.)

Booby and Man-of-War Bird Group. In this group is shown a portion of a coral islet on which three thousand Boobies and four hundred Man-of-War Birds were nesting, the former on the ground, the latter in the sea grape bushes. (Reproduced from studies in the Bahama Islands.)

Florida Rookery Group. In this group are Roseate Spoonbills, Snowy Egrets, American Egrets, Little Blue Herons, Louisiana Herons, ibises, cormorants, and Water-Turkeys. Because of the great inaccessibility of this island it was one of the last places to feel the depredations of the plume-hunter. (Reproduced from studies in the Everglades of Florida.)

Whistling Swan Group. A Whistling Swan on the nest is visible far across the arctic tundra, the summer home of this species. The nest is built of moss, etc., and in it are laid two to five white eggs, four and a quarter inches long. Both male and female share the labor of nest-building, incubation, and caring for the young.

Whooping Crane Group. The Whooping Crane is so nearly exterminated that not only was it impossible to obtain a nest and young, but in making this group it was necessary to use specimens taken many years ago.

Golden Eagle Group. The Golden Eagle is one of the most widely distributed of birds. In North America it is common from the Rockies to the Pacific, as far east as Maine. Stories to the contrary notwithstanding, the eagle never attacks man.

Its food consists of rabbits, squirrels, woodchucks and occasionally sheep. (Reproduced from studies near Bates Hole, Wyoming.)

Klamath Lake Group. The bird-life here shows how normal nesting habits may be changed by birds being forced to live in a new locality. White Pelicans, which usually make a nest of pebbles, Caspian Terns, which commonly build their nests on sand, and Cormorants that nest on rocks are all nesting together here on the islets of the lake.

Unfortunately the breeding ground shown here, with its wonderful bird-life, has been destroyed by ill-advised drainage. (Reproduced from studies at Klamath Lake, Oregon.)

Arctic-Alpine Bird-Life Group. The scene represented in this group is above the timberline on the crest of the Canadian Rockies, 8000 feet above the sea. Although these mountains are in the temperate region, the altitude gives climatic conditions that would be found in the Far North, and the bird-life is arctic in character. Here are nesting the White tailed Ptarmigan, Rosy Snow Finches, and Pipits. (Reproduced from studies in the Canadian Rockies.)

Sage Grouse Group. This group shows a stretch of western plateau covered with sage brush. In this brush is seen the male Sage Grouse strutting and wooing a mate (Reproduced from studies at Medicine Bow, Wyoming.)

Prairie Chicken Group. The Prairie Chickens are akin to the common grouse. The group represents a typical scene during the mating season. The male birds go through most surprising antics in their efforts to attract the females. They inflate the orange-colored sacs on the sides of their necks, dancing and strutting about and uttering a loud, resonant, booming note. (Reproduced from studies near Halsey, Nebraska.)

Wild Goose Group. The Wild Goose is one of the first birds to migrate north in the spring. It nests among the lakes of Canada even before the ice is melted. (Reproduced from studies made at Crane Lake, Saskatchewan, Canada.)

Grebe Group. The grebes are aquatic birds which build their nests in the water. During incubation the parent bird usually covers the eggs with grass and reeds when leaving the nest. Nesting at the same lake with the grebes was the Redhead Duck. (Crane Lake, Saskatchewan, Canada.)

Loon Group. The Loon is justly famed for its skill as a diver, and can swim with great speed under water. Its weird call is a familiar sound on the northern New England lakes. Many Loons pass the winter at sea fifty miles or more from land. (Lake Umbagog, New Hampshire.)

Bird Rock Group. This rocky island thirty miles from shore in the Gulf of St. Lawrence affords some protection to the sea birds which still nest in considerable numbers on its cliffs. Seven species are shown nesting in the group—the Razor-billed Auk, Leach's Petrel, Gannet, Puffin, Kittiwake Gull, Common Murre, and Brünnich's Murre. This was the Museum's first large group. (Bird Rock, Gulf of St. Lawrence.)

(See also Guide Leaflet No. 28, *The Habitat Groups of North American Birds.*)

(*Index Plan, p. 16, First Floor, Hall 12a*)

In the corridor on the first floor of the Roosevelt Memorial are shown all the species of birds that have been known to occur within 50 miles of New York City. The first four lettered cases, A-D, on the right, opposite the entrance to the new Hall of North American Mammals, contain the permanent residents. The next four lettered cases, E-H, contain the migrants. The latter are changed as necessary about the first of each month. Beginning at the entrance to the Mammal Hall on the left-hand wall, the numbered cases contain the general collection of all birds found within this area.

A case containing the nests and eggs of the local birds will be found around the corner from case A, on the opposite side of the stairway leading to the second floor.

CHIMNEY SWIFT

MOURNING DOVE

(*Above*) GREEN HERON

(*Below*) RED-WINGED BLACKBIRD

LOCAL BIRDS

In the central Hall of this floor of the Roosevelt Memorial, to the right of the entrance is the Roosevelt Sanctuary Group, showing characteristic spring migrants in the New York City area. The scene is laid in the Roosevelt Wild-life sanctuary at Oyster Bay, Long Island, and shows the memorial fountain (reversed) and the site of Theodore Roosevelt's grave on the hillside to the left. The background was painted by James Perry Wilson, assisted by Fred F. Scherer.

(*Above*) WOOD THRUSH

(*Below*) KINGBIRD

BALTIMORE ORIOLE

ALASKA BROWN BEAR. The world's largest carnivore. It goes into hibernation high on the mountain slopes in the fall and emerges in April or May

Living Mammals

HALL OF NORTH AMERICAN MAMMALS

(Index Plan, p. 16, First Floor, Hall 13)

THE new Hall of North American Mammals was opened to the public April 8, 1942, although a number of the groups are still unfinished.

At the west end of the hall, opposite the entrance, is the *Alaska Brown Bear Group.* These great carnivores are shown against the background of the Pinnacles, precipitous mountains of the Alaska Peninsula. A salmon lies on the shore of a small creek, also an Otter, frightened from its catch by the bears.

On each side of the entrance to the hall are small-scale groups, showing the mammals of North America and their environment during the Ice Age. These animals are now extinct in North America, although their close relatives exist in other parts of the world. The group to the right shows the mammals that existed in Alaska, the group on the left those that occured in southern California.

The first large group to the right of the entrance exhibits the *Grant Caribou.* The landscape is the Alaska Peninsula.

Next is the *White Sheep Group.* Handsome rams are resting on a mountain with a "midnight sun" striking the top of Mount McKinley, Alaska, in the background.

The *Rocky Mountain Sheep Group* shows how unlike in color and details of structure related species may be. The massive, closely spiraling horns of the Bighorn contrast with those of the White Sheep. In the foreground may be seen a Say Ground Squirrel, or "big chipmunk" as it is locally called.

THE BIG-HORN SHEEP inhabits the rugged mountains far above the tree line and only descends when forced down by deep snow. The scene portrayed for this group in the American Museum is in Jasper National Park, Alberta

The *Alaska Moose Group*, around the corner, shows two bulls locked in a struggle for mastery, while a cow moose, interested but not concerned over the outcome, looks on. The number of moose that are painted in the background convey an idea of their abundance on the Kenai Peninsula, where the scene is laid. A Canada Jay, or Whiskey Jack, may be seen in a bush to the right of the fighters, and a spruce grouse is in a tree to the left of the cow.

The *Grizzly Bear Group*, with a male, a mother bear, and her two cubs, is around the corner to the right. They are on the edge of the Canyon of the Yellowstone in the National Park. The Falls are shown in the distance, and an osprey, or fish hawk, is painted in the middle distance. The nest of this bird may be seen on a rocky pinnacle in the canyon.

Next is the *Jaguar Group*, showing a pair of these large, spotted cats on a rocky mountainside in Sonora, Mexico.

The *Mountain Lion Group*, exhibiting a pair in a shallow cave, has as a backgroun the picturesque Grand Canyon of the Colo rado. One of the cats is interested in th movements of a deer, far below, while th other lies on the floor of the cave.

Behind the Alaska Bear Group is a smal passageway containing a faunal map o North America and photographs of mam mals in the wild.

The *Wapiti Group* is on the opposit side of the hall from the Mountain Lio Group. A splendid bull Wapiti, or Ameri can Elk, several cows, and calves of th year are shown in the northern Colorad Rockies.

The *Virginia Deer*, or Whitetail, occur i numbers as close to the metropolitan area a Bear Mountain Park. A buck and two doe are exhibited in the group amid the brilliantl colored foliage of the eastern fall.

The Devil's Tower in northeastern Wy oming is the scene portrayed as the settin for the *Mule Deer Group*.

The next group shows *Bison* and *Prong*

horn Antelope on the North Platte River, Wyoming. Vast herds of Bison as shown here formerly roamed from the Appalachians to the Rockies and from Mexico into the Canadian Northwest. A prairie dog is poking its head out of a burrow, and cowbirds are associated with the bison.

Around the corner is the *Musk Ox Group.* Well equipped for life in the rigorous arctic regions with their long, dense coat of fur and hair, these animals are at home in the blizzard in northern Ellesmere Land.

Both *Black-tailed* and *Antelope Jack Rabbits* may be seen next, on the lower slopes

THE MUSK OX is now restricted to certain parts of Artic America, though in the Ice Age it ranged over most of Europe, Asia, and what is now the United States

of the Rincon Mountains, southern Arizona, among saguaro and barrel cactus, ocotillo, and other desert plants.

The *Rocky Mountain Goat Group* exhibits a billy, a nanny, and a kid on a mountain in southern Alaska, overlooking a beautiful fiord, the Endicott Arm.

The *Osborn Caribou Group* has as background the mountain grasslands of northern British Columbia. These caribou move down into the forest during heavy storms, but do not migrate like the caribou of the Barren Lands. A flock of ptarmigan may be seen in the background.

THE MOUNTAIN GOAT is famous for its climbing ability. The animals in the Museum exhibit reproduced here are shown on a precarious ledge overlooking the Sawyer Glacier in Alaska

MOUNTAIN GORILLA (*Gorilla gorilla beringei*). Of all living animals, the gorilla appears to be most nearly like man. The adult males may reach a weight of 500 pounds. Their strength is tremendous, and they are dangerous when enraged. They are found in the rain forests in the highlands of the eastern Belgian Congo. Terrestrial in habit, they feed on fruits and herbage.
Detail of group in Akeley African Hall

AKELEY MEMORIAL HALL OF AFRICAN MAMMALS

(Index Plan, p. 17, Second Floor, Hall 13)

The main floor of this hall, entered from the Theodore Roosevelt Memorial Building, was opened to the public in the spring of 1936. Here are recreated examples of the mammals typical of Africa, in their natural surroundings.

At each side of the two doors are sculptured representations of African natives by Malvina Hoffman.

In the center, dominating the hall, stands a herd of *elephants* in characteristic formation when alarmed. The great bull is testing the air for scent, while a younger bull wheels to cover the rear of the herd from possible attack.

Immediately to the right of the entrance is the *Water Hole Group*. The animals of the dry plains must come to such seepage holes to drink. Here are reticulated giraffes, Grant gazelles, oryx with long straight horns, and Grévy zebra. Other typical mammals are seen in the background, and several sand grouse in the foreground.

Next are seen the handsome antelopes, *Mountain Nyala*, on the heather-covered uplands of Abyssinia.

A herd of *African Buffalo* is next, emerging from the marshes along the Tana River, Kenya, in late afternoon.

A *family group of Lions* resting in the shade of a tree is the following scene, typical of the great plains of East Africa. In the background a herd of antelopes and zebra feed unconcernedly.

The *Bongo Group* shows a pair of these handsome antelopes in the bamboo forest high on the Aberdare Mountains, Kenya. They have disturbed another typical forest-dweller, the giant forest hog.

The next group on the right-hand side of the hall shows a fine pair of *Giant Eland*, the largest of the antelopes, in their natural habitat in southern Sudan.

The *Upper Nile Region Group*. Waterbuck, kob, Nile lechwe, tiang antelope, sitatunga, roam antelope, and hippopotamus are shown in this exhibit. A tributary of the Nile, with crocodiles, forms the background.

At the end of a short hallway there is a large-scale map of Africa, showing localities from which the various animals and their settings were taken.

On the left-hand side of the hall, beginning at the far end, is the *Plains Group*. Here is depicted the teeming mammalian life of the East African plains. The several kinds of antelope and the zebra in this group are typical of this part of Africa.

The *Greater Koodoo* bears the longest horns of any African antelope. An old male with a female and young male are placed here in a setting duplicating the rough, scrub-covered hills where these animals were collected.

The *Giant Sable* is noted for its handsome form, rich color, and long, saber-like horns. It is found in the dry, park-like country of central Angola, in a limited area, and is rapidly becoming extinct.

The *Gemsbok* is a larger relative of the oryx seen in the Water Hole Group. Although once widely distributed in South Africa, it is now common only in the dry Kalahari Desert.

Next is the family of *Okapi*, the strange forest-dwelling relatives of the giraffe.

In a typical scene in the *Libyan Desert* are shown several addax, which possess spirally twisted horns, also scimitar-horned white oryx, and addra gazelles.

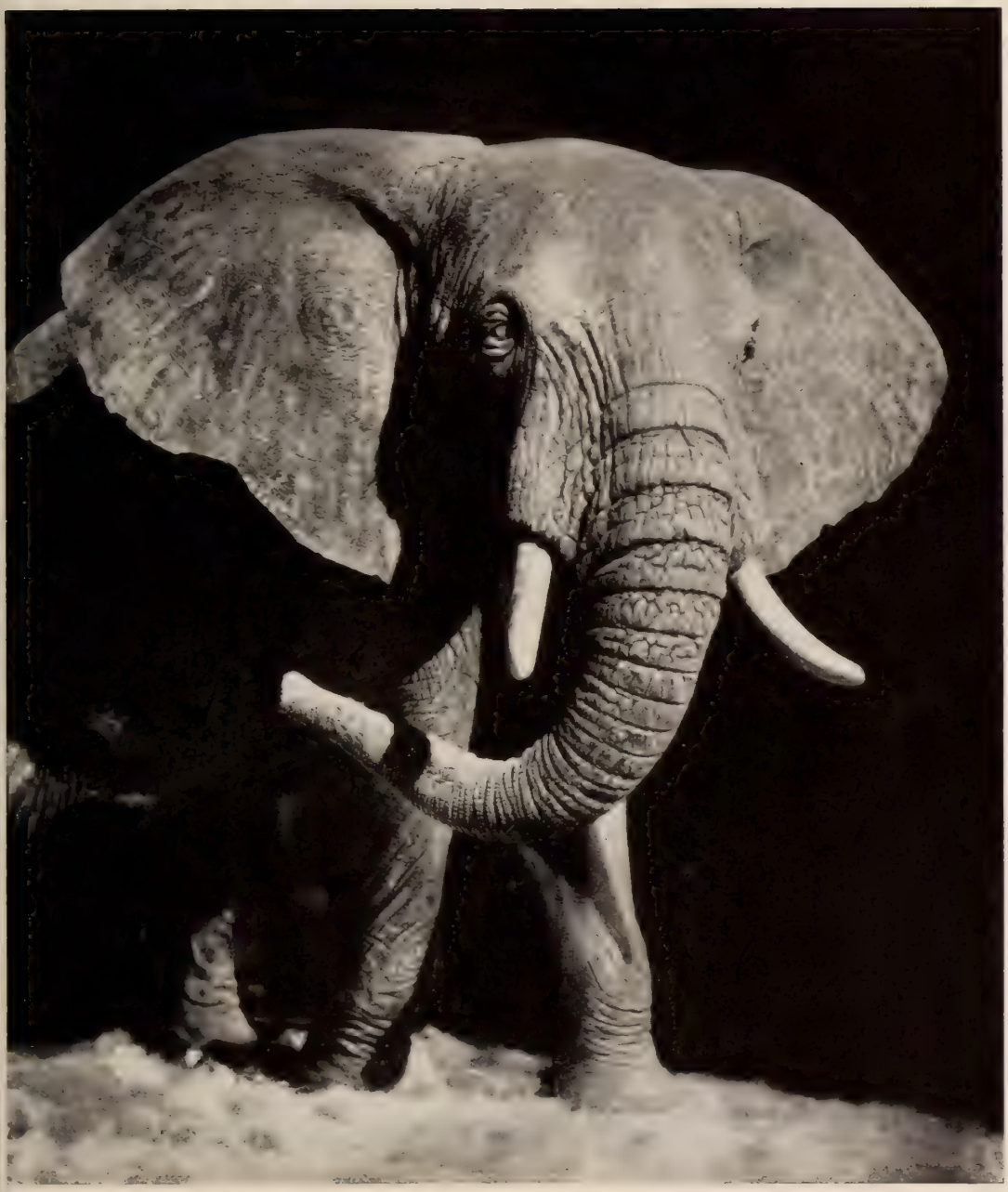
The *Gorilla* family is of particular significance to human beings, because these great apes are perhaps the most like man of all the living animals. They are shown here in a clearing in the dense rain-forest of the Kivu Mountains, an exact reproduction of their natural habitat.

MEZZANINE, AKELEY AFRICAN HALL

(Index Plan, p. 18, Third Floor, Hall 13)

The first group on the right shows the *Klipspringer*, the small, rock-climbing antelope in the right background. East African Baboons are in the right foreground, and a pair of Mountain Reedbuck appears on the left. Among the rocks in the left foreground may be discovered a hyrax, or cony.

The next is the *Cheetah Group*, which shows a pair of these fast running cats inspecting a family of nyalas which have just emerged from the forest. This scene is near the lower Zambesi River in Mozambique.



THE REAR GUARD. Detail from the great elephant group in the Akeley African Hall. In every herd of elephants, in the wild condition at least, one animal takes the responsibility of wheeling about at frequent intervals to see that all is well behind. The young male shown above is mounted in this position in the elephant herd. It was collected by John T. McCutcheon in 1910 when he was in the field with Carl Akeley

AFRICAN BUFFALO (*Syncerus caffer*). Detail of the group in Akeley African Hall

GREATER KOODOO GROUP (*Stepsiceros strepsiceros*)

A party of *Chimpanzees* are shown in their arboreal habitat overlooking the Cavally River. This river forms the boundary between the Ivory Coast and Liberia. The animal at the right is in the process of building a nest.

In the next habitat group we see several *Lesser Koodoo*, the males of which have twisted horns. There are two gerenuk in the group, strange, long-limbed and long-necked gazelles with a small head. A flock of Vulturine Guinea Fowl is seen in the background.

A scene from the dense rain forest of the Cameroons shows a group of *Mandrills* foraging for food. The females of these baboons are much smaller than the males. In the front, at right, one of the young animals is surprised by a Gaboon viper.

Impala prefer the park-like country in which they are shown. With handsome carriage and lyre-shaped horns, the males rank among the most beautiful of the antelopes.

The *White or Square-mouthed Rhinoceros* is third in size among living land mammals. In front of this family group is a African Porcupine.

On the other side of the passage, at th end of which is a large map of Africa, *Black Rhinoceros* family can be seen enjoying a mud wallow. A pair of long-nose Dik-dik are included in this group.

Next there is a *Hunting Dog* pack at ever ing looking over the plains to where herds c Wildebeest and Zebra can be dimly seer The dogs rarely bother these larger species gazelles, impala, and smaller animals are thei usual prey.

The *Hyaena-Jackal-Vulture Group*. Ou on the Serengeti Plains, Tanganyika, a pai of lions have killed a zebra, and as they ar withdrawing after completing their feast the scavengers arrive for their share of th spoils. The animals and birds in this grou include a Spotted Hyaena, two Black-backe Jackals, White-backed Griffon Vultures, Rüppel's Griffon Vulture, two Eared Vul tures, a Hood-Vulture, a Marabou Stork and a White-collared Raven.

WHITE RHINOCEROS GROUP (*Ceratotherium simum cottoni*)

The next group exhibits a pair of *leopards* about to spring upon an unsuspecting *Bush Pig*. The scene is on the edge of a small swamp in the Aberdare Mountains, Kenya.

The *Colobus Monkey Group* shows a troop of these showy black and white monkeys among the branches of a tree overlooking a section of the Aberdare Mountain Forest, Kenya.

The *South African Group* shows typical mammals of the high veldt as they were when white men first came. Now the Springbok are greatly restricted in numbers and Blesbok and Black Wildebeest are found only on a few farms where they are protected.

The *Ostrich Group* shows a pair of these large birds with young ones just hatched from the eggs. The wart hogs would relish a few young ostriches, but the parents stand guard belligerently.

ROAN ANTELOPE: a graceful animal found over a large part of Africa from the Sudan south to Rhodesia

"CAMEL" of East Africa: the gerenuk is said not to drink even in the well-watered Tanganyika country

VERNAY-FAUNTHORPE HALL OF SOUTH ASIATIC MAMMALS

(Index Plan, p. 17, Second Floor, Hall 9)

We enter this hall from the left end of the Roosevelt Memorial Hall.

From 1922 to 1928 Mr. Arthur S. Vernay and Colonel J. C. Faunthorpe of Great Britain made six expeditions into India, Burma and Siam to collect and later donate to the Museum this collection, which now stands as the finest and most complete exhibition of the larger South Asiatic Mammals in existence.

The groups and architectural setting were designed and executed under the direction

DETAILS FROM WATER HOLE GROUP IN AKELEY AFRICAN HALL

(*Above*) GREVY ZEBRAS

(*Opposite page*) GIRAFFES AND GAZELLES AT A WATER HOLE

of James L. Clark. The accessories were constructed under the direction of Albert E. Butler.

Dr. Harold E. Anthony, Curator of Mammals, was responsible for the scientific direction.

Two fine examples of the *Indian Elephant* stand in the center of the hall, giving due prominence to the largest and perhaps most characteristic mammal of southern Asia. This species differs from the African Elephant by smaller ears, higher forehead, and arched back. It has also different teeth and a trunk with only one "finger."

The *Nilgai* or *Blue Bull Group* is also centrally placed.. This is the largest Asiatic antelope. It exhibits marked sexual divergence in color, the female and young being reddish fawn, the male a blue gray. The Nilgai is related to the African twisted-horn antelopes like the Koodoo and Eland.

The *Indian Leopard* differs only slightly from those found in Africa. Both are forest animals but occur in the dry bush country also. They feed on deer, pig, and the larger birds such as the peafowl that has been captured by the leopard in this group.

The *Sambar* is the largest of the Indian deer, found throughout the wooded part of southern Asia. Its size makes it an important source of food for the larger carnivores, but it is powerful and, when brought to bay, may be dangerous. The red Wild Dog of India hunts in packs, sometimes as many as

(*Above*) SAMBAR ATTACKED BY WILD DOGS

(*Left*) THE LEOPARD GROUP IN SOUTH ASIATIC HALL

forty strong. In combination these fierce animals attack and kill animals as large as the Sambar.

The *Black Buck* (the adult male alone is blackish, the females and young males being yellowish-brown) is found in the high plains country. Here also lives the Chinkara, the Indian gazelle.

The *Muntjac*, or *Barking Deer*, is one of the most primitive of the true deer. Males, in addition to bearing small antlers, supported on bony pedicels, have well developed canine teeth. The Mouse "Deer" or Chevrotain is not a deer, but is probably more closely related to the camels.

The *Lion* formerly had an extended range in northern India, chiefly in the plains country. It is usually pale in color, but does not differ greatly from the several races found in Africa.

The *Four-horned Antelope* is the only living wild four-horned animal. It is found in small groups in most wooded and hilly parts of India but not in dense jungle. The *Smooth Otter* is found south of the Himalaya Mountains in India, Burma and the Malay Peninsula.

The *Chital* or *Axis Deer* is one of the most handsome of the deer family. The young of all deer are spotted, but this species retains the spotted pattern through life. It frequents the bamboo jungle and wooded regions near water, and is found in suitable habitats throughout most of India and Ceylon.

The *Gaur* is perhaps the largest of the existing cow-like animals, large bulls standing over six feet at the shoulder. Gaur are found in forested hilly country from India to Indo-China and the Malay Peninsula.

Water Buffalo occur in the lowlands and swamps of central India, Ceylon, and the Malay Peninsula. Buffalo have been domesticated and used as beasts of burden and milch animals. Wild Buffalo are the most dangerous Asiatic bovines to hunt, for they frequently charge. A herd will attack a tiger without hesitation.

The great one-horned *Indian Rhinoceros* is characterized by thickened skin which has the appearance of plate armor. Its pre-

THE GAUR (*Bos gaurus*). The Gaur is an imposing animal of India, Burma and the Malay Peninsula. It is found in the forests, but sometimes feeds in grassy areas on the high hills. It is not found in the lowlands

hensile upper lip indicates that it feeds partly at least on leaves and twigs, but it is found chiefly in the grass-jungles of Assam.

The *Banting* is perhaps the most like the domestic cow in appearance of all the wild bovines, and may be ancestral to the Indian cattle. It is, however, closely related to the Gaur, but is found chiefly in flat country and at lower altitudes. Banting are found from Burma and Cochin China to Bali in the Malay Archipelago.

The *Eld Deer*, or *Thamin*, is distinguished from other species by the graceful curve of the antlers in the male. It is found on the alluvial plains and in suitable localities east of the Bay of Bengal, from Assam and Manipur to Cambodia, Hainan, and the Malay Peninsula.

The *Sumatran Rhinoceros* is related to the Indian species but has two horns and is much smaller in size. It is found in Assam, Burma, Siam, the Malay Peninsula, Sumatra and Borneo, but is rare and secretive. It is found exclusively in forests.

The *Sloth Bear*, or *Honey Bear*, is characterized by the long flexible muzzle, which is used to such termites from their deep runways. These animals feed almost exclusively on insects, fruit, and honey. They climb trees with difficulty. Bears are usually timid, but if wounded or cornered may be dangerous antagonists.

The *Hog Deer*, or *Para*, is a small relative of the Sambar and is found in the Indo-Gangetic Plain, the flat country in Burma, and much of Indo-China. It is usually solitary in habit.

The *Indian Wild Boar* is closely allied to the Eurasian Boar, but has a higher crest. It is one of the most "gamy" of the Indian mammals, fighting until killed.

Gibbons are the most primitive of the anthropoid apes, but the most arboreal. They are capable of walking upright but travel by swinging from branch to branch and tree to tree. The Hoolock Gibbon inhabits the hills of Assam, Burma and southern Yunnan. Males are black, with white brows, but females are often pale yellowish-gray.

The *Swamp Deer*, or *Barasingha*, is related to the Thamin, but differs in the shape of the antlers. It is a large species, restricted to the vicinity of water in open forest, and on grassy plains. The Sambar is usually found in wooded regions, but is the most widely distributed species.

The *Tiger* is the largest Asiatic cat. Tigers live characteristically in the forest and tall

grass country, the stripes blending closely with the light and shadow of this habitat. They feed largely on deer and pigs but frequently kill domestic cattle. Individuals too old or decrepit for their usual prey may turn man-eaters.

HALL OF NORTH ASIATIC MAMMALS

(Index Plan, p. 17, Second Floor, Hall 5)

This hall is approached through the South Asiatic Hall from the Roosevelt Memorial. At present it is incomplete, but, when finished, the exhibits will cover the region north of the Himalayas, including Tibet, Afghanistan, Mongolia, and Siberia.

The *Giant Panda Group* is on exhibition and a *Siberian Tiger Group* is being prepared. Both of these are illustrated on pages 114-115.

ALLEN HALL OF NORTH AMERICAN MAMMALS

(Index Plan, p. 17, Second Floor, Hall 3)

As described elsewhere in this Guide, a new Hall of North American Mammals is now open on the first floor, the entrance being from the center of the Roosevelt Memorial Section. However, other exhibits of North American mammals can still be seen in the Allen Hall on the second floor, adjacent to the North Asiatic Hall just described.

The first center exhibit to catch the eye is a group of American Bison and beyond this the Moose from New Brunswick. These groups, mounted years ago, are still among the largest examples of their kind and are noteworthy accomplishments of the older taxidermy, especially as pioneer achievements in that art.

Mountain Sheep. Mountain Sheep inhabit the more inaccessible mountain ranges of the West, from northern Mexico through the Bad Lands and Rocky Mountains almost to the shore of the Arctic. They are gregarious, occurring in small flocks. When undisturbed, each flock is headed by a ram, but when danger threatens, he assumes the rear guard and a ewe takes the lead.

Rocky Mountain Goat. This animal is a goat-antelope, with its only close relatives in the Himalaya Mountains. It is found from Idaho to Montana northward through British Columbia to the mouth of Copper River, inhabiting deep mountain ranges and inaccessible peaks.

Roosevelt Elk. At the end of this hall is a group of Roosevelt Elk found in the Coast Range from British Columbia to Northern California. Once abundant, they have become much reduced in numbers, though an effort is now being made to preserve them.

ASIATIC WATER BUFFALO (*Bos bubalis*). These buffaloes are the cattle of the grassy plains of India.. They are widely domesticated as draft animals and furnish milk to the natives. They have been employed for hunting the Indian lion

THE GIANT PANDA (*Ailuropoda melanoleuca*). This interesting creature lives in the bamboo forests growing on the sides of the mountains of western China. Though it resembles a bear in outward appearance, anatomical studies show that it is more closely allied to the raccoon

HEAD OF SIBERIAN TIGER. To be shown in a group for the North Asiatic Hall

Beaver. The Beaver, formerly the most important of North American mammals from a commercial standpoint, and one intimately connected with the early history and exploration of the continent, is represented actively at work. The opening in the lodge is not natural, but made to show the interior.

Cats, Wolves and Foxes. The cats, wolves and foxes, and the host of small creatures like squirrels, rats and mice, are represented by numerous characteristic examples. Here are the Jaguar, the largest of the American cats, the Puma, the well-known Coyote or Prairie Wolf and the little-known white Arctic Wolf from the extreme north of Greenland. Here too is the Arctic Fox in its two color phases.

Timber Wolf. One of the most beautiful groups in the Museum is that showing part of a pack of Timber Wolves following the tracks of deer.

Virginia Deer. The Virginia or White-tailed Deer, found over a large part of North America, is shown in its summer coat. Other species of our deer are displayed in the adjoining cases.

Peccary. The Peccary, one of two species related to the pig family and peculiar to the Americas, is really an intruder from South America.

Grizzly and Alaskan Brown Bears. At the end of the hall are the Grizzly and Alaskan Brown Bears, the latter the largest members of the family, as well as a splendid specimen of Giant Moose of Alaska.

Grant's Barren Ground Caribou. The Barren Ground Caribou are animals of the waste and treeless regions of Arctic America where it is impossible for other members of the deer family to exist. At regular intervals these animals gather in immense bands and migrate, going northward in spring and southward in the fall.

Musk Ox. The Musk Ox is adapted for life in the far north and usually travels in bands of a dozen or more. Its food in summer consists mainly of grass, in winter of trailing willows, pawed up from under the snow. The specimens in the group were collected by Commander Robert E. Peary on Bache Peninsula, Ellesmere Land, October, 1898.

Pronghorn Antelope. The handsome Pronghorn Antelope, peculiar to North America, once found in vast numbers on the western plains, was verging on extinction but is now increasing in numbers.

Muskrat. Owing to its wide distribution, the rapidity with which it breeds, and the growing scarcity and increasing demand for furs, the muskrat has become one of the most important fur-bearing animals.

Black Bear. A group at the right-hand side of the hall shows general color variations of the Black Bear. Among these are the Cinnamon Bear, the Glacier Bear, and Kermode's White Bear.

Puma. The Puma is very wide-ranging, being found over a great part of North and South America. In its many forms or species it displays great adaptability to environment and is found not only in heavily forested districts and high mountains, but on arid desert areas as well.

Polar Bear. The Polar Bear inhabits the coast of the Arctic Ocean, wandering over the great ice-floes and along the shores of northern islands seeking seals and young walrus. The huge flat paws and powerful muscles make the animal a strong swimmer. The coat of long, almost woolly hair and a thick layer of fat protect it from the intense cold. The large male in the group was brought from Payer Harbor, Greenland, in the spring of 1902 by Commander Robert E. Peary.

OCEANIC MAMMALS

(*Index Plan, p. 16, First Floor, Hall 10*)

Leading from the Hall of Fishes is the *Hall of Ocean Life.* In this hall are displayed whales, porpoises, marine mammals, the great coral reef group, and shells. Although much of the space is now occupied by permanent exhibits, the final plans have not yet been fully consummated, and additions to the exhibits in the hall will be made from time to time.

Immediately upon entering, the visitor will note the large skeletons and models of whales and porpoises suspended from the ceiling. Just in front of the entrance to the hall is the striking full-size model of the *Killer Whale* with contrasting black and white markings—a fierce predatory cetacean capable of swal-

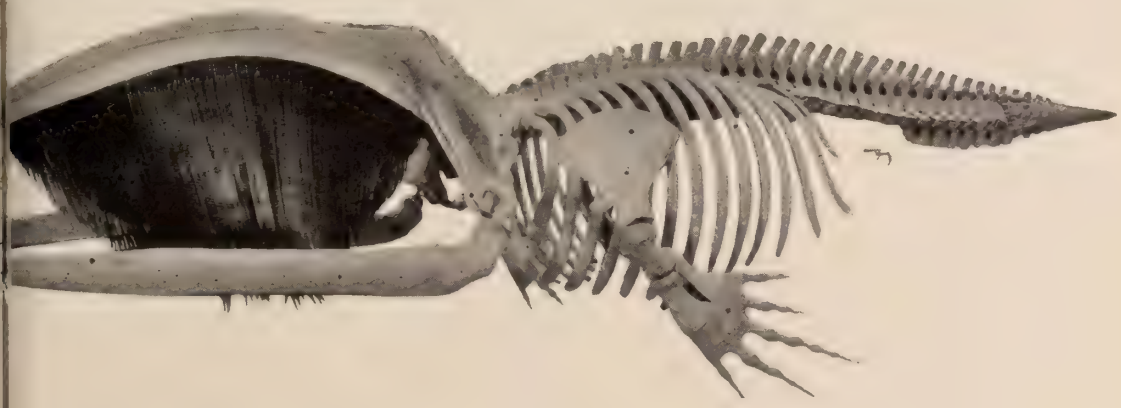
HARPOONING THE SPERM WHALE DURING THE DAYS OF SAILING SHIPS. One of a series of murals in the Hall of Ocean Life depicting whaling in olden times when sail-rigged vessels were used and the whales were killed with a harpoon thrown by hand

lowing a fur seal or small porpoise at a gulp. Near the Killer and facing it hangs the model of a *Blackfish*, like the Killer a species of giant porpoise but of a much milder disposition. Skeletons of these animals are hanging beneath the models. Above the balcony in front of the entrance is suspended a lifelike model of a *Giant Squid*, a great marine invertebrate upon which the Sperm Whale preys. The large skeleton to the right is that of a *Sperm Whale*, the largest of the living toothed whales, formerly much sought by whalers as the source of spermaceti. Beyond the Sperm Whale, on the same side, hangs a skeleton of the *Finback Whale*.

Just above these two large skeletons are found skeletons of several species of toothed whales, including several rare types, and the *Narwhal*. At the near end of this row is a model of the Sperm Whale, and at the far end is a small model of the *Sulphur-bottom Whale*, the largest animal in the world.

Along the left side of the hall, three skeletons of whales are suspended. The one nearest the entrance is a *Right Whale*, that in the middle a *Pigmy Right Whale*, and the third a *California Gray Whale*. Above them is a long row of life-like models of porpoises ranging in species from the common dolphin to the rare river and lake dolphins. Here also

(*Below*) SKELETON OF THE ATLANTIC RIGHT WHALE (*Eubalaena glacialis*). The "whalebone" is shown in the skeleton suspended from the roof of the mouth as close-set, horny plates



A BULL WALRUS FROM THE PACIFIC WALRUS GROUP IN THE HALL OF OCEAN LIFE. One of the specimens secured by the Stoll-McCracken Expedition to Bering Sea. Group presented by Mrs. Andrew Carnegie

is a model of the *Pigmy Sperm Whale*. At the far end are two large models, one of the spectacular *Narwhal* with long ivory tusk (at the right), the other the *False Killer*, formerly a very rare species but in recent years appearing unexpectedly off the British Isles and the coast of South Africa, where a large number were stranded in shoal water. At the opposite end, on the left of the entrance, is a model of the *White Whale*, a large northern porpoise.

Around the walls of the balcony are spaces for twelve mural paintings, of which nine have been completed. Along the right side are four great paintings showing scenes typical of *American Sperm Whaling* and titled respectively, "The Chase," "The Attack," "Towing the Carcass," and "Trying Out." On the left wall are three canvases portraying the life of *Typical Species of Whales* and including "Bowhead Whale," "Finback Whale," and "Killer Whales attacking a Gray Whale." These seven murals are the work of Mr. John P. Benson, the noted marine painter.

At the far end of the hall is the large habitat group showing a *Coral Reef in the Bahamas*. The group extends from the main floor of the hall up to the limits of the balcony ceiling and shows the multitudinous life below the surface, as well as the land, sea and sky above. This group was completed after twelve years study and preparatory work. (See page 62.)

Below the level of the balcony and hanging just beyond reach from the rail at the head of the stairway is a cast of a *Young Sperm Whale* which came into New York Harbor and eventually was held a captive in the Gowanus Canal at Brooklyn. It was brought to the Museum in the flesh.

On the main floor of the Hall of Ocean Life and under the balcony are the habitat groups of marine mammals. Beginning at the first right corner, the first of these is the group of *Northern Elephant Seals*, huge, ponderous mammals hauled out on the rocky beach of Guadaloupe Island, Lower California. The full-grown male of this species has a long, pendulous proboscis suggestive of an elephant's trunk. Continuing along the right side of the hall, the next exhibit is that of the *Florida Manatee*, a thick-set, homely beast, well adapted to its aquatic life. Next is the group of *Pacific Walrus*, one of the largest in the Museum, which shows these Arctic Sea mammals at home on an ice floe.

In the first left corner is a large group of *Steller Sea Lions* at home on St. George Island, on of the Pribilofs. The male Sea Lions are huge, powerful seals with massive necks and shoulders.

Adjacent to the Sea Lions are found the *Alaska Fur Seals* on Kitovi Rookery, St. Paul's Island. Many details of the home life of these beautiful seals are to be noted in this group, which shows the vigorous dominant bulls, each with his harem of sleek, slender cows, the bachelor bulls, and the playful pups.

On the floor of the hall are several cases with special exhibits. One of these is the *Townsend Fur Seal*, a species on the verge of extinction and only recently rediscovered after it was believed by many to have disappeared completely. Another case displays several types of diving gear with full equipment of pump, telephone, etc.

At either side, at the right side of the hall, main floor, are two cases with the beautiful *Undersea Paintings* by Mr. Zarh H. Pritchard.

Suspended from the ceiling at the far end of the hall is the *Lindbergh Plane*, "*Tingmissartoq*." This, together with the equipment used in flying across Bering Strait to China, and later in exploratory flights over Greenland, Iceland, the North Atlantic, Europe, the South Atlantic Ocean and South America, was the gift of Colonel and Mrs. Charles A. Lindbergh.

Other exhibits in the Hall of Ocean Life are described on pages 61-64.

SYNOPTIC HALL OF MAMMALS

(Index Plan, p. 18, Third Floor, Hall 3)

This hall, entered from the Insect Hall, is devoted mainly to a series of exhibits illustrating the characters of mammals, their principal groups, or orders, the main subdivisions of these, known as families, and various interesting peculiarities of habits and structure. Each family is, so far as possible, represented by a mounted specimen and a skeleton. Starting from the further end and

walking around the room from left to right, one passes from the egg-laying Platypus to man, represented by the figure of an Australian native, armed with the characteristic boomerang. Certain exhibits demonstrate modifications of form and structure for various modes of locomotion, and superiority of the brain of mammals over that of other vertebrates. Others show illustrations of albinism and melanism; that animals outwardly similar may be only very distantly related; how the coat of the hare changes from brown to white; and the adaptations of plants and animals to a desert habitat.

(*Below*) A toy-size antelope, Swayne's dik-dik, which is a close relative of the Giant Eland, weighing 1200 pounds: one of many interesting exhibits in the Synoptic Hall

Of special note is the skeleton of Jumbo, the largest elephant ever brought to this country alive.

The fruit bats, often known as flying foxes, the largest members of the Chiroptera, and found only in the warmer parts of the Old World, are represented by a small portion of a colony from Calapan, Philippine Islands. Such a colony may number several thousands, and may be very destructive to bananas and other fruits.

The most striking object in the hall is the life-size model of a *Sulphur-bottom Whale*, seventy-six feet in length. The original of this specimen was captured in Newfoundland, and the model is accurately reproduced from careful measurements. This species of whale is not only the largest of living animals, but, so far as we know, the largest animal that has ever lived. A specimen of this size weighs from sixty to seventy tons, twice as much as *Brontosaurus*. Although whales and porpoises live in the water, they are not fishes, but mammals, as they are warm-blooded and breathe by means of lungs, not gills.

MAMMALS OF NEW YORK STATE

A complete series of the living animals which have been known to exist within the limits of New York State is presented in the corridor on the first floor of the Roosevelt Memorial in the neighborhood of the elevators (Index Plan, p. 16, First Floor Hall 12a). This exhibit includes skins of all animals of moderate size, models of the larger species and cutout figures of the whales and other large sea animals, the latter recorded from the waters around New York.

Origins of Man

HALL OF PRIMATES

(Index Plan, p. 18, Third Floor, Hall 2)

THE Systematic Series of Primates, intended to give some idea of the number of species in this order, and their range in size, form, and color, begins on the left with examples of gorillas and chimpanzees and is continued in the wall cases around the room, ending with the lemurs. Noteworthy among the Primates is the Gorilla, largest and most powerful of apes; the curious "Proboscis" Monkey from Borneo; and the Aye-Aye of Madagascar.

The center corridor contains groups of Primates characteristic of various parts of the world, Africa, Asia, South America and Madagascar, and a group of Pygmies living in the forest in central Africa.

Outside of the central corridor, on the left side of the hall, is a group of Orang Utans from Borneo.

At the farther end of the hall, a series of skeletons demonstrates the comparative structure of the Primates and the changes that take place in passing from Lemurs to Man.

HALL OF THE NATURAL HISTORY OF MAN

(Index Plan, p. 18, Third Floor, Hall 4)

The Hall of the Natural History of Man when completed will consist of two parts, the first entitled "Introduction to Human and Comparative Anatomy," the second dealing with the physical characteristics of the Races of Man, Development, Growth and allied topics.

The first part begins by showing *Man in His Cosmic Aspect*, conceived as a living engine which derives its working capital of energy directly or indirectly from the energy of the sun stored up in plant and animal tissue. This energy is appropriated by man in food substances and distributed through the various anatomical systems.

In another exhibit the *Elements of the Locomotor Apparatus* are set forth. It is shown how red muscle fibres of the fish are combined into W-shaped muscle flakes, or myomeres.

Other exhibits deal with the anatomy of man as compared with lower vertebrates, following the chief organ systems and the locomotor apparatus.

The position of man among the vertebrates and the evidences of his evolution from lower types are illustrated by comparisons of skeletal structure in living and fossil types and by comparisons of his muscle system with lower forms, as well as by comparative embryology. An analysis of the nervous system, and the evolution of the human brain are dealt with and the functions of the brain are demonstrated.

The second part of the exhibit, on the right side of this hall, is devoted to *exhibits illustrating human biology*. It is planned to show the growth and development of the individual, the differentiation of man by constitutional and endocrine types, the racial classification of man, human genetics and race mixture, population problems and the technique of physical anthropology.

There have already been installed exhibits illustrating the growth and development of a human embryo, skeletal growth as shown in the head, and the variety of endocrine physical types. A series of full-size figures showing some of the major racial types has been placed in the central alcove.

Also in this alcove two charts are displayed. One illustrates the natural habitats of the various racial types exhibited. The other depicts the major population movements throughout the world since 1492.

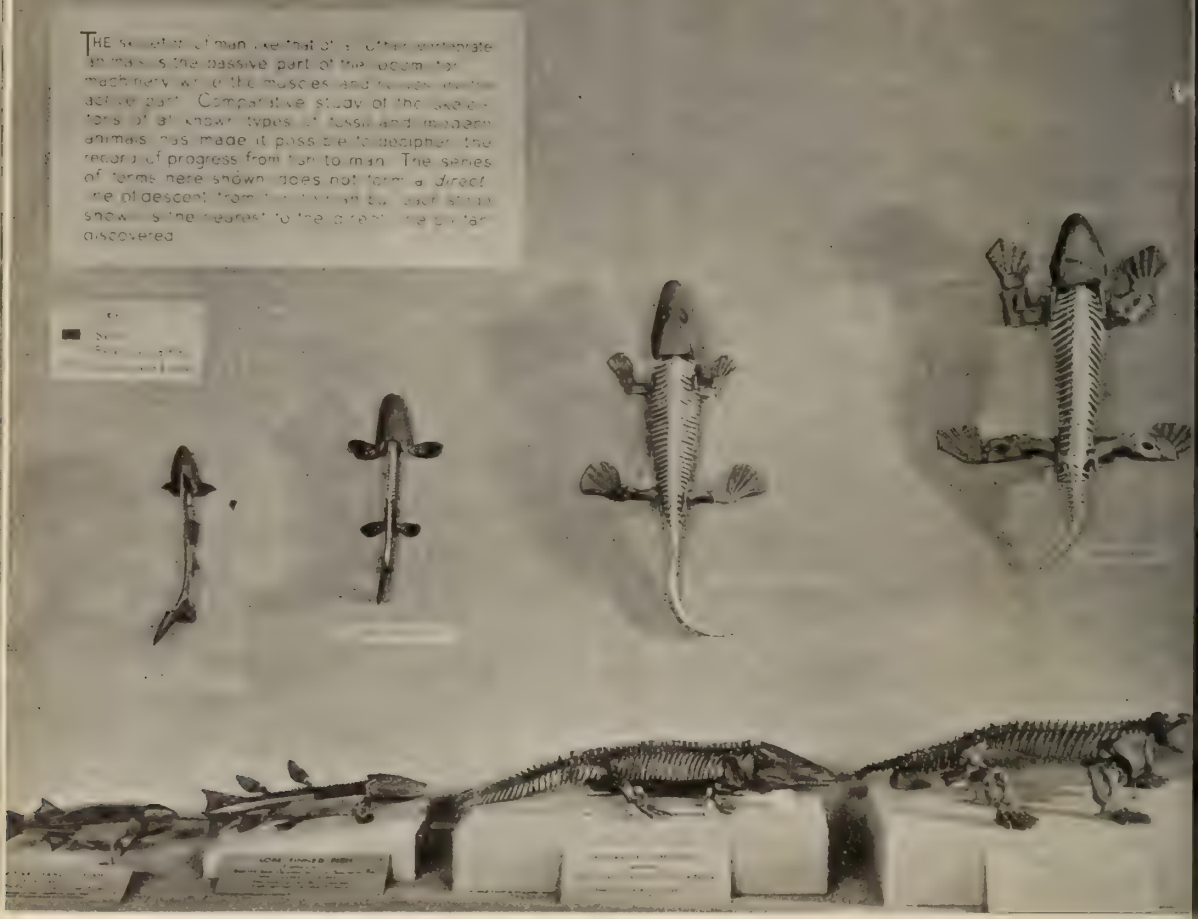
At the far end of this side of the hall will be found an exhibit on some of the more importaont endocrine functions.

THE SKELETON FROM FISH TO MAN

(Index Plan, p. 18, Third Floor, Hall 4)

The judgment of science is that our prehuman ancestors only reached the grade of humanity after millions of years of slow promotion from lower to higher grades of life.

Owing to the enormous number and variety of living forms in all ages and to the



Stage 1 *Cheirolepis* | Stage 2 *Eusthenopteron* | Stage 3 *Diplovertebron* | Stage 4 *Seymouria*

THE FIRST FOUR STAGES FROM FISH TO MAN. (From water-living to land-living)

wholesale destruction of their skeletons by natural agencies, only about thirty of the fossil forms which we have discovered to date happen to lie in or near the direct line of ascent from fish to man. Nevertheless the story of the evolution of the skeleton from fish to man is already clear in its main outlines as shown by this exhibit prepared under the direction of Dr. William K. Gregory.

The *First Stage* represents the earliest true fishes by a model based on a fossil fish named *Cheirolepis* from the Old Red Sandstone (Devonian of Scotland). This fish, which breathed by gills in the normal fish way, must have looked somewhat like a trout, but its tail was more like that of a shark. The body moved forward in the water by a wriggling movement caused by the regularly arranged muscle flakes along either side of the body. The axis of the body was an elastic rod called the notochord (similar to that which appears in the embryonic stages of all higher vertebrates, including man). The fins were folds of skin, serving as keels and rudders.

The *Second Stage*, of Upper Devonian age, represents a long step in advance. It is based on a fossil fish named *Eusthenopteron* from the Upper Devonian of Canada. This fish still had gills but there is some evidence that it also possessed an air-sac or lung. It had two pairs of paddles, corresponding to the fore and hind limbs respectively of four-footed animals.

Stage 5 *Cynognathus* | Stage 6 *Opossum* | Stage 7 *Notharctus* | Stage 8 *Gibbon*

THE SECOND FOUR STAGES FROM FISH TO MAN. (From ground-dwelling to tree-dwelling)

The *Third Stage*, from the Carboniferous age, represents the oldest known type of four-footed animals. The skeleton of the hands, feet and limbs is much more developed than in the previous stage. There are five digits on each of the hands and feet.

The *Fourth Stage* represents the primitive reptilian or lizard-like stage, from the Lower Permian of Texas. The skeleton on the whole is not greatly different from the preceding stage (except in detail) but the limbs were better developed.

The *Fifth Stage* represents an advanced mammal-like reptile (*Cynognathus*) from the Upper Triassic of South Africa. In this form the limbs were better adapted for running, and there are many features of the skull, backbone, and limbs that approach those of mammals.

For the *Sixth Stage* the skeleton of a modern opossum was used. It retains in the main the leading characters of the skeletons of the older fossil mammals. This form has five-toed grasping hands and feet, by means of which it climbs about in the trees. It has retained a relatively low type of skull, teeth, and brains.

In the *Seventh Stage* we come to *Notharctus*, a form that lies near the lower limits of the order of Primates. These animals were

Stage 9
Chimpanzee and Gorilla

Stage 10
Man

THE TWO FINAL STAGES FROM FISH TO MAN. (On the ground again, and attainment of erect posture)

thoroughly adapted to life in the trees but they had much larger eyes and bigger brains than any of the preceding stages.

The *Eighth Stage* is represented by the skeleton of the gibbon, an East Asiatic ape which is a tree-living descendant of the first family of the tail-less or man-like apes. When on the ground he is the only existing man-ape which normally walks on his hind legs. His skeleton begins to be almost human in many ways but his arms are excessively long.

The *Ninth Stage* is represented by our distant cousins the gorilla (below) and the chimpanzee (above). These apes retain the essential characters of the fossil apes of India and South Africa, some of which in turn approached quite near to the oldest known fossil men. The ape brain is much more developed than the brains of lower animals and ape intelligence at times is almost human.

In the *Tenth Stage* we see that the human skeleton is built upon the same general plan as that of the chimpanzee, gorilla, and gibbon, but that in man the backbone, pelvis and limbs are modified to enable him to walk on his hind legs and to use his forelegs as arms and hands rather than as supports. His brain is much larger and more highly developed than in the apes.

MAN AND THE APES. This exhibit illustrates the comparison of the skulls of man and the present-day apes, monkeys, and lemurs—all belonging to the great order Primates. The relationships of these groups are indicated by the branching lines of ascent from the inferred common stock

FAMILY TREE AND EARLY RACES OF MAN

In the *Hall of the Natural History of Man* (third floor) we see models of various skulls, ranging from the earliest Primates of the Eocene Period, through the monkeys and apes of the Miocene and Pliocene, to the subhuman and human races of the Pliestocene and Recent ages.

The exhibits in the central aisle of the *Hall of the Age Man* deal mainly with the older races of mankind as shown by their fossil remains and by preserved fragments of their handiwork.

Men of the Stone Age. Here we see a skull-cast of Trinil, or Java "ape-man," and skeletal remains or casts representing Piltdown Man, Heidelberg Man, Neanderthal Man, and Cro-Magnon Man. An excellent series of sculptured restorations of these types, four of which are illustrated below, have been made by Dr. J. H. McGregor, and are generally considered as embodying the most recent scientific deductions as to the general appearance of these primitive races of mankind. The earliest of them takes man back at least to the lower Pleistocene, estimated at 1,000,000 years ago.

Weapons and implements of rough and

RESTORATIONS OF HEAD AND SHOULDERS OF EARLY MAN. These restorations were made by Professor J. H. McGregor following scientific principles and utilizing the skull-remains of the various types as a starting point. They are as follows:

(1) Trinil Ape-Man
Pithecanthropus erectus

(2) Piltdown Man
Eoanthropus dawsoni

(3) Neanderthal Man
Homo neanderthalensis

(4) Cro-Magnon Man
Homo sapiens cro-magnonensis

CRO-MAGNON ARTISTS OF SOUTHERN FRANCE, at work in one of the limestone grottoes of the region. They are engaged in painting on the rough stone walls pictures of the woolly mammoths, which were then living

polished stone and of bone are exhibited as evidence of the gradual up-building of human culture through the "rough stone" and "polished stone" ages of man's prehistoric periods. Reproductions of the cave paintings of Cro-Magnon man in France and Spain show the artistic ability of the early stock which first represents modern man in Europe.

A series of mural paintings by Charles R. Knight over the doorways of the Hall of the Age of Man give a vivid idea of the various races of early man as visualized by the artist in harmony with our best scientific knowledge.

The Hall of Prehistoric Cultures on the second floor of the Museum (Index Plan, p. 17, Second Floor, Hall 6) is also devoted to exhibits of the early arts and industries of the European Cave Men and Lake Dwellers, as well as of North American prehistoric men.

STAG HUNTERS OF THE NEOLITHIC OR NEW STONE AGE. These men came into Europe after the climax of the glacial climate had passed. Their descendants apparently still exist in parts of Europe. This mural represents a family living on the shore of the Baltic. These people were the forerunners of later civilized man

MAPLE SUGAR CAMP: a miniature group showing how the Indians in the sugar maple region engaged in this springtime activity. The sap was boiled in bark kettles. The dome-shaped house was used for storing the utensils when not in use

LIVING RACES OF MAN

NORTH AMERICA

The Museum's exhibits on the life of the native peoples of North America occupy five halls on the first floor. The Indian exhibits radiate left and center from Memorial Hall, near the 77th Street entrance.

(*Below*) HOW the Indians gathered maple sugar

THE WOODLAND INDIANS

(*Index Plan, p. 16, First Floor, Hall 4*)

Walking toward the left on entering the building, we meet first the Indians of New York and New England, and the successive exhibits are so arranged that you can imagine yourself traveling across the United States from east to west.

Although designated as the Eastern Woodlands Indian Hall (northeastern United States and Canada), the exhibit in this hall extend beyond these cultural and geographical limits. They include the Southeastern and Mackenzie culture areas, the former contiguous to the Eastern Woodlands on the south, the latter on the northwest. The whole of the Eastern Woodland area was in forest and extended westward from the Atlantic coast almost to the Mississippi River. Objects in the cases show that these Indians lived in the forest. The materials they used came from the forest, and this fact influenced their houses, tools, weapons, clothing, and ornaments, so that they are readily distinguished from those of other areas.

These forest Indians were primarily hunters and fishermen, but wild rice and maple sugar were staple foods. Agriculture was practiced where the climate permitted, and corn, beans, squash, tobacco, etc., were raised. (See miniature dioramas at north side of hall.) Their woodland environment led to various simple industries naturally dependent upon the raw materials that were at hand and adaptable to their daily needs.

Wood was used for canoes, mortars, spoons, bowls, dishes, houses, and wood splint baskets. Bark of various kinds was a

USE OF BIRCH BARK AMONG THE EASTERN INDIANS (From a miniature group in the Woodland Indians Hall)

favorite material. For example, the birch-bark industry, as shown in the model illustrated above, is exemplified by containers and ornaments in many of the cases. Bark like that of the basswood tree was also shredded to make the fiber for weaving bags.

Skins were originally used for costumes, but cloth was often bought from white traders. Many wild plants and trees furnished fiber from which these Indians made good string and cord for making fish-nets and weaving bags. Every well-furnished home required mats for the floor and for sleeping, as shown in the group pictured below.

Climate influences the ways of life. In this hall, the tribes represent a range from near-Arctic Canada to sub-tropical Florida. Their clothing varies from fur garments among the Dene and the Cree, to thin dresses of commercial cloth among the Seminole.

MAKING CORN BREAD IN AN IROQUOIS HOUSE (From a miniature group)

A number of miniature groups along the side walls and in the cases show tribal costume, housing, and industries. Especially interesting subjects are rock shelters, the making of rabbit-skin clothing, weaving with basswood fiber, making a false face, and the stages by which grains of corn are transformed into bread.

Travel was on foot. Dugout or bark canoes were used in summer where streams or lakes were available. Snowshoes were used in winter, and in the north the toboggan was common.

The dwellings of this area are of several forms. Among these are the long rectangular houses of the Iroquois covered with bark, the dome-shaped huts of Long Island and vicinity which were covered with mats and bundles of grass, and the familiar conical wigwam of the Ojibway covered with birchbark. The utensils are of pottery, wood or birchbark. Pottery was made by most of the Eastern tribes and seems to be associated with the practice of agriculture. The designs are incised, never painted. Bowls, trays, and spoons are made of wood and often decorated with animal carvings. The use of birchbark in the construction of light, portable household vessels is one of the particular traits of our Eastern Indians.

Examples of Indian inventions are canoes, maple sugar, tobacco pipes, cornhusk weaving, splint baskets, tump-line, wampum, la crosse game, netted snowshoes, toboggan, and water-drum.

A MANHATTAN INDIAN WOMAN COOKING IN A POTTERY BOWL (Group in Woodland Indians Hall). Not much is known of the Manhattan Indians except from traditions handed down by early settlers. Some remains of their clothing and implements are in existence as illustrated below

The Indians' history begins with the landing of white men. Many of the objects shown in the cases are historic, but others, such as the stone, bone, and shell objects found in the ground, are usually prehistoric. In the exhibits dealing with Manhattan and Staten Islands, from which the Indians were driven by the first settlers, we can exhibit nothing but pottery, stone, bone, and shell objects. These local relics will be found near the entrance to the hall. On the left are some pottery vessels and many small objects of stone and bone from Manhattan Island, Staten Island, Long Island, and Westchester County. Near by on the same side of the hall are collections obtained from living Indians of the coast region north and south of New York. These are the Penobscot and Passamaquoddy of Maine, the Micmac and Malecite of the lower provinces of Canada, and a few but rare objects from the Delaware who once occupied the vicinity of New York City and the State of New Jersey. The age and historical relations of these cultures are shown in a large label at the left of the entrance.

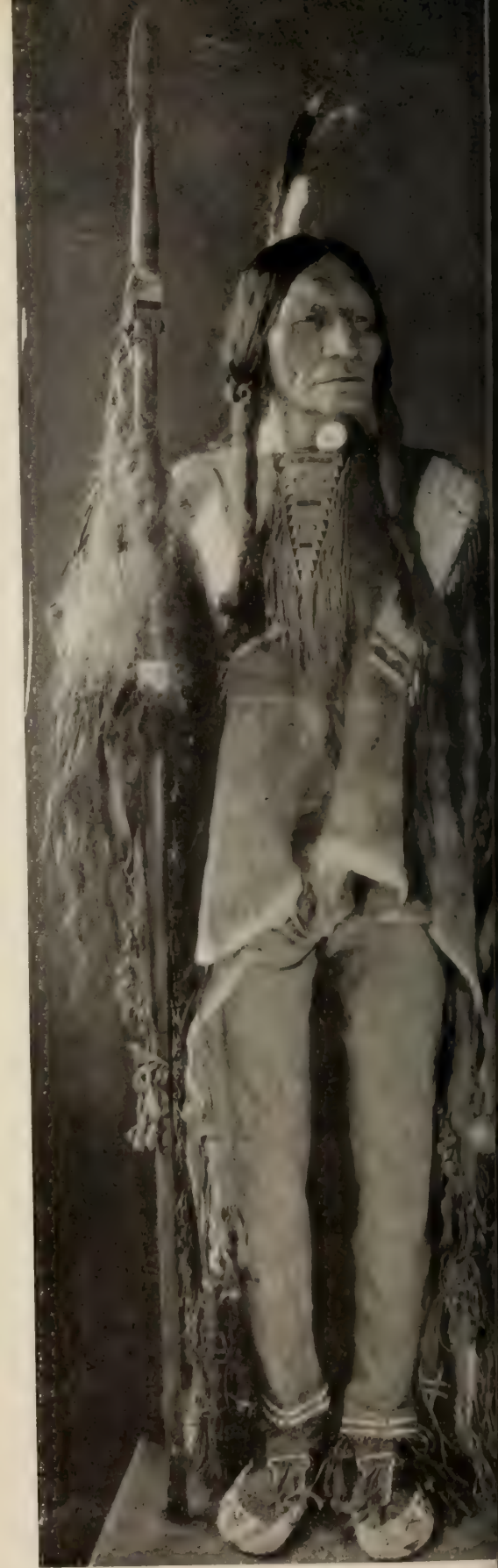
A family group of Micmac Indians, in a birchbark conical house, is shown half way down the hall.

On the opposite side are the Iroquois, whose league comprised the Mohawk, Seneca, Oneida, Onondaga, Cayuga, and later the Tuscarora. They dominated New York and much adjoining territory. The exhibits represent particularly the agriculture of the East, which was carried on with rude tools by the women.

In the farther end of the hall, on the left, are the collections from the Ojibway, Hiawatha's people, who lived mainly north of the Great Lakes. They had but little agriculture, living chiefly by hunting and fishing. Beyond the Ojibway are the Cree, who lived still farther north.

Opposite the Ojibway are the great Central Algonkin tribes, the Menomini and Sauk and Fox, who lived south and west of the Great Lakes.. They gathered wild rice and hunted and fished, also practicing some agriculture.

In the southeastern portion of the United States, agriculture was highly developed. These tribes are represented by the Cherokee



A DAKOTA SIOUX WARRIOR (Model in Indian Hall)

KOTA SIOUX WOMAN (Model in Plains Indian Hall)

and Yuchi, who made pottery, and by the Choctaw and Chitimacha, who made interesting baskets of cane. The Seminole of Florida have maintained an independent existence in the Everglades for nearly a Century. Their prehistoric arts are illustrated in the table case. They excelled in polishing stones and working shell. (See the diorama on the north wall.)

THE PLAINS INDIANS

(Index Plan, p. 16, First Floor, Hall 6)

The keynote to Plains Indian life could be sounded by such terms as "tipi," "buffalo," "horse," and large decorated "pipes." The tipi and the pipe are especially conspicuous in the center of the hall.

The art of these Indians is highly original and popular. Painting upon skin is the usual method, but many designs in beadwork and quills are shown prominently in the hall.

Artists look upon the feather headdress of these Indians as the most beautiful type of headdress to be found anywhere in the world. With this and his highly decorated costume, the Plains Indian is colorful.

Indians of the Plains comprised the tribes living west of the Mississippi and east of the Rocky Mountains as far south as the valley of the Rio Grande and as far north as the Saskatchewan.

Occupying the greater part of the hall, beginning on the left, are the buffalo-hunting tribes: the Plains-Cree, Dakota, Crow, Blackfoot, Gros Ventre, Arapaho and Cheyenne. These tribes did not practice argriculture but depended almost entirely on the buffalo. Buffalo flesh was their chief food, and of buffalo skin they made their garments. In some cases a buffalo paunch was used for cooking, and buffalo horns were made into various implements of industry and war. The spirit of the buffalo was considered a powerful ally and invoked to cure sickness, to ward off evil, and to give aid in the hunt. Wherever the buffalo herds led the way, the more nomadic Plains tribes moved their tipis and followed. With the extermination of the buffalo the entire life of the Plains Indians was revolutionized.

On the right, near the entrance, are the village tribes of the Plains: the Mandan, with

LEACHING ACORN MEAL AMONG THE HUPA INDIANS OF CALIFORNIA. Water is placed in a basket and brought to the required temperature with heated stones

whom Lewis and Clark passed the winter of 1804-1805; the Hidasta, who now live with them; and the Omaha, Kansa, Iowa, and Pawnee. All these tribes raised corn and lived in earth-covered houses of considerable size. A small model of one of these houses stands near the exhibits.

In the center of this hall is a Blackfoot Indian tipi with paintings of otters on the sides, representing a vision of the owner. This tipi has been fitted up to show the home life of a typical buffalo-hunting Indian.

There were numerous soldier societies among the Plains Indians which included practically all the adult males. Each society had a speccial dance and special costumes. (See the Arapaho cases for costumes of dancers.) There were other dances connected with tribal religious ceremonials, the best known and most important of which is the Sun Dance, illustrated by a model at the left of the tipi. The Sun Dance was held annually in the early summer in fulfilment of a vow made during the preceding winter by some member of the tribe who wished a sick relative to recover. The dance involved self-torture, great physical endurance and a fast lasting three days.

In the center of the hall is a genuine medicine pipe, held in awe by the Indians and dearly parted with; also the contents of a medicine-pipe bundle. The contents of another medicine bundle, belonging to a leading man of the Blackfoot tribe (medicine-man), together with the headdress which he wore in ceremonies, are in a case near the tower. Other remarkable bundles, particularly the skull bundle, are in the Pawnee case, on the north wall.

The Plains Indians are noted for their

(*Above*) BLACKFOOT WOMAN AND CHILD TRAVELING WITH TRAVOIS, which are attached to the horse and dog and are dragged behind them. A primitive method of transportation. From a miniature group in the series of models showing methods of transportation.
In the Eastern Woodlands Indian Hall

A BULL BOAT OR CORACLE OF THE HIDATSA INDIANS OF NORTH DAKOTA was made by stretching skins over a basin-shaped wooden frame. It was used for fording streams

(*Above*) APACHE WOMAN BUILDING FRAMEWORK OF A HOUSE to be covered with thatch and rushes

A NAVAJO MEDICINE LODGE. For the celebration of the Navajo Night Chant a special house is erected. The medicine man is laying down an elaborate ceremonial sand-painting. Group in Southwest Indian Hall

picture-writing on skins and for their quillwork, which was superseded by beadwork when glass beads became available in historical times. They have a highly developed decorative art in which simple geometric designs are the elements of composition, this being one of the most interesting features of their art. (See Dakota case and Guide Leaflet No. 50, also Handbook No. 1, North American Indians of the Plains.)

INDIANS OF THE SOUTHWEST

(Index Plan, p. 16, First Floor, Hall 8)

This region is famous for two reasons: the picturesque living Indian tribes, and the large number of ruins built by prehistoric Indians. Since many of the latter are placed upon high rocks or in the walls of canyons, they are spoken of as Cliff Dwellings.

This hall presents collections from both the prehistoric and the living Indians of the Southwest. On the right are the nomadic tribes: the Apache, Navajo, Pima, Papago, and Havasupai. A life-size exhibit, the first of a series along the right-hand wall, shows the home life of the San Carlos Apache. Next is a larger group showing a Navajo hogan in Canyon de Chelly, and the Night Chant ceremony. The painted background in this group gives a view of the canyon, and in a cave of its walls, one may see the famous White House ruins.

In near-by cases, Navajo silverwork and blankets are exhibited. The Navajos are the modern blanket makers. With simple implements and looms, they card, spin, and weave the wool of the sheep they raise. This art has arisen since the coming of the Spaniards and it is known to have passed through several stages in the last sixty years. Some of the older types of blankets here shown contain yarn which was obtained by cutting or raveling from imported flannels, called in Spanish "bayeta," from which these blankets receive their name. These are either bright red or old rose in color, resulting from cochineal dye. Several blankets are made of yarn bought ready dyed from traders and are called Germantowns. The greater number, however, are made of yarn of native spinning, dyed with native vegetable and mineral dyes.

The Navajo are a large and widely scattered tribe. During the winter they occupy log houses, but in milder weather they camp in the slight shelter of a cliff or windbreak and shade made of brush. They live by raising corn in the moist valleys, and on the flesh of their numerous flocks of sheep.

The Western Apache live along the upper portion of the Gila and Salt rivers, where they practice agriculture, gather natural products, and hunt. Indians related to these, under Geronimo, raided the settlements of southern Arizona and northern Mexico and evaded our troops for years. They live in grass-thatched houses or in the open under the shade of flat-topped, open-sided shelters.

The Eastern Apache lived in buffalo skin tipis. They went far out on the plains in search of the buffalo herds, avoiding, if possible, the Plains tribes, but fighting them with vigor when necessary. In dress and outward life they resemble the Plains Indians, but in their myths and ceremonies they are like their Southwestern relatives and neighbors.

In the first alcove to the right of the entrance is a basketry exhibit showing the types of baskets and the materials, tools, and techniques employed by the Southwestern tribes. This exhibit is in contrast with the corresponding case of pottery on the opposite side. Not the environment, but social habits, caused one people to develope pottery and the other to make the easily transported and not easily breakable baskets. (See Handbook No. 2, Indians of the Southwest.)

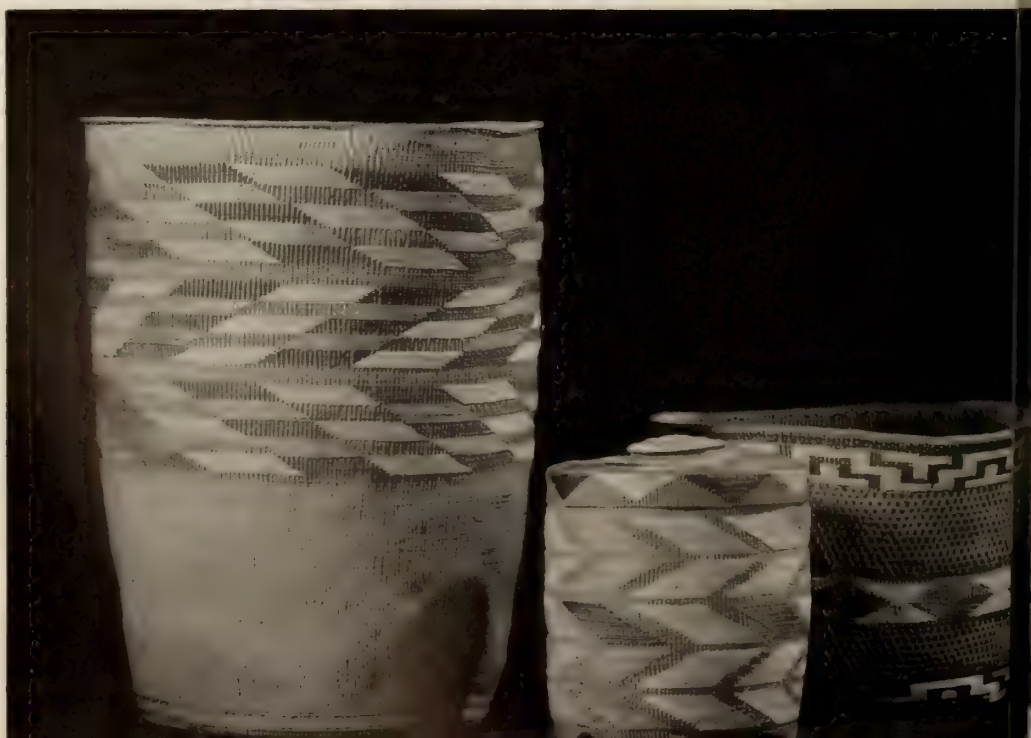
At the left of the hall, as we enter, are exhibits for the modern village Indians—first types of pottery from San Ildefonso, Laguna, Santo Domingo, Zuni, and Hopi.

The Pueblo Indians live in large community houses, built of stone or adobe, often with several receding stories. They depend chiefly upon agriculture for their food, make a great variety of pottery, and have many elaborate religious ceremonies. The nomadic peoples live in tipis or small brush and thatched houses which are moved or deserted when they are forced to seek the wild game and wild vegetable products which furnish much of their food. They make baskets for household purposes which are more easily transported than vessels of clay. In the hall

MODEL OF A KWAKIUTL HOUSE (In the North Pacific Hall). The Kwakiutl Indians live on Vancouver Island, and on the mainland to the north. They build their rectangular houses of split cedar planks on a framework of heavy posts and beams. The front is decorated with fantastic designs and a totem pole near the house door is carved with grotesque figures as a coat of arms of the owner

(*Right*) CEREMONIAL RATTLE OF THE HAIDA INDIANS

(*Below*) TLINGIT BASKETS. Twined basketry made by the Tlingit Indians of the British Columbian sea coast. Spruceroot fibers are used for both warp and woof



are models of the pueblos of Taos and Acoma, of prehistoric cliff-dwellings, and of the houses used by the Navajo.

The inhabitants of Zuni are believed to be the descendants of the first people seen by the Spaniards in 1540. Their former villages, many of which now are in ruins, were probably the "Seven Cities of Cibola," for which de Coronado was searching at that time. Although there were missionaries among them for about three centuries, they have retained many of their own religious ceremonies. Many ceremonial objects as well as those pertaining to everyday life are shown in this alcove.

In the Hopi section are costumes, masks, images, and basketry plaques used in their ceremonies. Their best known ceremony is the Snake Dance, the performance of which is supposed to increase rainfall and the crops. Some of the regalia worn for the Snake Dance are shown, as well as a small model of a single phase of the ceremony. On the right side of the hall, next to the Navajo group, is a representation of Hopi life.

In the center of the hall, as well as in the farther half of the left side, are special exhibits for the prehistoric Indians of the Southwest. Near the center is an exhibit showing how many prehistoric ruins have been dated by the tree-ring method. A chart at the entrance to the hall gives the successive culture periods for the Southwest, beginning with early Basket Maker and ending with the modern Pueblo villages. Typical objects made by the Basket Makers are shown in small cases in the center of the hall and in upright cases to the left.

Two of the most famous prehistoric Southwestern ruins are Bonito and Aztec. A model of the latter stands in the center, and near the entrance is an exhibit of turquoise from Pueblo Bonito. Other collections from these two ruins are shown in cases at the left of the hall. One contains a remarkable collection of pottery from Pueblo Bonito. Similar black-on-white wares with very elaborate and splendidly executed designs, shown in adjacent cases, are from Rio Tularosa, and in part from cliff-dwellings. In another case will be found material

HOUSE POST FROM VANCOUVER ISLAND

gathered by the Museum expedition which explored the Galisteo Valley, New Mexico. (See Guide Leaflet No. 73, *Pottery of the Southwest Indians.*)

At the farther end of the hall, at the right, is an exhibit from the prehistoric Indians of California. (See Guide Leaflet No. 55, *Basketry Designs of the Mission Indians.*)

INDIANS OF THE NORTH PACIFIC COAST

(*Index Plan, p. 16, First Floor, Hall 1*)

The Jesup North Pacific Hall is devoted to the Indians living in the heavily forested and mountainous coastal belt extending from the Columbia River in Washington to Mt. St. Elias in southern Alaska as well as on the offshore islands. They are the most skilful wood workers on the American continent, as demonstrated here by the models of their houses; their intricately carved and painted totem, house, and grave posts; their ceremonial masks, boxes, implements, and tools. Paralleling their dependence on their forest environment for housing, clothing, and utensils, was their dependence upon the products of the sea for food. Travel and transportation were mainly by water, for which canoes, like the large Haida war canoe in the center of this hall, were built by skillfully hollowing out giant cedar logs.

Except for two tribes, the Shushwap and Thompson, who live in the interior of British Columbia, the exhibits are arranged in the order in which the several tribes are encountered in traveling from south to north along the coast of Washington, British Columbia, and Alaska. On the right side of the hall are the Bella Coola, Tsimshian, Haida; on the left, the Nootka, Kwakiutl, Tlingit.

The murals of Will S. Taylor illustrate not only the industries, religious and social life of these Indians, but also their heavily forested and fog- and rain-drenched environment. The murals on the right side are devoted to ceremonial and religious life, on the left to daily life and industries. Over the entrance are shown games, and at the farther

CARVED WOODEN FIGURE made by the Quinault Indians inhabiting the northwestern coast of the State of Washington

ESKIMO WOMAN FISHING THROUGH THE ICE (Group in the Eskimo Hall)

end of the hall is depicted the return of a victorious war party.

No less conspicuous than the wood-carving art of the Northwest Coast Indians is their skill in weaving in mountain goat wool and shredded bark and in making baskets. Notice in this connection the Chilkat ceremonial blankets a little over halfway along the hall, on the left, and the Tlingit baskets at the end. These Indians have likewise distinguished themselves in the carving of stone, bone, and ivory, examples of which are shown for the various tribal groups.

Outstanding perhaps is the wealth of decoration observable on all their products. The typical grotesque art motives, based on the

distortion of animal forms, are found in equal abundance on utilitarian and ceremonial objects.

ESKIMO CORRIDOR

(Index Plan, p. 16, First Floor, Hall 7a)

The Eskimos are frequently cited as the primitive people who have achieved the most complete adjustment to their environment. They inhabit the northern shores and adjacent islands of North America, from easternmost Siberia and the Aleutians to East Greenland and Labrador. All these Eskimos, who differ somewhat in details of culture according to locality, are represented here, though not with equal completeness.

Contact with the white man has changed the Eskimo's way of life to greater or lesser extent, but he continues to use many of his traditional tools, implements, and distinctive articles of fur clothing. The Eskimos are hunters and fishermen. In summer they hunt the caribou, musk ox, and birds, often inland. Their dwellings at this season are tent-like frames covered with deer or seal skin. In winter they hunt sea mammals, especially seals. Their winter houses are of stone built over shallow excavations and covered with earth. The familiar snow-house is the traditional winter dwelling of certain tribes but is unknown in Alaska and most of Greenland. Models on exhibit show how the snowhouse is built. The Eskimos are skilled in the making of fur clothing and skin boats. The ingenious implements they fashion of wood, bone, and ivory are frequently decorated with naturalistic incised designs.

Many of the objects shown here are from the collections made by the Peary, Comer, MacMillan, and Stefansson-Anderson expeditions..

Near the entrance of the corridor is an Eskimo woman fishing through the ice. She has formed a windbreak with blocks of ice. The fishing rod and hook and the long ladle are made of bone, and with this latter she keeps the water in the hole from freezing over while she is fishing. In another case will be found an Eskimo woman cooking in the interior of a snow hut that is lined with seal skin. She is using a stone lamp filled with seal oil, which feeds the flame over which the meal is being prepared.

MEXICO AND CENTRAL AMERICA

(Index Plan, p. 17, Second Floor, Halls 2a and 4)

At the west stairway on the second floor we enter a corridor and hall devoted to the ancient civilizations of Mexico and Central America. Along the walls of the stairway are casts of some of the finest stone monuments from the Maya cities of Central America, and the corridor alcove contains pottery and stone objects from Costa Rica. In the central portion of the main hall are three illustrated maps, one showing several typical landscapes in Middle America and the other two the distribution of pottery types and architectural forms. Farther on are a number of cases devoted to the finest objects in the collection, which well illustrate the great artistic achievements of the Middle American civilizations.

The far end of the hall is devoted to the Maya culture. The right side shows the known cultures of Central Mexico, from the earliest to the latest, and the left side deals with Northern Mexico, the Mexican Period of Yucatan, the Zapatec culture of Oaxaca, and Aztec sculpture.

Peoples and Time: The history of ancient Middle America is little known. Contemporary archaeological opinion gives the following rough dates:—

10,000 B.C.—200 B.C. Period of Population and Settlement. No remains yet identified.

200 B.C.—500 A.D. Early Cultures, including growth of techniques of farming, weaving, ceramics, stonework, and establishment of permanent villages. Some persist until the Spanish Conquest.

500 A.D.—1000 A.D. Ritualized Civilizations with Temple Cult, Polytheism and Sacred Calendar, like Maya of Guatemala, Zapotec of Oaxaca, Olmec of Vera Cruz, Teotihuacan of Valley of Mexico.

1000 A.D.—1200 A.D. Period of Unrest and Migration, Chichimec Period in Valley of Mexico, Mexican invasion in Yucatan.

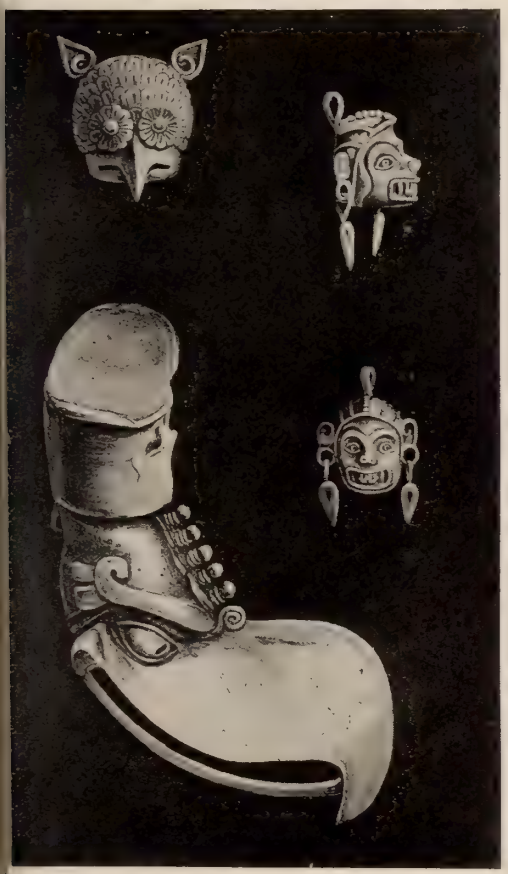
1200 A.D.-1519 A.D. Domination of Mexican Peoples. Mexican Period in Yucatan, Mixtec Period in Oaxaca, Aztec Period in Valley of Mexico.

There are specimens shown in the hall

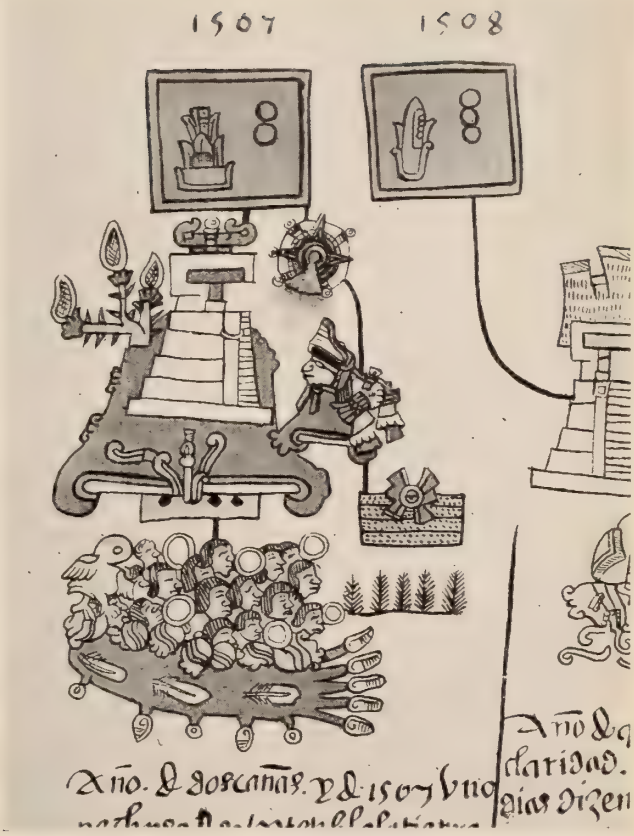
whose makers are absolutely unknown, but whose style is distinctive. Conceivably in time we may be able to assign them to the speakers of some one of those fifty languages recorded for Mexico, a fact which in itself indicates that in Middle America there were tribes not empires.

Nature of Objects: The majority of objects shown in the Hall are made of pottery, stone, bone, shell, and metal, because these substances best resist the destructive action of time and weather and are preserved through the centuries. Therefore, the wooden drums in the Aztec case and the obsidian mirror with the wooden frame are great treasures, since only a handful of examples of the woodcarver's art survived the Conquest.

Architecture: The varied and imposing temple architecture of Middle America may be estimated by the models distributed



GOLD OBJECTS FROM MEXICO AND CENTRAL AMERICA



AZTEC PICTURE WRITING recording the last of the "New Fire Ceremonies" before the Spanish Conquest in 1519. It also represents an eclipse of the sun, an earthquake, and the drowning of two thousand warriors on their way to make war on the people of Southern Mexico

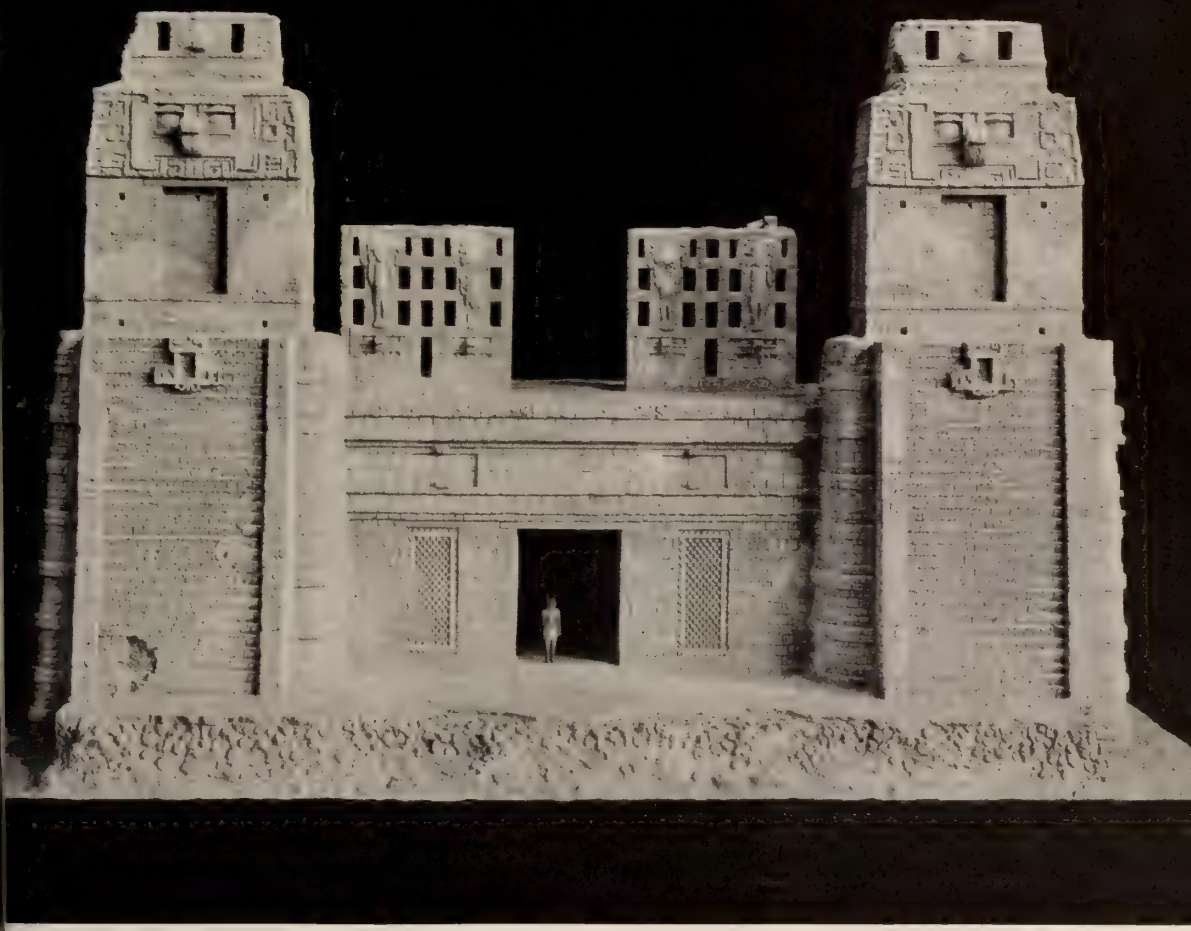
throughout the hall. The Maya buildings of which we have examples ranging through the span of their history show how a sculptured platform evolved into one supporting a massive shrine, and how that in turn developed into temples and priest's quarters. Yet the architecture of the Zapotec, Toltec, and Aztec is hardly less imposing, and the cast of a Serpent Column from Chichen Itza brings vividly home the tremendous scale of these Indian temples.

Sculpture: It is in sculpture that we may gauge best the tremendous attainments of the ancient peoples of Middle America. The polytheistic religion required many images depicted in a great variety of forms human, animal, and grotesque. The casts of Maya stelae from Quirigua indicate that the native sense of design could function in terms of

an enormous mass. The intricate monuments from Copan likewise show how skillful a mass sculpture can be. Equally important are the casts from the southwest coast of Guatemala ranged along the stair to the first floor. Yet there is an abundance of original material, which includes for the Maya some of the cream of the Copan style as well as original examples from Yucatan collected by the famous traveller, Stephens, a century ago. The abilities of the Aztec are displayed both in casts and original examples, which cannot be duplicated in this country. The work of the Totonac and Olmec, in the form of masks and small figures including jades, is thought by various authorities to be the best produced in Indian America, while the vigorous barbarity of the Geutar carving of Costa Rica is worthy of attention. A series from Oaxaca shows the laborious methods of carving stone with stone, since no metal tools hard enough for this purpose were developed by the Indians.

The figures in baked clay are worthy of considerable attention, since the Middle Americans developed this type of work into a fine art. Especially interesting are the historical series of figurines from the Early Culture and Teotihuacan horizons. These show the change in styles in two cultures, over a period of nearly a thousand years. The most notable clay sculpture is the life size warrior of the Chichimec period of the Valley of Mexico. However, for sheer vigor and vitality the large clay figures from Western Mexico are preeminent. A profound grasp of realistic appreciation of human features is displayed by the Vera Cruz exhibit of clay heads, laughing ones from the Totonac area, more serious ones from the

A PRIEST MAKING AN OFFERING: a cast of a Maya relief sculpture from Jonuta, Tabasco, Mexico. The original of this cast is in the National Museum of Mexico and is one of the finest examples of the Palenque style of Maya sculpture. This piece dates from the Maya Great Period in the centuries immediately preceding the year 1,000



MODEL OF A MAYA TEMPLE: a miniature replica of the temple at Rio Bec in the eastern part of the state of Campeche, Mexico

Tuxtla region. A culmination of ceremonial requirements is to be seen in the funerary urns from Oaxaca, where a great sense of design mitigates the grotesque forms employed.

Writing: Examples of the methods of writing used in Middle America are found in different parts of the hall. The simple pictographic style of the Aztec and Mixtec are represented by original paintings on cloth and by skillful reproductions. A post-Conquest land map and genealogical tree from Tlaxcala throws much light on dress and costume fifty years after the Conquest. The Zapotec and Maya writing was expressed by highly conventionalized signs. On the Maya casts long inscriptions relating to the dates of astronomical phenomena may be found. Aztec writing can be read, Maya writing partly deciphered.

Jewelry: Certain cases in the hall show priceless examples of Middle American jewelry. Jade was the substance most highly prized, and there are several local styles of working it. The American variety of jadeite and nephrite is distinct from the Asiatic type. Especially important are the Zapotec and Olmec collections, which include two of the finest specimens in the world. Gold was esteemed only as an easily malleable metal, but the workmanship on the Mexican pieces and the design of the Costa Rican ornaments attest again to the high level of Indian civilization.

FIGURE OF A GOD. MAYA CULTURE. Limestone sculpture from Copan, Honduras. This is one of the finest examples of Maya sculpture in the round, showing how perfectly the Maya represented their physical type, and how beautifully they could express their art without the use of metal tools of any kind. Around the tenth century

Metals and Precious Stones: Silver is very rare, owing to the difficulty of extracting the ore, but copper was used in late times for tools and ornaments. Mirrors of iron pyrites used in their matrix and as a mosaic show an interesting utilization of this mineral. Obsidian or volcanic glass, commonly used for tools, was wrought into mirrors and ornaments with the simplest abrasives. Rock crystal, amethyst, moonstone, opal, jasper, and porphry were other stones valued and worked as ornaments by these people.

Pottery: The commonest product recovered by archaeology is pottery, and the halls are full of vessels recovered from graves and ceremonial deposits. These vessels were not made on a wheel, and building up the pots with strips of clay brings about a squat appearance to our eyes. However, the variety of shape and design shows how each tribe or community had its own styles. Notable techniques are the vitreous ware from Salvador and the plaster cloissonné from Jalisco. Note also the common use of lost-color or

MOCIUTLXOCHITL, THE GOD OF GAMES AND FLOWERS. A fine example of Mexican terra cotta pottery dating from about 1400 A. D.

BOY AND DOG (*Below*). This little pair of clay figures from Colima, Mexico, shows the vitality of western Mexican art

batik decoration in Jalisco and Costa Rica. Vessels of huge size were sometimes made, like the Toltec vessels from Azcapotzalco. Even the earliest forms from the early cultures of the Valley of Mexico reveal a development of technique and style that indicates long years of experimentation. Few regions in the world can show such a wealth of form and ornament as Middle America.

Design: The textile art was important in Middle America but time and weather have destroyed almost all of it. However, hints are given by the ancient picture writings and the use of textile designs on pottery. The art is old and cotton has been recovered from the earliest levels in the Valley of Mexico. Examination of the designs on the Puebla pottery, on the West Mexican figurines, and on the dress of the figures on the Maya stelae will show how skilled these people were. In various cases the clay weights for spindles are exhibited, many of which are beautifully carved and polished. The size and weight seem to be gauged in some cases to the fineness of the thread.

Musical Instruments: Music was not highly developed in ancient Middle America, but many examples of flutes, whistles, shell trumpets and rattle bones attest to an interest in tone and rhythm. Most notable are the Aztec two toned drums which give forth very pleasing notes. A pottery whistling jar in the form of a rain god is one of the outstanding pieces in the Salvador collection.

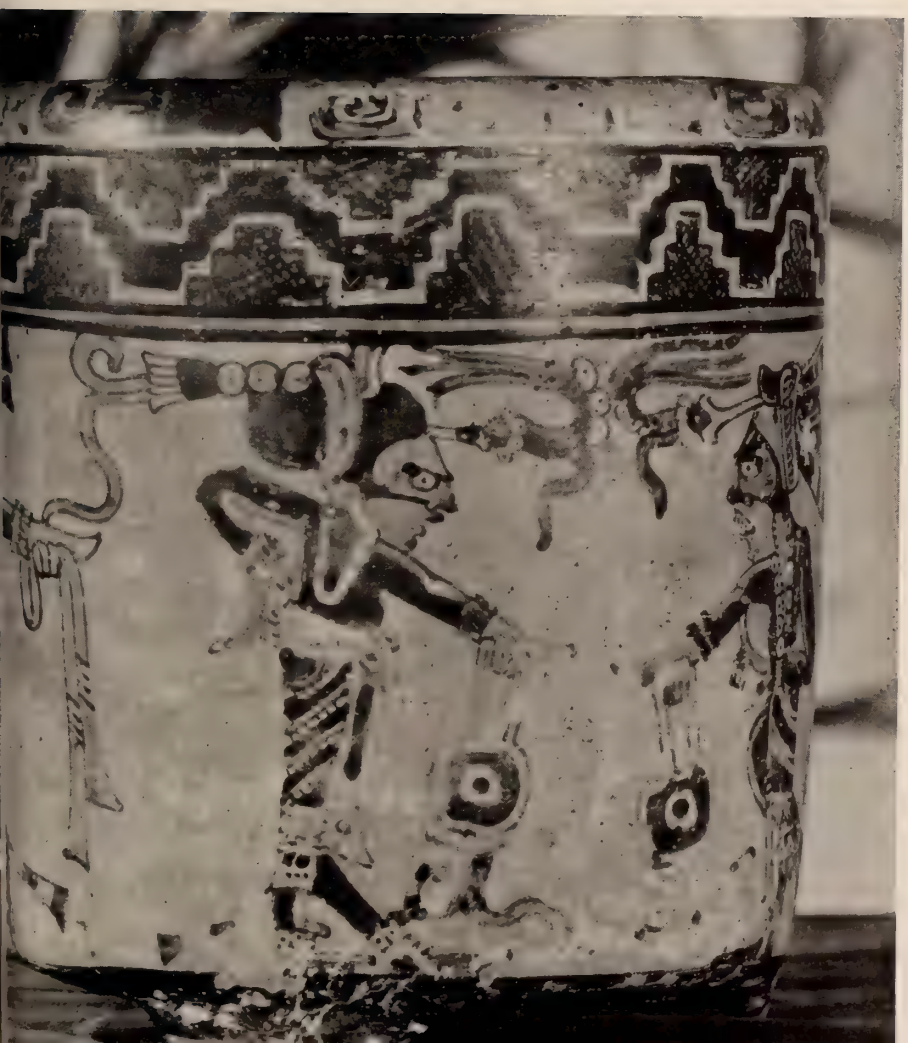
Tools: The chief tools of the ancient Middle Americans were made of stone, bone and wood. Copper tools were only sporadically employed and in late times at that. The great wonder of Middle American civilization is that with these simple elements and without knowledge of the wheel or draft animals, these people were able to achieve an imposing culture comparable to the great civilizations of the Old World, whose technical basis was so much more highly developed.

THE GOD XIPE, LIFE-SIZE, in terra cotta. Worshipped by the Central Mexicans as the God of the Flayed, Xipe is shown here wearing a human skin. When the skin was fresh it was tied on the God. As it dried it wrinkled, and the wrinkles formed the scales. This practice flourished in Central Mexico about the year 1200

CORN GODDESS OF THE ANCIENT AZTECS. This figure from Ixtapalapa, Mexico, is carved in black basalt. It is an outstanding example of Aztec art showing great naturalistic skill in presentation (Fifteenth century)

FIGURE OF A SEATED WOMAN: a splendid example of clay modeling from western Mexico, illustrating the remarkable ability of these ancient sculptors in depicting form and expression

LAUGHING CLAY HEAD. An example showing conscious humor. Clay heads of this type are said to be parts of complete figures. They come from central Vera Cruz. Nearly all the figures are laughing or smiling in a very contagious manner



MAYA VASE WITH FIGURE PAINTING. From San Jacinto, Salvador. Not only does it illustrate great skill in depicting attitudes, but seems to indicate a remarkable sense of humor in the artists

INDIANS OF SOUTH AMERICA

(Index Plan, p. 17, Second Floor, Hall 8)

This hall contains Indian exhibits from all the South American countries except Paraguay and Uraguay. The largest portion of these illustrate the prehistory of the peoples of Peru and Bolivia and are arranged in the front of the hall.

Unlike the ancient peoples of Mexico and Central America, the Peruvians had no written language. They were tillers of the soil and raised potatoes, oca, quinua, beans, coca, and cotton. They domesticated the llama, which was used as a beast of burden. They excelled in the manufacture and decoration of pottery vessels, in metal work, and in textile fabrics.

Their gold and silver objects, such as beads, cups, pins, plates, and ear ornaments, show a high degree of skill in the beating, soldering, and casting of metals.

In weaving, the Peruvians were perhaps preeminent among prehistoric peoples of the world, many of their textiles exhibited here being unsurpassed at the present day. The materials used were cotton and the wool of the llama, alpaca, and vicuna. In the cases near the entrance are examples of these textiles and the fibers, spindles, thread, looms and other equipment used in their manufacture.

On the right side of the hall are collections from important localities in Peru, followed by exhibits from Ecuador, Colombia, Venezuela, Brazil, and Panama. In case 57, near

MUSICAL WIND INSTRUMENTS OF ANCIENT PERU. The wind instruments of the ancient inhabitants of Peru, as illustrated below, included the panpipe or syrinx shown in the center; resonator whistles *(left)*; trumpets of clay and wood; and a great variety of simple whistles. The pottery figure at lower left shows how the panpipe was played

POTTERY OF THE EARLY CHIMU PERIOD. A warrior in full regalia is depicted on the vessel at the left. In his right hand he holds a mace; in his left, a shield, spear thrower, and javelins. The central piece is a "portrait" jar. The vessel at the right shows a hand to hand combat between mythical beings

the center of the hall, selected examples of pottery show the different forms and decorations which distinguish the various important cultures of Peru and Bolivia. As far as our present knowledge permits, the changes which occurred in the course of time are also indicated. Each of these cultures is shown in greater detail in individual cases. Outstanding is the beautiful work of the Nazca people in cases to the left of the entrance. In special exhibits are grouped such things as musical instruments, whistling water jars, examples of intentionally deformed human heads and trephined skulls showing the successful practice of a delicate surgical operation by the ancient Peruvians.

POTTERY OF EARLY NAZCA PERIOD. The Valley of Nazca was the center of one of the earliest highly developed cultures in Peru. It dates from the beginning of the Christian Era. The two jars at the left show conventional representations of the feline-monster deity

Much of our knowledge of their daily life we owe to a fortunate combination of climatic conditions and tribal customs. Along the coast of Peru, where the extreme dryness of the climate and nitrous character of the soil have preserved perishable materials for centuries, are more extensive burial places than anywhere else in America. Countless thousands of bodies were interred with such things as had been most useful and prized during life or were considered to be most serviceable in a future life. Examples of these mummy bundles are displayed, and it was from such as these that many objects in the hall were secured.

The mummy in the case at the west side of the room was found in a copper mine at Chuquicamata, Chile. The body is that of an Indian miner who was killed by the falling in of rocks and earth while engaged in getting out the copper ore (atacamite) used by the Indians in making implements and ornaments in prehistoric times. The tissues of the body have been preserved by copper salts with which they are impregnated. The implements he was using at the time of his death are shown beside him in the case.

Much more primitive than any of the prehistoric peoples just mentioned were the nomadic hunters and fishermen who inhabited the southern end of the continent and the adjacent islands. Their story from the time when they hunted the extinct native American horses and ground sloths was re-

PREHISTORIC DOUBLE CLOTH. This is the finest example of ancient South American technique in weaving in the Museum collection. The double cloth is woven on two looms, one above the other, arranged so that the warps are parallel. Warps and wefts of contrasting colors are used in each loom

PERUVIAN EMBROIDERED SHAWL. The designs in polychrome chain stitch embroidery depict mythical warrior figures. Weaving was an outstanding artistic and technical achievement of the ancient Peruvian civilizations. The thread was hand-spun from cotton and wool and the fineness has never been surpassed. The textiles, from 500 to 2000 years old, have, for the most part, been preserved as mummy wrappings in the graves of the dry desert of Peru

A PERUVIAN WOMAN'S WORK BASKET. Containing spindles, bobbins, carded fibre, and other materials for spinning and weaving

covered from caves and shellmounds. The simple tools and weapons which they used are arranged chronologically in a case in the rear of the hall. Near by are examples of the equipment of the various tribes surviving in the same region at the present time.

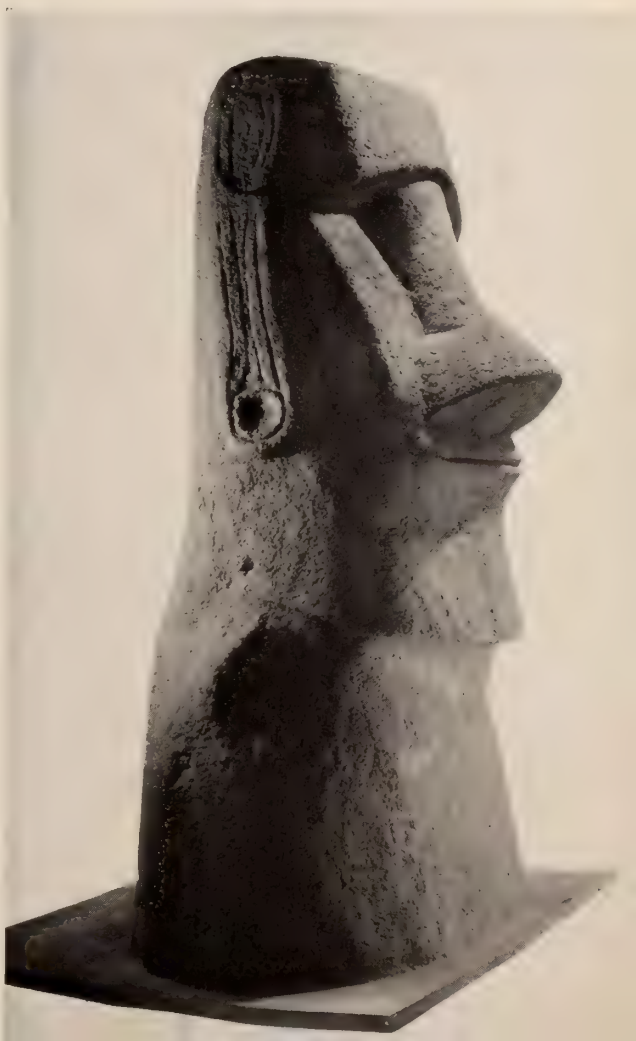
In neighboring cases are exhibits for other living Indians of South America. As there are a great many distinct tribes, sometimes living in widely different geographical areas, the collection is far from complete. An example of native life in the tropical rain forest of northeastern Peru is shown in a miniature group of the Chama Indians. They raise plantains and cassava and hunt small game, so their equipment is naturally specialized for these occupations.

(*Below*) AN EXAMPLE OF SOUTH AMERICAN EMBROIDERY. This elaborate fabric is a Paracas type solid polychrome embroidery

(*Below*) A PERUVIAN TAPESTRY. An excellent tapestry from Pachacamac, Peru, with slit left open between color areas as part of the desig

MINATURE MODEL OF A SOUTH SEA ISLAND CANOE. The Polynseians make canoes hollowed out of tree trunks. An outrigger on one side keeps them from capsizing easily

EASTER ISLAND STATUE. Easter Island in the South Pacific is famous for the immense stone statues found there, from one of which a Museum expedition made the cast illustrated at the right



THE PACIFIC

(*Index Plan, p. 19, Fourth Floor, Halls 6 and 8*)

Two halls are devoted to the Islands in the Pacific Ocean. The first contains collections from *Polynesia, Micronesia, and Melanesia.* The second is principally an exhibit for the natives of the *Philippine Islands, Java,* and *Borneo.* However, the collections from *New Zealand* extend into this hall.

The conspicuous objects in these halls are as follows: a statue from Easter Island; life-sized models, showing the Tahitian fire-walking, grating of coconut, etc; a collection of tattooed heads from New Zealand; and a tree-house from the Philippines.

SOUTH PACIFIC HALL

On entering the South Pacific Hall (Fourth Floor, Hall 6) beyond the Hall of Minerals, the visitor faces a huge monolithic figure. This is a cast of one of the famous images found on Easter Island and was brought back

TAHITIAN KAVA-BREWER AND ROOF-MAKER. The Tahitian woman, at the left, is preparing a stimulant from the roots of a species of pepper. The beverage is known as ava in Tahiti but is identical with kava of other islands. The woman to the right is manufacturing roofing from pandanus leaves in an elaborate form often employed in Tahiti. Life size figures cast in the Museum from Tahitian fire-walkers who once visited New York City

in 1935 by the Templeton Crocker Expedition. Statues such as these, representing departed chieftains, were found set up on stone platforms all along the coast of Easter Island. Circular stone mats of red tufa formerly completed the figure.

Directly in the center of the hall is a Tahitian priest taking part in the fire-walking

TAHITIAN FIRE-MAKER AND COCONUT GRATER. The old way to make fire in Tahiti was to rub a blunt-pointed stick in a groove made in another until the dust became ignited. The natives produced fire within a few minutes. In preparing grated coconut the Tahitians sit on a stool which has a blade projecting in front. This blade is used for grating the white inside part of the coconut

POLYNESIAN BARK CLOTH OR TAPA. This cloth was made from the inner bark of the paper-mulberry tree which is steeped in water, thinned out with a shell scraper, and pounded on a board with a mallet. Designs may be painted on the cloth free-hand, but more frequently they are printed from wooden stamps

ceremony, in which the participants walk over heated boulders of lava. On each side is a group showing natives engaged in typical activities,—grating coconut, preparing kava, or plaiting *Pandanus*.

One of the exhibits that was removed from the Museum for safe-keeping for the duration of the war is a fine Hawaiian feather cape, such as was formerly worn by the highest ranks of the Hawaiian society. Red and yellow honeysucker feathers completely hide the netted twine foundation. The value

A MANUS VILLAGE reconstructed with scientific accuracy in every detail: one of many miniature models in the American Museum showing native home life and activities

of these garments was proportionate to the enormous labor expended on their manufacture.

The hall is roughly divided into two main sections. In the first half are exhibited the collections from Polynesia and Micronesia, while the second half is devoted to New Guinea, Melanesia and Australia. However, it proved impossible to be wholly consistent and to separate Melanesian Fiji from Samoa and Tonga.

In the *Polynesian* section the examples of decorated native bark cloth (tapa) are especially noteworthy, and a number of canoe models remind us that these people are daring seafarers. A series of ceremonial adzes from the Cook Islands in the farther quarter of the hall shows aboriginal carving at its highest level.

In the section on the right, the elaborately carved sacred masks, about 14 feet back of the Tahitian priest, illustrate the æsthetic tendencies of *Melanesia*, which are also apparent in a carved pole set on top of a vertical case. Very different from these artistic

USIAI CARVED WOODEN BOWL FROM MELANESIA

BRIDE'S APRON OF SHELL MONEY: A Melanesian woman's dress used on festival occasions. Her costume is part of the payment which her kin make to her husband's family. The most important part of her dress comprises the two aprons woven of shell money

MELANESIAN MASK

MELANESIAN SACRED FLUTE

manifestations are the carvings of the *New Zealanders* (Maori), characterized by the dominant spiral motive. The series of dried and tattooed Maori heads forms one of the most remarkable exhibits in the Museum. (See Guide Leaflet No. 71, *The Maoris and Their Arts.*)

Near the boundary between the two main sections are the *Australian* cases with numerous boomerangs and very crude stone tools, which should be compared with those in the archæological hall. The farther corner is devoted to a collection from the *Admiralty Islands*, including a model of a village of the Manus tribe, a lagoon-dwelling, fishing people who build their houses on piles far from land. In the right corner of the hall are shields, clubs, carvings and household utensils from *New Guinea.*

The islands of the Pacific Ocean are of two kinds; first, those which are the remnants of a sunken land mass running southeast from Asia formerly connecting Australia and Tasmania with the mainland; and secondly, in the case of the numerous islands to the eastward, those which were formed by volcanic action and coral growth. The inhabitants belong physically to two very distinct races: the frizzly-haired, nearly black Papauns and the former inhabitants of Tasmania; and the wavy-haired, light-colored Polynesians of the islands stretching nearly across the Pacific. South of these islands are others inhabited by the Melanesians, who have straight or wavy hair and darker skins.

The cultural grouping is generally similar to that of the physical types. The Polynesians manufacture bark cloth and matting, have no pottery, drink kava, fight with clubs, and are skilled navigators. They are governed by chiefs who trace their ancestry back many generations. The Melanesians make some pottery, chew the betel nut, do grotesque carving, use bows and arrows for hunting and spears for fighting. They have

CARVED WOODEN HOOKS USED IN DECORATING MEN'S HOUSES IN NEW GUINEA

PHILIPPINE TREE HOUSE

secret societies and the men live in clubs. Between these two are the Micronesians, possessing some of the cultural traits of both their neighbors but differing considerably from each. Their islands being small, they depend for food chiefly on fish and pandanus and coconut palms. They are socially divided into castes: nobility, commoners, and slaves.

In addition to these cultural groups there are two specialized ones: the Polynesian Maori of New Zealand, and the Negroid inhabitants of Australia. The former have a very rich development of practical and aesthetic arts; the latter are almost without them. Besides, there are the inhabitants of New Guinea, generally Melanesian-like, but varying somewhat in race, language, and culture, and as yet not very well known.

COLLECTIONS FROM PHILIPPINES AND MALAYSIA

(Index Plan, p. 19, Fourth Floor, Hall 8)

This hall is reached by turning to the right in the South Sea Islands Hall.

The side aisles are devoted to the Philippine Islands. The farther section of the hall contains exhibits from other parts of Malaysia with an interesting series of marionettes from Java.

At the right of the entrance is a case containing life casts of faces, nose and hair from the different races represented in this hall, also charts of stature and head form, with distribution maps.

In the center is a model of a Filipino bamboo-walled and thatch-roofed house. At the far end a native tree house dominates the scene, and on the left may be seen the model of a woman weaving a garment on a native loom.

The visitor should note that, like the African Negroes, but unlike all other primitive stocks, the Malayan tribes represented in this hall used iron tools. The numerous iron weapons—spears, battle-axes, and krises (daggers with serpentine blades)—are especially remarkable.

On the left side of the hall will be found a number of synoptic exhibits of native krises, shields, fabrics, basketry and ceramics. Pottery is not highly developed in this area, but the textile arts flourish to a remarkable degree. The industrial life of the Bagobo of Mindanao is particularly well illustrated in the collections.

Much more primitive in their culture than the other Malaysians are the Negritos, a dark-skinned and frizzly-haired pygmy stock forming with similar groups in other parts of the world a distinct division of the Negro race. They are everywhere hunters, using the bow and arrow, and ignorant of agriculture. Their simple implements are shown in a table case in the farther section of the hall.

The islands lying close to the coast of Asia have been subjected to several migrations and to varying cultural contacts. Judging from the Andaman Islands and the Negrito remnants in the Philippine Islands, the original inhabitants were physically the most primitive of living men, related to the African Bushmen and the extinct Tasmanians. The present population is predominantly Malay in origin, members of the great Mongolian race. Their cultural arts include pottery, metal work, and textiles. The metal work is especially fine in the weapon-making of Java and among the Mohammedan inhabitants of the Philippines. Among the textiles are exhibited the batik work of Java, the tie dyeing of the Bagobo in the Philippines, and fine textiles of Luzon.

They possess fowls and pigs, cultivate rice, and use the Carabao, or water buffalo, as a domestic aid in agriculture and transportation. They possess the out-rigger canoes generally in use throughout the Pacific. Their weapons are blow-guns, bows and arrows, spears, and knives. They are devoted to head-hunting, considering it necessary for religious peace and security.

The original culture of the first black race has disappeared. That existent at present is basic Malay, on which has been superimposed the influence of India and China, the former affecting thought and philosophy, and the latter furnishing, through commerce, cherished objects of art and utility. Next came Mohammedanism, which is the prevailing religion in some of the islands, and about three hundred years ago Christianity and European culture were brought by the Dutch and Spaniards.

AN EMPEROR'S BIRTHDAY GIFT. An assemblage of elaborate carvings fashioned from purest white jade and fitted together

ASIATIC COLLECTIONS

(Index Plan, p. 19, Fourth Floor, Hall 6, also Hall 4, and p. 18, Third Floor, Hall 6)

DRUMMOND COLLECTION OF JADE

The famous *Drummond Collection* of carved Chinese jade, amber, Japanese ivory, and sword-guards is in the Southwest Tower on the fourth floor, opening out of the South Sea Islands Hall. This magnificent collection gathered by the late Doctor I. Wyman Drummond and presented to the Museum in his memory, is installed as a unit, largly according to Doctor Drummond's original arrangement.

It is really a group of collections, each one of the greatest importance and beauty. The *jade collection* alone is a rich and well balanced series, representative of all periods and covering a cultural range of more than thirty centuries. The left half of the room is devoted to jade arranged by periods, while the right half is given over to *amber*, *ivory*, *lacquer* and *bronze sword-guards*. The oriental amber displayed is the finest of its kind in the world.

A unique composite piece of white jade, occupying the center of the room, was a birthday gift to the Emperor Kien Lung from the officials of his court. This assemblage of jade carvings consists of thirteen pieces fashioned from purest white jade and fitted together. Surrounding the central piece are twelve segments fitted together, each of which is carved with a representation of one of the twelve terrestrial branches corresponding to the signs of the zodiac.

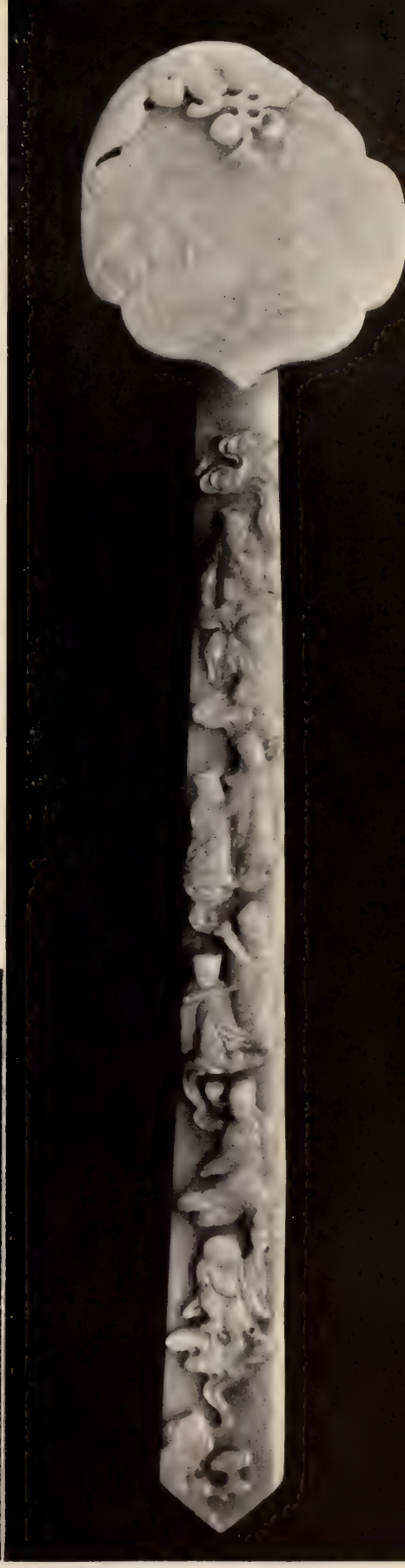
A very fine piece of white jade of the Kien Lung period of renaissance in glyptic art is in the form of a "Scepter of Good Luck" (Joo-i scepter). On the long handle of this piece are carved in high relief the figures of the Eight Immortals, the half-mythical, half-historical personages so often represented in Taoist art. Each of these carries some characteristic object, such as the flute of Han Hsiang-tzu, whose marvelous tone caused flowers to grow and blossom instantly.

ASIATIC ETHNOLOGY

Other fine examples of jade are also to be seen in the Morgan Gem Collection (Fourth Floor, Hall 4) and in the Asiatic Ethnology

JADE SCEPTER (*Right*). From the Drummond Collection

JADE CUP (*Below*). The dragons on this jade cup are of the form which developed in China in the Ming dynasty



K'WAN YIN, GODDESS OF THE FISH. A carved ivory Japanese figure of great beauty from the Drummond Collection. This ivory statuette is characteristically Japanese both in conception and rendering. It immortalizes in ivory the story of the princely fisherman who set up a shrine to this goddess after he had repeatedly found her image in his net instead of the fish he sought

WANG MU, THE CHINESE QUEEN OF THE FAIRIES. This is a carved ivory figure from the Drummond Collection. Though produced by a Japanese artist, it is founded upon a Chinese myth. It is said that the palace of Wang Mu is in the Juen-lun Mountains, where she guards the Tree of Immortal Peaches that grows beside the Lake of Gems, whose fruit ripens upon her birthday, every 3000 years. Here gather to the Feast of Peaches all the immortals to renew their immortality by eating the celestial fruit

CHINESE BRONZES. A set of three bronze ornaments inlaid with silver from the Sung Dynasty, 960-1279 A. D. To the right is a bronze libation cup, probably used in religious ceremonies, from the Shang Dynasty, 1766-1122 B. C.

Hall on the third floor (Index Plan, p. 18, Third Floor, Hall 6), where are installed collections from eastern and northern Asia. Specimens illustrating the culture, industries, religion and manufacture of China are on the left. Others, showing the mode of life, the costumes, and the war implements of Siberia, are on the right.

The fur-work, costumes, and rugs of the people of eastern Siberia reveal remarkable skill in workmanship. Two models show respectively summer and winter scenes in Siberia. In the rear are collections from Japan, the Ainu and the Amur River tribes noted for decorated fabrics and picturesque costumes.

The collections on the left side of the hall deal mainly with the everyday life of the modern Chinese and have a special value, as they were made just before the sweeping changes of the last few years took place. These abolished many of the customs in which these objects were used. For example, the series of weapons and material showing the tests to which a soldier was submitted on entering the army have been rendered ob-

THE EIGHT IMMORTALS. A group of figurines in Formosa coral depicting eight legendary beings who became immortal. From the Morgan Hall of Gems and Minerals on the fourth floor of the Museum

(Above) CHINESE BRONZE BOWL. This large bronze bowl has the original scroll design characteristic of the Chou dynasty. Attributed to the Han Period

(Below) A PAIR OF CHINESE BRONZE HORSES. They may have represented the horses of a chariot which has been lost. Ts In dynasty

SIX EXAMPLES OF CHINESE CLOISONNE ENAMEL FROM THE CHINESE COLLECTION OF THE MUSEUM

THREE BRONZE STATUETTES FROM THE TIBETAN COLLECTION. (*Above*) NARO KHE-CHO-MA. A feminine divinity, invoked to confer superhuman power

TSONG-KHA-PA. The great fifteenth century Reformer of Lamaism

YAK-HEADED RAKS
One of the animal-hea
goddesses who appear in
Bardo, or After-Death S

solete by the introduction of modern weapons and tactics. Bamboo, porcelain, basketry, inlaid work, cloisonné enamel, agricultural implements, carvings in wood, ivory and stone, and examples of embroidery, are shown to advantage.

A special collection of great value is comprised in the ancient bronzes shown in the wall cases near the entrance. In the tower is the Whitney Collection from Tibet, illustrative of the costumes and religious rites of that little-known region.

An exhibit illustrates the production of cloisonné by the Chinese. A series of eight vases is displayed showing various stages of the process.

The foundation of all enamel objects is red copper of the shape and size desired. The decorations are first sketched on paper by special artists. These patterns are traced with a stylus on the copper. Vase No. 1 shows the simple copper foundation. No. 2 is a vase to which has been glued a network of thin copper wire following the tracings of the pattern. The whole is then powdered with a composite of silver filings, copper and borax (No. 3). The vase is now enclosed in an iron vise placed in an iron wire cage filled with burning charcoal which produces a perfect soldering (No. 4). Then an acid solution of apricots is brushed over it, and it is ready to receive the enamel. The enamel paste is troweled into the cell-like compartments ("cloisons") formed by the copper wire (No. 5).

After cooling, the vase is again exposed to the fire to properly harden the pigments. Nos. 6, 7, and 8 show the vases after successive firings. Very fine pieces of work may be fired eight times. Next the vases are polished with a steel file—then with sandstone and lime tree charcoal while the vase revolves on a lathe. Finally it is gilded.

The Koryak of Siberia. The Koryak live in northeastern Siberia, south of the Chukchee, between the Anadyr River and the central part of Kamchatka. Their number is about 7500. In language they are related to the Chukchee and Kamchadal, with whom they also share their arts and practices. Like the Chukchee, the Koryak are divided into a Reindeer and a Maritime Branch but differ

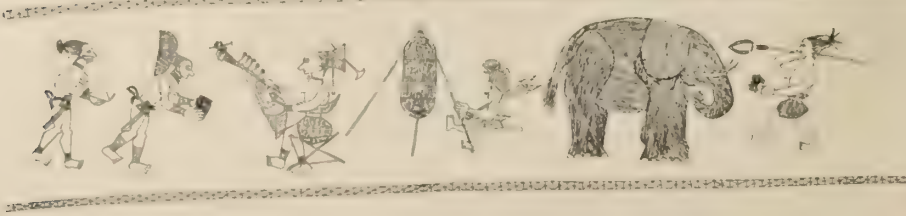
from their neighbors in the almost exactly equal size of these divisions. The Reindeer Koryak subsist mainly on the flesh of their herds. The Maritime group depend largely on fishing, while the hunting of sea mammals is also important but relatively less so than among the Maritime Chukchee. The Reindeer people live in movable tents. The stationary, partly underground house of the Maritime division is illustrated by a model in this hall. Both divisions of the Koryak wear clothing made of reindeer skins.

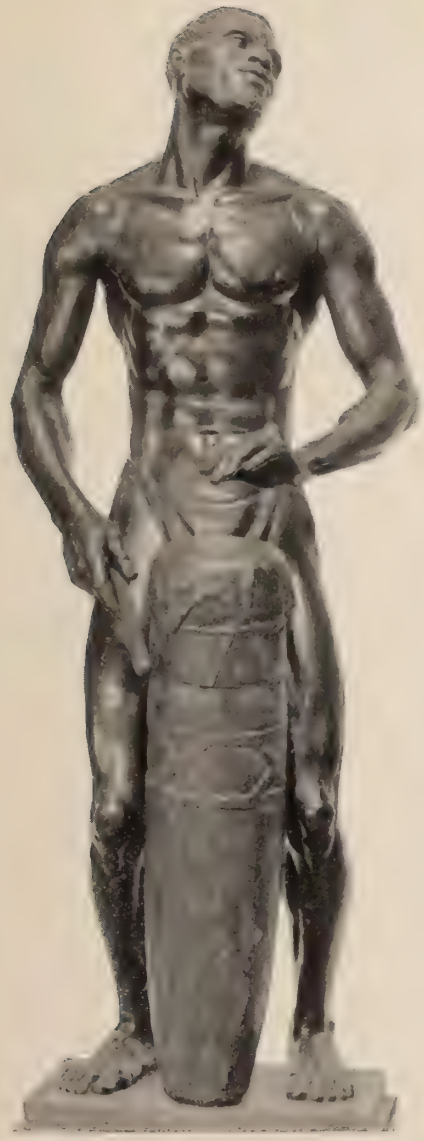
Before contact with other peoples the Koryak had no metal and made all their implements by chipping stone. At present, several settlements are renowned for their iron technique, which may antedate the coming of the Russians, since the Tungus and Yakut were both familiar with the blacksmith's art. The dressing of skins and the weaving of baskets by the coiled and twined methods are important industries. Remains brought to light by excavations of old dwellings show that the ancient Koryak knew how to manufacture pottery. In art the Koryak have attained a high degree of perfection as carvers in wood, antler, and ivory, as well as in the tasteful ornamentation of clothing and fur rugs.

(*Right*) KORYAK MAN IN ARMOR. Life size figure, clothed in original Koryak armor. From the Jesup North Pacific Collection

(*Below*) IVORY CARVING OF A BOY AND REINDEER FROM EASTERN SIBERIA

RED CAM-WOOD BOXES FROM MANG-BETULAND. These boxes have hollow sections of ivory engraved with hunting episodes like those shown above and below the picture. The tops represent the hairdress of a man and two women





AFRICAN TOM-TOM DRUMMER. Exhibited in the Akeley Memorial Hall of African Mammals. Sculptured by Malvina Hoffman

HALL OF AFRICAN ETHNOLOGY

(*Index Plan, p. 18, Third Floor, Hall 8*)

The order in this hall is roughly geographical. Thus, as one proceeds through the hall he meets the tribes that would be found in passing from south to north in Africa, while the west coast is represented along the left-hand wall, the east coast along the right-hand wall, the central Congo tribes at the far end.

There are three aboriginal races in Africa: the Bushmen, the Hottentots, and the Negroes. In the north the Negroes have been greatly influenced by Hamitic and Semitic immigrants and have become mixed with them.

Nothing is more characteristic of the Negro culture, to which the rest of the hall is devoted, than the art of smelting iron and fashioning iron tools. The process used by the African blacksmith is illustrated in a group on the left, and the finished products, such as knives, axes and spears, are amply shown throughout the hall. The knowledge of the iron technique distinguishes the Negro culturally from the American Indian, the Oceanian, and the Australian.

All the Negroes cultivate the soil, the women doing the actual tilling, while the men are hunters and, among pastoral tribes, herders. Clothing is either of skin, bark cloth,

WOODEN MASK FROM WESTERN AFRICA

CARVED IVO
ARTICLES FR
THE CONG
Ivory carvings
among the m
cherished possess
of African chief
the emblems of
and power

or loom-woven plant fiber. The manufacture of a skin cloak is illustrated by one of the figures in the group to the left of the entrance. Bark cloths from Uganda are shown in the farther right-hand section of the hall, while looms and the completed garments are shown in the large central rectangle devoted to Congo ethnology. The most beautiful of the last-mentioned products are the "pile cloths" of the Bakuba, woven by the men and supplied with decorative patterns by the women. Very fine wooden goblets and other carvings, especially a series of ivories from the Congo, bear witness to the high artistic

IVORY HANDLED IRON WEAPONS OF THE MANGBETU. The great sickle-shaped knives were worn over the shoulder by the king and other prominent men when they were sitting in council, partly as proof of the wearer's readiness to strike. At other times the knives were pushed under the belt

sense of the African natives, who also excel other primitive races in their love for music, which is shown by the variety of their musical instruments.

A unique art is illustrated in the Benin case in the farther section of the hall, where the visitor will see bronze and brass castings made by a process similar to that used in Europe in the Renaissance period.

The religious beliefs of the natives are illustrated by numerous fetishes and charms, believed to give security in battle or to avert evils. Ceremonial masks are shown, which were worn by the native medicine-men.

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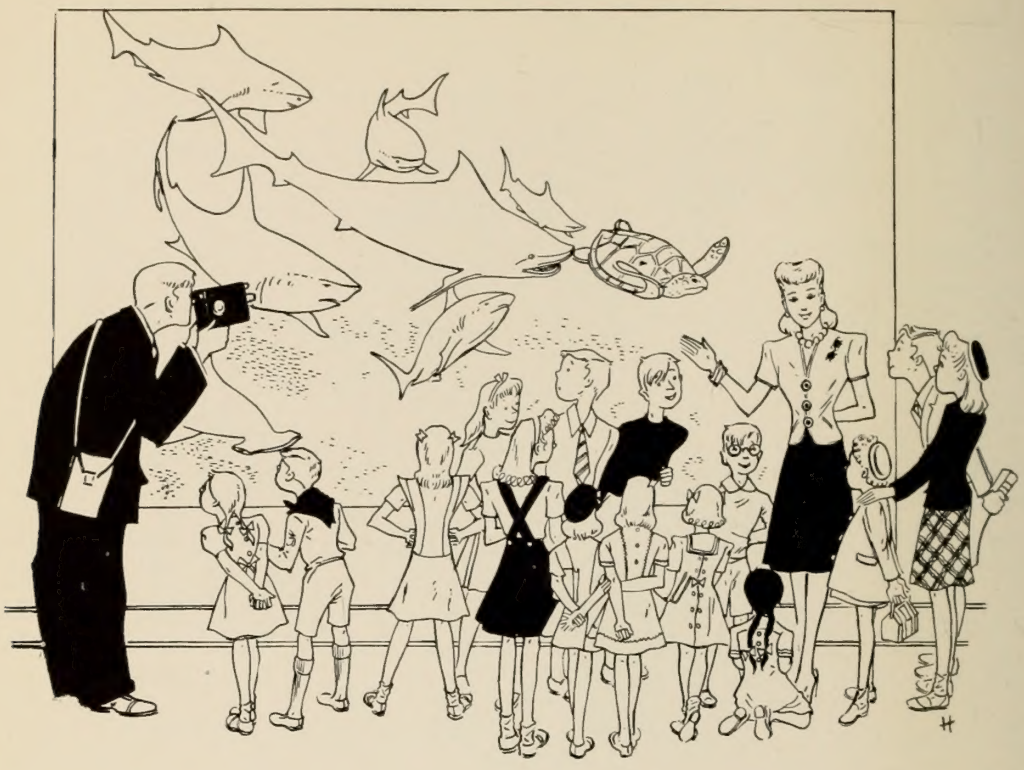

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Libyan Desert animals

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