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PARAMO VALLEY, SANTA ISABEL

THE AMERICAN MUSEUM JOURNAL

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THE PARAMO OF SANTA ISABEL

By Arthur A. Allen

Photographs by the Author and by L. E. Miller

LOOKING through the perspective of a few years upon my experience in the Andes of Colombia, the days spent on the paramos recur most vividly to my mind. The debilitating weeks in the steaming coastal forests with their parasites and fevers, the long hours in the dugout canoes beneath the blazing vertical sun, the dust of the valley trails, and the lomas with their clouds of locusts pass from me. I forget the interminable silence of the Cloud Forest, its soaking moss and epiphytes, but as often as memory recurs, comes to me the austere splendor of those stretches of rock and sky, of ridge piled upon ridge, backed by a line of snow and gray cloud and bathed in an atmosphere cool and clean. It was a land of peculiar fascination to me. I recall how we toiled across the paramo of the Valle de Pappas and though at this time so lashed by wind and rain that the trail was visible hardly fifty paces ahead, it still had lost none of its charm. Peaceful as it is during its few months of summer, the Andean paramo is a land of sleet and storm during the rest of the year; indeed many of the trails even at the equator are closed, and man and beast that attempt to cross are frozen to death.

The paramo of Santa Isabel lies about two days' journey from Salento, the largest town on the Quindio trail which crosses the central Andes, and on clear days, especially toward dusk, can be seen at several points rising above the forest-capped ridges to an altitude between sixteen and seventeen thousand feet. Beyond it and a little to the east lies the paramo of Ruis, and most magnificent of all, Nevada del Tolima, with its crown of crystal snow gleaming in the rays of the setting sun. Many travelers pass over the trail without ever a glimpse of the snows to the north, seeing only the banks of clouds that obscure even the tops of the moss-forest and hide all but the near distance. The sight of the snows is so unusual even to the natives that with the first lifting of the clouds groups of travelers assemble at the open spots along the trail and discuss the coming of winter.

So it was in the little town of Salento where we happened to be stopping. They manifested great concern over our proposed trip and told us that we must hasten if we would camp on the paramo before the storms set in, when life there would be impossible. So one morning in early September we slung our packs and started for the paramo of Santa Isabel. From Salento the trail to the paramo leads first down into the Boquia

Note.— Dr. Arthur A. Allen, a member of the biological staff of Cornell University, was connected with the Museum's expedition in Colombia, from August, 1911 to May, 1912. During this period, in coöperation with Mr. Leo E. Miller, he made important collections in the vicinity of the Quindio Trail, and in the little-known region between Popayán and the Valle de Pappas, and San Agustin; also in the Cauca and Atrato valleys. In the latter region he contracted a severe type of malarial fever which necessitated his return to the United States.

Santa Isabel from the Quindio Trail — Cloud Forest in the foreground has more tropical luxuriance than the lowland jungles, the trees being burdened with giant vines and they in turn laden with moss and fern and orchid. Cloud Forest extends up the mountain side from 9000 feet to timber line at about 12,500 feet

Valley and then follows the river's meandering course through groves of splendid palms nearly to its source, when it turns abruptly and begins a steep ascent of the mountain side. The palm trees, in scattered groves, continue to nearly nine thousand feet, where the trail begins to zigzag through some half-cleared country, where the trees have been felled and burned over, and where in between the charred stumps, a few handfuls of wheat have been planted and now wave a golden brown against the black.

And next the Cloud Forest! It is seldom that the traveler's anticipation of any much heralded natural wonder is realized when he is brought face to face with it. Usually he feels a tinge of disappointment and follows it by a close scrutiny of the object before him in search of the grandeur depicted, but not so with the Cloud Forest. It surpasses one's dreams of tropical luxuriance. It is here rather than in the lowland jungles that nature outdoes herself and crowds every available inch with moss and fern and orchid. Here every twig is a garden and the moss-laden branches so gigantic that they throw more shade than the leaves of the trees themselves. Giant vines hang to the ground from the horizontal branches of the larger trees and in turn are so heavily laden with moss and epiphytes that they form an almost solid wall and present the appearance of a hollow tree trunk fifteen or twenty feet in diameter. One should pass through this forest during the rainy season to form a true conception of its richness, although even during the dryest months the variety and abundance of plant life covering every trunk and branch seem beyond belief.

Quite as impressive as is its luxuriance, is its great silence. One walks for hours along its rank trails, sometimes sinking knee-deep in the wet forest mold, and hears no sound. A slight *tsip* or a buzz of wings in the tree top may tell of the presence of a honey creeper or humming bird, or the weird call of a tinamou or an ant thrush from the dark recesses may startle one, only to leave him the more impressed by the great breathless silence.

The trail through this forest was new and while perhaps not quite as steep as the old Indian trail, was very difficult in places. Many times we dismounted and led our horses, where the soft mold of the trail seemed insecure and where even a slight floundering of the animals might have pitched us down the mountain side. Even with such care one of the mules floundered and before we could get to his assistance was rolling over and over down the mountain. Fortunately it was still in the forest and one of his packs became wedged in the roots of a tree, holding him until we could get to his release.

This great forest occasionally interrupted by clearings, continues for many hours' travel up the mountain from 9000 to about 12,500 feet, where a sudden change occurs. The trees become dwarfed, their leaves small and thick, heavily chitinized or covered with thick down, and remind one of the vegetation about our northern bogs with their Andromeda and Labrador tea. Here too the ground in places is covered with a dense mat of sphagnum, dotted with dwarfed blueberries and cranberries and similar plants which remind one of home.

Looking back at timber line — We had left the tropics of Cloud Forest and come into a temperate region, almost on the equator but more than 12,500 feet above the sea. The photograph shows clouds rolling in at the left

A cool breeze greets the traveler, sky appears in place of the great dome of green, and suddenly he steps out upon the open paramo. He has been traveling through the densest of forests, seeing but a few hundred paces along the trail and only a few rods into the vegetation on either side; he has grown near-sighted, and even the smallest contours of the landscape have been concealed by the

dense forest cover. Suddenly there is thrown before his vision a whole world of mountains. As far as he can see in all directions save behind him, ridge piles upon ridge in never-ending series, until they fuse in one mighty crest which pierces the clouds with its snow-capped crown. This is the paramo of Santa Isabel.

At this point we dismounted and led our horses along the narrow ridge, for they were not used to the mountains. We looked in vain for the jagged peaks that are so characteristic of our northern

On the paramo of Santa Isabel — The ground is undermined with numerous small rivulets and the strange mullein-like *frailejons* grow everywhere even up to the edge of the snow, sometimes reaching a height of ten feet in sheltered places

frost-made mountains. Here even the vertical cliffs did not seem entirely without vegetation and as far as we could see with binoculars the brown sedges and the gray *frailejons* covered the rocks even up to the very edge of the snow. Beneath our feet the soil was springy and as we afterwards found, undermined with innumerable small rivulets making their way to the stream below, which we could hear even at this distance as it dashed over the boulders and occasionally gleamed in the sunlight. All about us the strange mullein-like *frailejons*, as the natives call them, (*Espeletia grandiflora* Humb. and Bonpl.), stood up on their pedestals, ten or even fifteen feet in height in sheltered spots; down among the sedges were many lesser plants similar to our North American species: gentians, composites, a hoary lupine, a buttercup, a yellow sorrel, almost identical with those of the United States.

Birds also, several of which proved to be new to science, were numerous, but all were of dull colors and reminded one in their habits of the open country birds of northern United States. A goldfinch hovered about the *frailejons*, a gray flycatcher ran along the ground or mounted into the air much like our northern horned larks, an ovenbird flew up ahead of us resembling a meadowlark, a marsh wren scolded from the rank sedges, and almost from under our horses' hoofs, one of the large Andean snipes sprang into the air with a characteristic bleat and went zigzaging away. On a small lake which we now had come to, barren except for a few algæ, rode

In the shadow of a frailejon — The nest is made entirely from the down of the *frailejon* leaves and belongs to a slate-colored finch (*Phrygilus unicolor*). On the paramo the leaves of all plants are either small and horny or heavily covered with down

an Andean teal, surprisingly like our northern gadwall. And so the story goes on. Here almost on the equator but 13,000 feet above the level of the sea, we had left the strangeness of the tropics and come upon a land that was strikingly like our own.

We decided to pitch camp at timber line where there would be wood for cooking and so made our way back down the valley to the edge of the trees where we had some difficulty in finding a dry level spot for the tent.

Here we studied and collected for about a week, working up the ridges to 15,000 feet but finding greater abundance of bird life along the dashing stream that flowed down the valley in which we were camped. There was not however, a great variety of birds and but few species were really common. Mammals too, were scarce, a few tracks of deer and tapir along the edge of the forest and numerous runways of the rabbits in the rank sedges, being almost the only visible signs. Even the smaller rats and mice were scarce, and few came to our traps.

Each night the temperature dropped to freezing, each noon the temperature rose to about 75 degrees Fahrenheit, and each afternoon great white clouds rolled up from the forests below and obscured the landscape. One dared not venture far from camp after three o'clock, for the great mass of anastomosing ridges would easily confuse even the traveler with a compass. In fact one day when returning from an exploring trip to the snow line, the clouds rolled up while we were still four or five miles from camp. Ridge after ridge disappeared from sight until soon we could see only the rocks close about us. There was no trail to follow and we were soon unable to recognize any of the features of the landscape that were still visible. For two hours we stumbled along trying to keep track of the number of ridges as we passed them and trying to recall the number passed during the morning, until finally we gave up hope of return that night. Looking about for a spot somewhat sheltered from the raw winds which had already begun to sweep down from the snows above us, a ray of light very far to the left attracted our attention and we looked just in time to see the rift in the clouds close again. We knew it must have been reflected from the small lake at the head of the valley in which we were camped and realized that we had been traveling at least an hour in exactly the wrong direction. It was not reluctantly therefore, that we abandoned the thought of beds of *frailejons* and made straight for our little lake. In terrible thirst and fatigue and after many collapses from the great altitude, we were able at last to perceive its dim silver outline, and we knew we were little more than a mile from camp.

This was our first warning to leave the paramo. In a few weeks these ridges would be covered with snow and swept by gales. The clouds and fog would not part for days and life would be unendurable — although even then one would feel the more deeply the grandeur of the elements, and with the mountain tops shut from view, would still know their awe-inspiring presence. With this warning then, we prepared to leave the paramo.

AN APPRECIATION OF THEODORE NICHOLAS GILL

By Frederic A. Lucas

THERE died in Washington on September 25, 1914, the man who may well be termed the Nestor of American zoölogists, not perhaps so much from the fact that he chanced to be a year or so older than his compeers, as from his extraordinary grasp of various branches of zoölogical science. Theodore Nicholas Gill was born in New York, March 21, 1837. He passed part of his early life in Brooklyn, and we infer from his "Reminiscences of the Apprentice's Library" that this ancestor of the Brooklyn Institute of Arts and Sciences had much to do with turning his attention from law toward natural history. He first became familiar with the Institute that was to be, in 1854, when he was seventeen, and as long as he remained in Brooklyn, made use of its library and collections and was a regular attendant at the meetings of the Lyceum of Natural History, being for a part of the time its secretary.

The fact that shells were the objects most readily obtained and preserved by amateurs, and the accessibility of the fine ichthyological library of Mr. J. Carson Breevoort, seem to have been the factors that directed his attention to conchology and ichthyology, although, as noted farther on, other factors came into play later. The influence of Baird and of the Smithsonian Institution led him to Washington in 1863, where for a time he was librarian of the Smithsonian Institution and later, assistant librarian of the Library of Congress.

For one who achieved such important results he did comparatively little original work, from a natural indolence of body which led him to take life easily, to shun the dissecting table, to relegate the labor of preparation to others and to utilize their work, even if he might not accept their conclusions, for he possessed to an unusual extent the ability to make use of the work of others, not by claiming it

as his own, but by embodying it as one of many items in some important generalization. If one may so put it, he took the bricks of information turned out by many workers and combined them into an edifice of knowledge. As might perhaps be expected from one of his temperament, he was a "closet" rather than a "field" naturalist, although in his earlier days he visited the West Indies in the interests of Mr. D. Jackson Steward, whose shells[1] form part of the collections of the American Museum of Natural History.

For many years his favorite morning haunt was the library of the United States National Museum, and later, the periodical room in the Smithsonian, where he read the standard scientific journals as soon as they were received, and noted the most recent discoveries in those lines in which he was especially interested. This extensive reading, coupled with a wonderfully retentive memory, made him an extraordinary source of information. He was a veritable storehouse of zoölogical facts, which were freely placed at the disposal of anyone who really wished them. As a matter of detail, he probably had at his tongue's end more scientific names of animals than any other living man — more probably than anyone will ever know again. This wide knowledge rendered easy such work as the technical parts of the zoölogical portion of the *Century* and *Standard* dictionaries. In the first-named work he was associated with Dr. Coues, and more than once sorely tried the patience of his colleague by his procrastinating habits,[2] for while Coues was a fluent talker and ready writer, he was also a hard and systematic worker, as his many books and various papers bear witness. It is rather interesting to note that these two men, Coues and Gill, should have been so closely associated, for Coues probably did more than any other one man to popularize the study of birds and mammals, and Gill, though largely indirectly, did much to systematize and stabilize the technical side. As an example of Gill's ultra-technical style may be cited his definition of Giraffidæ:

> A family of ruminant artiodactyl mammals, having the placenta polycotyledonary, the stomach quadripartite with developed psalterium, the cervical vertebræ much elongated, the dorso-lumbars declivous backwards and horns present only as frontal apophyses covered with integument.

Coues read this and turning to Gill said, "That is n't English, its Choctaw." "No," said Gill, "it is an exact definition of the family."

For many years, more than twenty to the writer's knowledge, Gill occupied a room on the west side of the big north tower of the Smithsonian, and for a long time Coues had an office on the opposite side, the two opening into a still larger intercommunicating room. Dr. Gill's room like the girl's workbasket, had a "place for everything and everything in it," — desk, chairs, shelves, floor — especially floor — were covered, aside from dust, with a miscellaneous collection of books, pamphlets, old letters, skulls, skeletons and odds and ends of wearing apparel. During the summer this deposit, like a lava stream, flowed

[1] Gill's second published paper was on *Cypræa notata*, now considered a synonym of *C. macula*, from a specimen in the collection of D. W. Ferguson, which is now in the collection of Columbia University.

[2] The recent article in *Science* is in error in calling Dr. Gill the author of the zoölogical text of the *Century Dictionary:* Dr. Coues was the editor and wrote the major part of the definitions and chose the larger number of the illustrations; Dr. Gill was the scientific adviser, so to speak, and Coues relied largely upon him for accurate and technical information. Gill wrote a large share of the technical definitions, particularly those of the families and genera of mammals and fishes. — The Author.

slowly eastward until by fall all three rooms were filled and Dr. Gill was working at Coues's desk. Here and in the Museum library Dr. Gill's papers were mainly prepared, for even in his later days he rarely made use of a stenographer. Gill's astonishing knowledge of names and his exactness in matters of nomenclature made him extremely helpful in the bestowal of names upon new species, and it was customary for one about to christen some newly discovered beast, bird or fish to ask him if the proposed name had been previously used, a procedure that saved much time and many synonyms. He excelled in tracing the history of some much described species through the mazes of literature in which it had wandered, and delighted to show that what Aristotle is supposed to have called some animal was really quite a different creature.

He was the first president of the Biological Society of Washington and hence a life member of the council; he was also an almost constant attendant at its meetings. As the present specialization of societies had not even begun, the members of this society represented many branches of science and the papers presented covered a remarkably wide range of subjects, varying from technical to popular, and from Protozoa to Primates.

It mattered not what paper was presented, it came to be expected that if Dr. Gill did not lead the discussion, he would participate in it, and when at the close of some paper the hearers turned expectantly toward Dr. Gill, they were rarely disappointed. He was a severe, one might almost say merciless critic, not from any particular personal animus, but because he expected an exact statement of fact.

While the majority of Gill's papers were systematic, yet on occasion he could write most entertainingly, and not only did he have a vast fund of information on which to draw, but the reader had the satisfaction of feeling that he could rely upon what he was being told. His contributions to zoögeography were numerous also and the subject was dealt with in at least two of his presidential addresses.

Among the more important deductions that he made were the recognition of the claim of the Elasmobranchs to a position of the "highest" rank and of the purely artificial nature of the groups Carinatæ and Ratitæ in birds. He accurately defined and established on a sound structural basis seven orders of fishes, to say nothing of genera, and was practically the first to suggest that the curious little fishes termed *Leptocephalus* were larval forms of eels.

As an example of the estimation in which the work of Dr. Gill was held by fellow scientists, one cannot do better than to quote an extract from David Starr Jordan's *Guide to the Study of Fishes* read by Dr. Smith at the Testimonial Dinner to Dr. Gill:

> Theodore Nicholas Gill is the keenest interpreter of taxonomic facts yet known in the history of ichthyology. He is the author of a vast number of papers, the first bearing date of 1858, touching almost every group and almost every phase of relation among fishes. His numerous suggestions as to classification have been usually accepted in time by other authors, and no one has had a clearer perception than he of the necessity of orderly methods in nomenclature.

And Dr. Jordan further wrote:

> In my scientific work I have owed more to the critical ability of Dr. Gill and his clear insight in matters of classification and generic relations than to any other man whatsoever. In all the long history of science there has been no one who has had this unique quality of being able to see through unimportant things to the real heart in biological classification as has Dr. Gill.

FUR-SEAL ROOKERY

In the photograph below is shown a massed rookery area from which 10,575 pups were counted. Hutchinson Hill, St. Paul Island

ROOKERY READY FOR COUNTING

The photograph above shows a beach rookery cleared of adult seals and ready for pup counting

THE MAKING OF A FUR-SEAL CENSUS

By George Archibald Clark

[Of Leland Stanford University]

THE really important practical problem in connection with the fur-seal herd of the Pribilof Islands has always been that of enumeration. How many animals are there? Is the herd increasing or diminishing? What is the rate either way? What number of young males can safely be taken each year? What breeding reserve should be set aside? These questions can be answered effectively only by a more or less exact census of the herd.

In making a fur-seal census you cannot, as in the case of human communities, go to the head of the household. The harem master is not an approachable being and will not discuss family affairs with you. You go within his circle, if at all, at your peril. You can stand on the neighboring cliffs and looking down upon his household observe many things of interest; but this will not tell you whether all his wives are at home or how many children he has. The children hide in the crevices of the rocks and most of the mothers are away at sea feeding.

Bull fur seal, Gorbatch Rookery, St. Paul Island

It is easy to count the harem masters. Each one is big and aggressive and is always at home. As you come into his range of vision he rises up to greet you like a bristling question mark. The fur-seal families can therefore be easily counted. It is even possible to count the individual females on many scattered breeding areas, and this fact has been utilized at times to gain an approximate enumeration, an average harem being thus obtained which could be applied to breeding areas where counts of individuals were impossible.

The fur-seal census however, does not rest finally with the adult animals; it rests in the young of the season, or the fur-seal pups. Although destined to spend most of its life in the water and to brave all kinds of weather, the fur-seal pup in the beginning is timid of the water and keeps away from it during the first month or six weeks of its life.

There is a time therefore in each breeding season when all of the pups are absolutely within reach; and as there is a mother for each pup, a count of the pups is in effect an enumeration of the mothers — the breeding females — the all-important element in the herd.

By the first of August each season, practically all of the fur-seal pups are born. About this time also the majority of the harem masters, who have fasted since their arrival in May, have withdrawn from the rookeries to feed at sea. The mother seal, while she will defend her pup of a few hours old with her life, pays no attention to it when it is a week or more old, betaking herself promptly to the sea when disturbed and leaving the pup to shift for itself. A very little urging therefore suffices to clear the rookeries of the older animals, leaving the young to be dealt with by themselves. The period is a limited one because when the fur-seal pups begin to take to the water the transition from a land animal to a water animal is very sudden and after the pups gain command of themselves in the water they take to it instantly when disturbed. There is however, a period of about ten days in early August when the pups can be controlled and counted.

The fur-seal rookeries occupy about eight miles of shore front, generally in a narrow band twenty to fifty feet in width. At certain points there are massed areas. Each form of breeding ground has its own problems in the counting. The narrow beaches have holes and crevices among the rocks where the little animals hide. On the massed areas they can be more readily controlled, but there is danger of crowding and smothering. The difficulties in neither case are serious and call merely for care and experience in dealing with them.

On the narrow beach portions, the process of counting is carried out by two persons, one passing along the seaward side of the rookery, the other on the landward side. Coming together they cut off a small group of twenty-five to one hundred pups and force them to run back along the beach twenty to fifty yards. These pups represent varying ages and degrees of strength since they are born at different dates between the twelfth of June and the first of August and they therefore naturally line out in order of capacity to travel and this line can be readily counted. The process is like that of the counting of sheep as they pass through a narrow gate. Group by group the pups of a given rookery are counted. Between the passage of the separate pods, or groups, the openings in the rocks are searched for hidden animals. Careful search is also made for the dead, a necessary part of the enumeration. The services of native helpers who, preliminary to the work of counting have driven off the adult animals, are utilized at all times to keep the pods of counted animals from mingling with those not counted.

Where massed groups occur they are rounded up and held loosely on some flat surface, a native guard being posted about, except at one point from which the animals are allowed to run off. These departing pups again travel readily in lines which can be counted by two's and three's and four's. If tendency to stampede develops, a guard is thrown across the front and a new opening at some other point is established. By the above process, repeated and varied as conditions demanded, in a period of four hours, approximately eleven thousand fur-seal pups were handled and counted from the massed breeding ground under Hutchinson Hill on St. Paul Island in July, 1913. One of the accompanying photographs illus-

A general rookery view from the cliffs, showing contrast between males and females by which harems can be counted.

The young seals hide in the crevices of rocks and a large number of the mothers may be away at sea feeding, but it is easy to count the harem masters who are big and aggressive and are always at home. An approximate average of the females in a harem must often be applied to packed breeding areas where the bulls alone are conspicuous and individual enumeration impossible

The process of counting fur-seal pups in the massed area on Hutchinson Hill, July, 1913. Note in the background of the photograph the long line of pups which are being counted as they file past.

Fur-seal pups are easily counted only during a period of some ten days in early August. This is after they are a week or so old and the mothers no longer defend their young but depart leaving them to shift for themselves, and before they have learned to take care of themselves — in which later condition of course they take to the water as soon as approached

GUARDING HIS HAREM

Fur seals of the Zapadin Rookery, July, 1913

A MASSED POD OF PUPS BEING HANDLED IN COUNTING

trates the operation of counting and the following is a record of the pods as run off:

152, 108, 146, 54, 128, 152, 116, 40, 152, 68, 200, 78, 96, 150, 234, 192, 44, 52, 56, 122, 144, 23, 83, 110, 66, 150, 232, 98, 10, 102, 120, 53, 119, 106, 118, 14, 56, 62, 58, 88, 91, 68, 21, 61, 42, 110, 67, 72, 68, 88, 90, 66, 48, 20, 61, 58, 88, 50, 80, 168, 14, 68, 37, 68, 116, 82, 68, 33, 128, 41, 44, 15, 25, 54, 134, 243, 54, 90, 42, 116, 75, 120, 100, 57, 36, 17, 116, 44, 36, 50, 79, 88, 68, 115, 69, 118, 153, 122, 56, 33, 55, 48, 70, 124, 174, 63, 180, 146, 14, 73, 146, 84, 173, 235, 129, 52, 25, 26, 63, 102..Total, 10,576.

It was by this process of counting, applied day by day to the rookeries in 1912, that the first full count of fur-seal pups was made, the number being 81,984. A repetition of the process in 1913 gave a total of 92,269. The difference, approximately twelve and one-half per cent, marks the rate of increase in the herd between the two seasons, the first seasons for thirty-five years in which the fur-seal herd was free from the drain of pelagic sealing [suspended by treaty of July 7, 1911], with its destruction of mother seals and their young.

These three elements — the adult males, the adult females, and the young of the season — constitute the important features of the fur-seal census. They were thus fixed by actual count.

There remain certain other animals in the herd which cannot be counted. These are the two and one-year-old females and the young males of four years and under. They come and go irregularly, some of them spending very little time on land. The annual rate of increase in the herd, established by the counts of 1912 and 1913, enables us to estimate very closely the number of young three-year-old females on which it depends. The sexes are subject to like vicissitudes and from the approximately equal birthrate of the sexes a like number of three-year-old males may be assumed to survive. The two-year animals can be closely judged from these, and the yearlings, from births of the preceding year, diminished by the losses which experience shows the animals to suffer in the first migration.

Putting these various estimates together and uniting them with the counted animals we have the following total for the fur-seal herd in the season of 1913:

Breeding males	1,403
Reserve males	2,364
Breeding females	92,269
Young of the season	92,269
Three-year-old males	10,000
Two-year-olds	30,000
Yearlings	40,000
Total	268,305

This census affords to the government as accurate a knowledge of the status of its fur-seal herd as, for example, the average cattleman has of the animals on his range.

The herd will now grow steadily in the future and in due time as many animals may be expected in the herd as it formerly showed, between two and three millions. With this growth, counting of all the pups cannot long be continued. The task will become too great. It can however, be continued on certain limited areas and the balance of the herd judged by these. Certain valuable averages have been obtained — for the individual rookeries, for each of the islands, and for the herd as a whole. It will always be possible to get a reasonably accurate count of the breeding families. To this the known averages of harem sizes in 1912 and 1913 can be applied with a result sufficiently exact for all practical purposes.

MOSS AGATE MOCHA STONES, HINDOOSTAN

Specimens from the Morgan Collection of Precious Stones in the American Museum. Illustration from *The Curious Lore of Precious Stones*, by George Frederick Kunz, Ph.D., D.Sc. Copyrighted 1913, by J. B. Lippincott Company, Publishers, Philadelphia

THE CURIOSITIES OF GEMMOLOGY

A REVIEW OF A RECENT BOOK BY GEORGE FREDERIC KUNZ ON SUPERSTITIONS AND MEANINGS ATTACHED TO PRECIOUS STONES

L. P. Gratacap

These metaphysics of magicians,
And necromantic books are heavenly.
Lines, circles, scenes, letters, and characters:
O what a world of profit and delight
Of power, honour, and omnipotence,
Is promised to the studious artizan.
Tragical History of Doctor Faustus.

THE pages of a recent book [1] by Dr. George Frederick Kunz, honorary curator of gems at the American Museum, will be turned over by the fascinated reader with, we imagine, the most interesting commixture of feelings, an interfusion of wonder, amusement and half-credulous assent, of admiration and curiosity. He will feel admiration at the art and discernment, the resources and adequacy of the author, and curiosity as to the origin or real derivation of such strange predispositions, hallucinations and ultra-romantic traditions and fancies, regarding these "mute insensate things."

Certainly the traditions and fancies are not unfamiliar. In any desultory reading they have been encountered by everyone — not forgetting indeed the Wilkie Collins story of boyhood, *The Moon Stone*, but here through almost four hundred pages of anecdote, quotation, description and allusion, reënforced by beautiful figures and plates, the effect is bewildering. Why these attributes of miraculous power? Why the association of precious stones with religious beliefs, why the mystic influences credited to birthstones, the extra-terrestrial stations assigned to gems in the zodiac, and their ascription to the planets — with the more contemporaneous touch of occultism when we read of the prophetic powers of crystal balls, their magical landscapes and portents? Such questions are surely not answered in Dr. Kunz's work, and indeed a *soupçon* of dissatisfaction arises when we think that we discover in the learned writer, a poetic acquiescence in these ascriptions, as perhaps becomes the antiquarian, the virtuoso, the connoisseur, and above all the philosophic historian.

But if reasons are not fully discussed, albeit many passages assume some seriousness in that respect, the display of facts, the careful analysis of reports, and the evidence of large research, the clearness and charm of narration, with the remarkable elegance of illustration, are all there.

The frontispiece of the book is a superbly colored plate of cut and polished gem-stones, many from the Morgan-Tiffany collection in the Museum. This is followed by three other fine examples of color reproduction: Cardinal Farley's ring, gems from the Morgan-Tiffany collection, and the dazzling cross, attached as pendant to the crown of the Gothic King Reccesvinthus. The remaining illustrations evince the qualities of the unusual, the rococo, the quaint, the delicate and the antique, as befits a book of a semiliterary and scientific scope; the touch of the virtuoso is plain and the guidance of expert taste as well. The chapters as they succeed each other are as follows: Superstitions

[1] THE CURIOUS LORE OF PRECIOUS STONES. By George Frederick Kunz. Philadelphia and London: J. B. Lippincott Company, 1913.

and their Sources; Talismans and Amulets; Talismanic Use of Special Stones; Engraved and Carved Gems; Ominous and Luminous Stones [with an exceptionally valuable plate giving the autophotographs of luminous diamonds]; Crystal Balls and Crystal Gazing; Religious Uses of Precious Stones; The High-Priest's Breastplate; Birth-Stones; Planetary and Astral Influences; On Therapeutic Uses of Stones.

The book has an overwhelming wealth of detail and assembled references, available literature and the most diverse elements of evidence having been carefully sifted. We are not sure, but we believe that one field has not been harvested, and that is the Church Fathers, interesting and possibly prolific of quotation, since the patristic writers were inquisitive in many ways. Apart from the purely archaic strangeness of the fancies the book records — regarding the qualities of gems and precious stones, interest emphatically attaches to the accounts of crystal-gazing. It might be regretted that Dr. Kunz has not reviewed at greater length the work of Miss Goodrich-Freer and of Miss Gregor (Andrew Lang's friend), and extracted more liberally from *Crystal-Gazing* by Northcote W. Thomas, as also from Andrew Lang's *Making of Religion*, which has many cases, appreciatively recorded, of "scrying" (short for descrying).

To those of us a little "dematerialized," as Oliver Lodge for instance, an agreeable mysteriousness is felt in Mr. Lang's words, "If then the crystal gazer is right in a considerable percentage of cases, to my unmathematical mind it does look as if some unknown human faculty and fact in nature may be surmised." Dr. Kunz does mention "hypnagogic illusions," the illusive appearances introducing sleep, and he does contribute more space than perhaps he deemed the subject could claim in his work, to a few guesses as to the nature of the queer phenomena so frequently adduced in this connection.

The Curious Lore of Precious Stones is a most entertaining book, and to the reflective reader will afford a singular retinue of impressions as to the vast credulity and the imaginative exuberance of the human mind, so that perchance as he lays it down, he will exclaim with the "Duke" in *Twelfth-Night:*

> so full of shapes is fancy
> That it alone is high fantastical.

Rubellite, from the Shan Mountains, China. Used as idol's eye in India

Star of India—Probably the largest star sapphire in the world

Engraved Emerald—East Indian Carving, 17th Century

GEMS FROM THE MORGAN COLLECTION
IN THE AMERICAN MUSEUM OF NATURAL HISTORY

TO DRAMATIZE CONSERVATION

STAGE AND MUSEUM TO JOIN HANDS IN A NEW OPPORTUNITY

By Winthrop Packard

The JOURNAL publishes the present sketch by Mr. Packard concerning museum work as viewed by poet and dramatist, for its suggestiveness. In respect to it relative to the American Museum, we would say that this institution holds the belief that an educational institution of the organization of a museum should employ all the coöperation possible and use all the methods feasible at any given period in the history of civilization, in order to make its service reach the minds and imaginations of the people who come to learn from it. The American Museum in New York is at present broadening its relations with the public schools of the city and employs moving pictures in much of its educational work. That it should at some time in the future use some form of the drama as one of its methods of education, does not seem an impossible step.— EDITOR.

THE poet's vision has done much for the world, and the dramatist visualizing the poet's thought, has done much. Often the two have worked together for the world's welfare and now the poet comes forward with a new vision. The stage is to visualize conservation and make its needs felt by the public.

"Drama and conservation," says Percy Mackaye to whom we owe the new idea, "is a new coupling of the words, but the present age is restive of tradition and for the first time in history the naturalist and the artist of the theatre have come together to consider how they can serve the public. The nature student never goes to the drama except

For the child the museum must put more beauty and dramatic truth into its exhibits of animals.

Arvia, the poet's little daughter who, wandering in the woods and listening to the hermit thrush, sees and hears as in a dream the story of the play, *Sanctuary*. Through her vision we see the dancing of the dryad in the realm of fantasy, hear the pleading voice of the bird spirit — and come to feel the cruelty that it is to take the life of a wild bird for its plumage

as a diversion. There he expects to forget his study of bird and beast and revel in a world of fantasy which has nothing in common with science. In the same way the worker of the theatre goes to nature merely for rest and relaxation. What does wild nature mean to him excepting a pageant of unnamable birds and animals in whose presence he may forget the cares of his work? But that is the old-fashioned point of view for both. A new school arises and we are discovering that scientists and artists are one soul, seeking truth by two methods — the one objective, the other subjective. Science has fought its fight with superstition and tradition and has won. Art is only beginning its fight with superstition. Dramatic art is not yet delivered from its life scramble with quacks and commercialism. Yet in the hearts of the people, is the origin both of drama and of conservation and there the two will ultimately work together."

"The plea for conservation," says the naturalist Ernest Harold Baynes, "must reach the hearts of the people before it can achieve success. They must visualize the beauty and romance of wild life as well as its economic value. Then they will be willing to conserve it."

Out of these beliefs of naturalist and poet came the bird masque *Sanctuary*, by Percy Mackaye, under the tutelage, one suspects, of Mr. Baynes. The play is a dream of Mackaye's little daughter, to whom through the voice of the hermit comes the great need of preserving our wild birds. "The text-books," says Augustus Thomas, "tell us that drama is a story told in action, but I believe that a better definition is an idea visualized." In *Sanctuary* we have the idea that bird life must be conserved, visualized and made very real.

It is believed that the play gave impetus to the fight for the clause in the new tariff bill, forbidding the importation of feathers. Thus already has the drama been a powerful agency in forwarding the movement for the preservation of wild birds — but the opportunity has merely a beginning in this. It is easy to see that the needs of forestry, of the protection of our water supply, and in fact of all branches of conservation may be put upon the stage with equal beauty and grace.

"Let us dramatize our museums," says Mackaye. "The natural history museum is established for a great social object, the conservation of wild nature knowledge in the hearts of people. Equipped by science only, it cannot fully obtain the interest of the people for whom it was founded. It must go farther and reach their imaginations. As it stands now indeed, it is a public boon; the people spend their spare time on Sunday at the museum, gazing eagerly at the exhibits although they only in part understand them and do not, in any case, fully appreciate their meaning. They spend their spare time for the rest of the week at the "movies." To them the museum is never ecstatic and vivid, but the moving pictures are. ....Yet, it ought to be possible so to interpret the exhibits at a museum as to make them live for the general public as do the moving pictures. The naturalists and taxidermists have felt this need in creating the exhibits and have done their best to meet it. It is possible completely to fulfill this need. The drama can do it..... Pageantry possesses the people. It must become a civic drama in name and in technique and will develop the masque to fit the public needs."

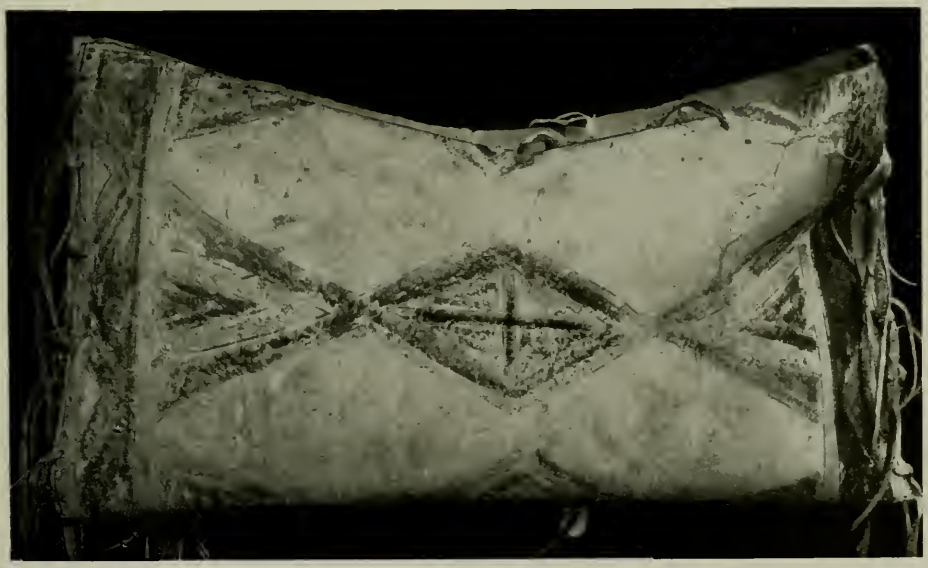
The masque *Sanctuary* has thus marked the beginning of an epoch in the service which the stage of the future is to render humanity. It offers a new field to player and playwright — a new pleasure and a new incentive to the playgoer.

THE CROW INDIAN SUN DANCE

By Robert H. Lowie

WHILE I was investigating various phases of the old Crow culture in 1910, I heard a good deal about the sacred dolls formerly used in the Sun Dance, but without any expectation of ever seeing one "in the flesh" since the last ceremony of this type had been celebrated thirty-five years previously. After a while I learned however, that not only *a* doll, but what my informants regarded as the most sacred of all dolls, was still in the possession of an elderly widow, named "Pretty-enemy," whose husband had been the real owner. Pretty-enemy, being a woman, was not even permitted to unwrap her precious possession, which was occasionally taken out by old men visitors, who would address it in prayer and restore it to its envelope. The sense of unremunerative ownership evidently weighed on the woman's mind, and when she heard that I had bought numerous articles of ethnographical interest she approached me through my interpreter with an offer to sell the doll. The price first demanded was so extravagant that I felt obliged to decline with regret, but after a lapse of negotiations Pretty-enemy again approached me with a more reasonable offer. Then the purchase was consummated after I had pledged strict secrecy so far as the Reservation people were concerned, for the woman was very much afraid of social ostracism as soon as her action should become known.

Looking at the doll with a layman's eye, one would hardly be disposed to set much store by it. It is a stuffed effigy of the human form, about six inches long, with crudely marked eyes and mouth, and a number of half-faded rectangular crosses front and back, to symbolize the



One of the most highly venerated of the medicine bundles of the Crow Indians. It consists of a rawhide envelope in which was kept the sacred doll together with various smaller sacred objects used in the ceremony of the Sun Dance.

morningstar; the head is topped with a profusion of plumes. The rawhide envelope in which the doll was kept also contained a number of subsidiary articles, including skunkskin regalia worn by the pledger of the Sun Dance, rawhide effigies, beaded bags and bunches of feathers — none of them of ostensibly great intrinsic value. Why then was this medicine bundle so highly regarded by the natives? In order to understand this, we must understand the character of the Crow Sun Dance.

By the several Plains tribes the Sun Dance was celebrated for a variety of reasons. Among the Western Algonkin, for example, it was performed mainly in order to ward off disease or other danger from the pledger and his family. But among the Crow the motive was quite different from that of their neighbors: a Crow promised to undergo the expense and hardship of the ceremony only when some near relative of his had been slain by the enemy and for the sole purpose of wreaking vengeance on the guilty tribe. Any military operation whatsoever was supposed to be the result of a supernatural revelation that ensured success, and accordingly such a revelation was sought in the Sun Dance, but in this case the end could be secured only through the hypnotic action of a particular type of object, the sacred doll. By fixedly gazing at the doll during the dance, a man could make himself go "out of his head," that is, go into a trance. When in this condition he would see an enemy lying bleeding on the ground, and this vision was taken as a promise by the supernatural powers that his quest for revenge would be crowned with success. Hence the mourner who undertook a Sun Dance was obliged to seek out some man

This sacred doll (about six inches long) was thought to give a vision at the close of an elaborate ceremony called the "Sun Dance," which lasted several days and in which all members of the tribe took part. The last Crow Sun Dance was celebrated some thirty-five years ago

owning one of the dolls and induce him to supply the needed effigy, and act as master of ceremonies, vested with dictatorial powers. The doll bought of Pretty-enemy had been successful, above all others of its kind, in effecting visions that led to victorious reprisals against the enemy, hence the high veneration in which it was held by the tribe.

It would seem from the above that the entire Sun Dance pivoted about the doll and the vision it procured. In a certain sense this is true, for no sooner had the vision been experienced and announced than the ceremony came to an abrupt stop, and preparations were made to bring about the fulfillment of the promise embodied in the revelation. Nevertheless this would be a very one-sided point of view. For the Crow Sun Dance, like the corresponding ceremony of all other Plains tribes, was a very elaborate performance, lasting several days, in which practically all the members of the tribe played a part. To the pledger and the doll-owner, to be sure, the essential thing was the vision to be obtained through the doll, but to the other tribesmen, whether actors or spectators, the performance meant something quite different. As in all great assemblies of the Crow tribe, there was abundant opportunity for the recital of one's heroic exploits; accordingly, to the great warriors the Sun Dance was a chance for self-aggrandizement before a large audience. Again, certain offices in the construction of the lodge devolved only on men and women of a perfectly pure mode of life, hence for these the ceremony meant a public recognition of virtue. Then there were others who voluntarily underwent self-torture, not to enhance the vision of the pledger, but in order to secure one for their own benefit. As for the common herd, what appealed to them most was probably the dramatic aspect of the spectacle and the licensed frivolity that was customary throughout the duration of the ceremony.

The great interest of the Crow Sun Dance lies precisely in this: that it brings out so clearly the great difference between theory and reality, which coincides in this case with that between the esoteric and the exoteric aspects of the ceremony. Theoretically, any part of the performance not directly contributing to the production of the vision would seem superfluous. But in reality, to the great majority of the people, the "superfluous" portions of the performance are probably the main object of interest, filling the want of a free show. Moreover, these exoteric parts are the very ones that are most widely diffused over the Plains area and are thus presumably of great antiquity. To say therefore, that the entire Sun Dance of the Crow is nothing but the quest of a vision to ensure vengeance, would be wide of the truth. It seems so only to the logic-chopping white observer, or to the native himself when he begins to theorize about the complex things he does. But apart from the pledger, the Indian performers or witnesses pass through various psychological states during the ceremony, which are very remote from the notion embodied in the theory of the performance. This tendency to rationalize his actions, to interpret things to himself and mislead himself and the guileless ethnologist as to his real motives, is a very marked characteristic of primitive man that has invited and continues to engage the attention of ethnologists.

THE COMMON ROUND-WINGED KATYDID

Some recent ingenious and painstaking work in motion pictures has brought to our eyes the mysterious activities of insects in a way we should never have thought possible

The katydid "sings" by rubbing together the overlapping glassy parts of the wings just back of the head

EDUCATIONAL MOTION PICTURES IN NATURAL HISTORY

By Raymond L. Ditmars

THE growth of the educational motion picture rather parallels that of its dramatic ally. There was a time when a moving picture of a railroad train was considered a novelty and from that time the product for the theatres has grown steadily in elaboration until superb dramatic productions of five and six thousand foot lengths are in use in every civilized part of the world.

When I first considered the practicability of showing the habits of mammals, reptiles, amphibians and insects by means of motion pictures, I was confronted with the immediate decision that an especially constructed laboratory would be necessary and this would probably involve much originally designed apparatus. The latter point proved to be of prime importance. It was fully a year after the construction of the studio that continual experimental work demonstrated the best available apparatus. Experimentation had been difficult and so costly that I was called to a halt for five months in preparing "popular" educational films for theatrical use in order to cover expenses to purchase the necessary apparatus.

The studio was finally lighted with a combination battery of mercury vapor lamps and arc lights. It was necessarily arranged to do all the photographing by electric light owing to daytime duties at the Zoölogical Park. Switchboards, light housings and supports, all stagework, backgrounds and general accessories were built at the studio. A projecting room was arranged for the immediate testing of all films, an automobile provided with apparatus for collecting and a number of tanks and cages provided for specimens. Actual work in preparing a systematic series of natural history films was begun in August of 1913. With the reopening of the free lectures of the Board of Education of New York City in the fall of 1913, the first of these films was used for educational purposes.

The work of photographing mammals, reptiles and insects demands much varied ingenuity. Some of the mammals large enough to be dangerous took many liberties in the studio and at times did considerable damage. In order to avoid any trace of cagework in the pictures, the subjects had the free run of the place and were enticed upon the stages with food or by rock shelters built for them. The promptings of a hungry stomach were found to be the most effective in the stage management of this theatre of nature and many of the pictures were made at the period of feeding time. The prowling of a hungry ocelot or tiger cat is a good illustration of animal management. For several days this creature's food had been concealed in different locations of the stage — sometimes hidden among the rocks or concealed in the branch of a tree. The picture was taken as the cat started to search for the food, crouching, scenting and alertly peering about, in characteristic actions of the wilds.

With the scenes of poisonous snakes striking, where there was the necessity of taking the photographs very close to the reptiles, the camera was run by an electric motor. This relieved the human operator of the grave danger of standing within a few feet of an infuriated fer-de-lance or cobra. In photographing the ring-necked cobra or *Spughschlange* of South Africa, the camera was peppered with drops of poison, as this snake voluntarily sprays its venom a distance of six to eight feet, its object being to blind the enemy. The snake was induced to face the camera by projecting a spot of light on a white semaphore directly under the lens.

The development of the eggs of frogs and toads was obtained with a camera set before a Bohemian glass jar and from the same position recording a few feet of film each day. One of these cameras did such duty for a period of two months, thus placing this instrument *hors-de-combat* for all other laboratory work. The life history of several spiders was obtained in like fashion. The story of a large species of *Lycosa*, or wolf spider, was recorded throughout upon the same "field"— a gravelly hollow six inches square. After each photograph the enclosure was covered with a bell-glass and wet sponge to provide the proper moisture — for many spiders are particularly delicate as captives.

The care of this spider was more laborious than that of a large animal. Soft-bodied grubs were hunted for her and she received drinking water by permitting miniature drops

to run to the end of a broom straw. These precautions were necessary in preserving the absolute cleanliness of her tiny yard, which on the projecting screen would be magnified thousands of areas. The spinning of her egg cocoon was successfully accomplished and we awaited with much anxiety the time when the young spiders would emerge and crawl upon the parent's back — hundreds of them, presenting an indescribable spectacle. At last this chapter of the family history was recorded and there was a wait of eight days for the infants to swarm from the mother's back and shift for themselves. This process may be spectacularly inaugurated by a sudden vibration of the ground, causing the parent to jump — then a riot of the spiderlings swarms over the ground.

An additional camera was trained into the field, for once the dispersal takes place all is over and the little spiders are gone. The critical time, when the youngsters appeared uneasy, arrived on a humid evening, when a heavy electrical storm was brewing. The rectifiers for the mercury vapor lamps were already giving some trouble as the cameras were adjusted. With the cameras running, we dropped a steel ball upon the metal stand containing the spider arena to cause it to vibrate, and the spider family departed to all points of the compass. This was an event we had anxiously awaited and luck appeared to be with the photographer. As the electrician prepared to throw out the main switch and extinguish the illuminating batteries, lightning followed the feed wires into the studio and gave us a week's work repairing burned-out parts. But the history of the spider family was completed minus a few feet of film showing the exit of the more laggard members.

So many insects are tiny, almost microscopic creatures and such a large proportion of them perform their characteristic capers in inaccessible places that the value of greatly enlarged motion picture portrayals opens previously impossible opportunities for study and observation in the schoolroom. By these methods students are enabled to see habits that the greater number of them would never in any other way observe. Not one child in a million has seen the katydid sing, the praying mantis rear in frightful pose, grasp and devour a fly, a gaudy grasshopper carefully brush pollen dust from its face.

It is not so difficult to obtain motion pictures of insects eating because these creatures are always hungry and persist in satisfying their appetites even under greatly disturbed conditions, but to obtain scenes of nervous spiders caring for their young and to show insects singing — that is a different matter.

To photograph the katydid singing was a difficult task. This insect sings by scraping the wings together and only at night. A light of any kind will stop it. Yet to photograph a singing specimen at night meant that a stream of powerful electric light must be turned upon the songster. The deed was done in a grove of young oaks close to the studio. Several dozen katydids were placed in the trees and the camera — on a high tripod — focused on the vegetation of a tree in the center of the grove. The instrument, with special long focus lens was to record the movement of a single insect that watched all proceedings, but remained silent owing to our close arrangements with the machines. The camera was then belted to a small motor so that no operator would stand by the instrument to disturb the insect. A searchlight, such as is used in the navy was then trained on the single tree in which reposed the actor, its powerful rays making photography possible. With the remainder of the grove in darkness the decoy katydids sang vigorously. In the intense beam of violet light the principal in this educational drama was seen turning slowly. Was it irritated by the light, and would it crawl from the lines of focus? This would mean much labor in moving the heavy apparatus in what seemed a fruitless and costly experiment. But its uneasiness was caused by the saucy taunts of the decoys. Its wings were elevated slightly. It could not resist answering some of those rasping calls. The man behind the searchlight could be seen glistening with perspiration as he "fed" the carbons of the great arc light. The writer's fingers were upon the switch of the camera motor. Then the insect's wings began to move rhythmically and another chant was added to the chorus of "katydid, katydid n't," and so it continued until the picture was taken. And this picture has been seen by thousands of school children who never knew how insects "sing."

MUSEUM NOTES

Since the last issue of the Journal the following persons have become members of the Museum:

Life Members, Major Basil Hicks Dutcher, U. S. A., and Mr. William Rutger Britton;

Annual Members, Mrs. W. P. Hardenbergh, Mrs. Charles Hirschhorn, Mrs. W. W. Hoppin, Jr., Mrs. Albert L. Judson, Mrs. S. R. Kaufman, Mrs. Jacob Langeloth, Mrs. John R. Livermore, Mrs. Morris Loeb, Mrs. Theresa Mayer, Mrs. George L. Otis, Mrs. Eugene H. Paddock, Mrs. Jerome Regensburg, Miss Marie Louise Baldwin, Miss Mary Pinchot Eno, Miss Emma G. Sebring, Miss Mary Shoonmaker, Hon. Henry Roberts, Dr. Charles E. Fleck, Dr. T. Mitchell Prudden, and Messrs. H. H. Benedict, Alfred Polk Bergh, Alfred Bleyer, A. I. Esberg, B. Hamburger, Martin F. Jackson, Robert U. Johnson, George Kennan, Warren Kinney, Henry M. Lester, Edmund J. Levine, Charles N. Mead, George W. Merrihew, Allan Pinkerton, Myron T. Scudder.

A new expedition, to cross South America by way of La Paz and Cochabamba, the Mamore, Madeira and Amazon rivers, and to be known as the "Collins-Day South American Expedition," has been organized to sail December 26 for several months' work in exploration and zoölogical collecting. Mr. George K. Cherrie will accompany the expedition as the naturalist representing the American Museum of New York and Mr. Robert H. Becker will represent the Field Museum of Chicago. The birds and the mammals collected by the expedition will be presented to the American and Field museums respectively for permanent ownership of types and for scientific study and publication, preliminary to a later equal division of all specimens except types between the two institutions.

Colonel Theodore Roosevelt on the evening of December 10 presented before the members of the Museum some of the zoölogical results of his recent expedition to South America. He was introduced by Professor Henry Fairfield Osborn and was accompanied on the platform by Mr. George K. Cherrie, one of the Museum's representatives with him on the expedition. A full report of the expedition will be given in the February Journal.

Dr. Felix von Luschan, professor of anthropology at the University of Berlin and director of the Royal Ethnographical Museum, visited the Museum several times during the month of December. Professor von Luschan, who delivered the Huxley lectures some years ago, had been one of the guests of honor at the Australian meeting of the British Association for the Advancement of Science. He is primarily a specialist in physical anthropology, but has done notable work in ethnography, being especially interested in the Oceanic and African fields, and has also conducted archæological researches in Asia Minor. He found many specimens of great interest in the South Sea hall and pronounced the Jesup collection of tattooed Maori skulls to be unique. On December 17 Professor von Luschan lectured at the American Museum under the auspices of the American Ethnological Society; his subject was "Culture and Degeneration." He dwelt particularly upon inherited physical disabilities and the alarming decrease in the birth rate among the wealthier classes in the cities of Europe.

A Memorial Meeting in honor of the late Professor Albert S. Bickmore will be held at some time during the latter half of January. Mr. Joseph H. Choate, and Mr. Cleveland H. Dodge, who were intimately associated with Professor Bickmore, will give brief addresses in which they will recount the steps that led to the founding of the museum and the story of the early days of the institution. Mr. L. P. Gratacap, curator of mineralogy of the Museum faculty, will present personal reminiscences of Professor Bickmore.

The following note from *Science* for December 18 is of interest to Journal readers: At the Academy of Natural Sciences of Philadelphia on Tuesday evening, November 24, Dr. Henry Fairfield Osborn was presented with a Hayden medal. In presenting the medal Dr. Samuel G. Dixon called attention to the fact that Mrs. Emma W. Hayden, widow of the well-known scien-

tific man, Ferdinand Venderveer Hayden, had established a deed of trust arranging for a sum of money and a bronze medal to be given annually to the author of the best publication, exploration, discovery or research in geology or paleontology, or a similar subject. Professor James Hall, of Albany, received the award in the first instance and the other nine succeeding him were Edward D. Cope, 1891; Edward Suess, 1892; Thomas H. Huxley, 1893; Gabriel August Daubree, 1894; Carl H. von Littel, 1895; Giovanni Capellini, 1896; Alexander Petrovitz Karpinski, 1897; Otto Torell, 1898; Giles Joseph Gustav Dewalzue, 1899. In 1900 the deed of trust was modified so as to award a gold medal every three years. The first to receive the new medal was Sir Archibald Geikie; the second was Dr. Charles D. Walcott in 1908 and the third John Casper Branner in 1911.

THE Annual Meeting of the Board of Trustees of the American Museum of Natural History will occur on the evening of February first, when the members of the Board will be guests of President Osborn at dinner at his residence, 850 Madison Avenue.

THE December meeting of the Section of Biology of the New York Academy of Sciences was devoted to a "Symposium on Porto Rico" in which the progress of the Academy's natural history survey of that island was described.

Professor Charles P. Berkey outlined his geological reconnaisance of the island, in which he and Dr. Fenner had traveled more than two thousand miles. They had studied the rocks at so many points that they were enabled to construct a preliminary geological map which revealed the general geological history of the island.

Professor N. L. Britton outlined the progress of the botanical investigation of the island. The material collected by the Academy workers has been distributed to a number of specialists and from their labors, knowledge of the flora is rapidly being extended.

Dr. Marshal A. Howe by means of the stereopticon illustrated a series of marine algæ which he collected recently. Especially interesting were the reef-building coralline algæ. Dr. N. Wille summarized the present knowledge of the fresh-water algæ, in which much further collecting is necessary. Mr. Roy W. Miner described his collecting of marine invertebrates. Mr. Frank E. Lutz in summarizing the present knowledge of the insects and spiders touched upon several interesting problems of distribution in which Porto Rico offers an attractive field for further work. Mr. J. T. Nichols described the fish fauna of the island.

THE manuscript for a book, "Men of the Old Stone Age," which covers the long Palæolithic history of Europe, was completed by Professor Henry Fairfield Osborn during the month of November and it will appear from the Scribner press in February. The writing of this work was suggested by the author's tour through the caverns of Italy, France and Spain, described in the December, 1912, number of the JOURNAL. The work differs from the volumes recently published by Professor Sollas, Lord Avebury and Professor James Geikie in presenting a fuller description of the various primitive races of men and in giving a connected story of the geology, geography, climate, and development of the flint industry and art. An attempt has been made to give a very clear and semipopular treatment of our present knowledge of the long prehistory of Europe, closing with the advent of the men of the New Stone Age, which is believed to have occurred between 7000 and 9000 years ago.

MR. N. C. NELSON has returned from several months' archæological field work in New Mexico. His work this year was a continuation of that of previous years on the ancient villages of the Tanos, south of Santa Fé. He made partial excavations of three large ruins, digging out altogether about four hundred and fifty ruins from which he brought back approximately seven hundred specimens for the Museum. A large number of skeletons were also secured, some from the ruins and some from refuse heaps belonging to the different villages. In his excavations Mr. Nelson discovered a stratified deposit in which four distinct types of pottery were found. Since the pueblos clustered all about the region belong to one or more of these pottery-making stages, the chronological position of most of the ruins can now be determined on the basis of this discovery.

SIR DOUGLAS MAWSON will lecture on "Racing with Death in Antarctic Blizzards," under the auspices of the American Geo-

graphical Society and the American Museum of Natural History at Aeolian Hall, January 17, 1915. The lecture will cover Dr. Mawson's experiences in the Antarctic from 1911 to 1914 and will be illustrated with still and motion pictures which are pronounced by Sir Ernest Shackleton, Mr. A. Radclyffe Dugmore and others who have seen them, to be the most marvelous pictures ever presented on polar subjects. Professor Henry Fairfield Osborn will preside and Dr. Mawson will be introduced by Mr. John Greenough, chairman of the Council of the American Geographical Society. Dr. Mawson has recently been knighted by George V in recognition of his scientific research in the Antarctic. He was well equipped for valuable work, having been lecturer in chemistry at Sydney University and in geology at Adelaide University even before he obtained his doctorate in science in 1909. Later he was on the staff of Sir Ernest Shackleton's expedition as physicist and mineralogist and was one of the party which reached the summit of Mount Erebus and also the South Magnetic Pole. In 1911 he organized the Australasian Antarctic expedition and led it into the great unknown region south of Australia. It is of the story of the accomplishment and the privations and tragedies of this expedition that Dr. Mawson will speak in New York.

The anthropological course of lectures for 1915 is to be devoted to the Aboriginal Art of North American Indians. The subject has been chosen in recognition of the increasing demands of students of art and design upon the ethnological collections in the Museum. The opening and closing lectures are to be given by Dr. Clark Wissler; the first will deal with "Technique and Distribution of Textile Designs," and the concluding lecture with "Design Names and Symbolism." Dr. Herbert J. Spinden, who has devoted much time to the study of the art of the Southwest and Central America, will discuss in the second and third lectures of the series, "Form and Ornament in Ceramic Art" and "History and the Higher Arts." These lectures will be given in the West Assembly hall of the Museum on Thursday evenings in January at 8:15 o'clock.

The Indian figures for the Hopi group under construction by Mr. Howard McCormick in an alcove off the hall of the Southwest Indians, have been modeled by Mr. Mahonri Young and are at present in process of casting in the Museum's preparation shop. It is understood that Mr. Young has in charge also the pediments for the Utah State Capitol at Salt Lake City and that he has a group of bronzes ready for exhibition at the San Francisco Exposition.

Through the kindness of Miss M. Eliza Audubon the Museum has recently come into possession of a painting by John James Audubon. This painting has been in the Museum on deposit for some time and its gift makes a very important addition to the Museum's collection of Auduboniana. It is one of the largest of Audubon's pictures and is especially pleasing in composition and color.

There has recently been placed on exhibition in the Plains Indian hall a small model of a Hidatsa earth-lodge constructed by Mr. S. Ichikawa after drawings made by Mr. F. N. Wilson and plates from the early publication, *Travels in the Interior of North America* by Maximilian, Prince of Wied, who visited the Hidatsa and Mandan in 1832–1834. It was in a village of houses of this type that Lewis and Clark spent their first winter (1804).

The Museum has long been desirous of obtaining a specimen of the devilfish (*Manta birostris*), the largest of all rays. This species, owing to its great size, the difficulty of caring for specimens in the field and the danger attending its capture, is very poorly represented in museums. In fact no full-grown specimen, so far as known, is on exhibition anywhere. Last summer the Museum sent an expedition to the west coast of Florida for the purpose of capturing a devilfish. The expedition succeeded in getting two specimens. For the capture of these we are indebted to Mr. Russell J. Coles of Danville, Virginia, an amateur ichthyologist who has had considerable experience in the capture of large sharks. Mr. Coles was in charge of the capturing of the specimens and did most of the work of harpooning them. The expedition made its headquarters at Captive Island, about twenty-five miles south of Punta Gorda. The two devilfish caught were splendid specimens, the larger one eleven feet wide and the smaller one seven feet ten inches. Excellent casts of both specimens were made in the field by Mr. J. C. Bell, of the Museum's department

of preparation. The scientific work of the expedition was in the hands of Dr. L. Hussakof, who obtained, in addition to the studies necessary for the correct mounting and coloring of the specimens for exhibition, valuable data on the structure and natural history of this little-known ray.

Two new leaflets by Dr. F. E. Lutz, assistant curator of invertebrate zoölogy, have recently been issued in the Museum's educational series. The first deals with the thirty-four species of butterflies most common in the vicinity of New York City, each species being illustrated by a life-size figure. The second gives directions for collecting and preserving insects in the field.

The Peruvian and Mexican collections of the Metropolitan Museum of Art have been deposited with the American Museum for an indefinite time and may be used either for study or exhibition purposes.

Three new exhibits of the department of anatomy and physiology in the synoptic hall on the third floor include a series of mounted limb-bones, showing the adaptation of mammalian limbs to their various modes of living, and two series of wax models illustrating respectively the evolution of the vertebrate chondrocranium and the brain.

Mr. Ernest Thompson Seton on the evening of November 27 gave a special lecture in the auditorium of the Museum on "Voices of the Night," in which he told the story of some of the wild animals of North America and gave imitations of their calls.

A new edition of the *General Guide* to the exhibition halls of the museum has just been issued comprising 125 pages and 65 illustrations. Experience has shown that the changes in the Museum's collections are so extensive that a guide must be issued at least once a year in order to keep pace with them.

Important exhibits in the department of vertebrate palæontology have recently been opened to the public. The first of these is a skeleton of Scelidotherium, which is a part of the Cope Pampean collection secured through the generosity of the late Morris K. Jesup, former president of the Museum. This animal belongs to the sloth family and is interesting anatomically in its approach to the anteaters. Two nearly perfect skulls of horned dinosaurs have been added to the reptile collection. These are a part of the collection made by the Museum expedition to the Red Deer River, Alberta, in 1913. The skeleton of the giant carnivorous dinosaur, Tyrannosaurus, is being mounted in the Pleistocene hall, and the new duck-billed dinosaur, Corythosaurus, in the dinosaur hall.

Additions to the mineral collection comprise an exchange with Professor W. Vernadsky of the Imperial Academy of Sciences and a series of purchases made from the interest of the Bruce endowment. The former were interesting from locality, and among them powellite from the Urals merits mention. Noticeable among the purchases are native bismuth and the association of bismuth and molybdenite from North Queensland, Australia; a remarkable native copper coated with solid malachite like a paint, from Michigan; small delicate crystallizations of gold from Verespatak, Hungary; deep blue halite from Stassfurt, Germany; quartz (nodular) with inclusions of acicular bismuth from New South Wales; a handsome large crystallization of dioptase from South Africa; and the new mineral wilkeite from Riverside County, California. Some superior specimens of species already represented were purchased, among which particular reference may be made to catapleiite, cryolithionite, eudialyte, narsarsukite, schizolite, steenstrupine and willemite from Greenland.

The department of public health is at present engaged in the preparation of a special exhibit of military hygiene and sanitation, dealing with the health of armies, the hygiene of the individual soldier and the general problems of camp sanitation.

A number of new exhibits illustrative of insect-borne diseases were added to the department's display during 1914, the most important single exhibit being a model of the flea (carrier of bubonic plague) 1,728,000 times natural size, prepared by Mr. Ignaz Matausch. The history of the bubonic plague in the past is shown by reproductions of a number of early paintings and by a series of maps illustrating the geographic spread of disease during its historic epidemics. A series of photographs of four American army surgeons who have discovered a mosquito transmission of yellow fever, has been hung near the entrance of the hall.

The American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

Open free to the public on every day in the year.

The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people. It is dependent upon private subscriptions and the fees from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world. The membership fees are,

Annual Members	$ 10	Patrons	$1,000
Sustaining Members (annually)	25	Associate Benefactors	10,000
Life Members	100	Associate Founders	25,000
Fellows	500	Benefactors	50,000

Guides for Study of Exhibits are provided on request to members and teachers by the department of public education. Teachers wishing to bring classes should write or telephone the department for an appointment, specifying the collection to be studied. Lectures to classes may also be arranged for. In all cases the best results are obtained with small groups of children.

The Museum Library contains more than 60,000 volumes with a good working collection of publications issued by scientific institutions and societies in this country and abroad. The library is open to the public for reference daily — Sundays and holidays excepted — from 9 A. M. to 5 P. M.

The Technical Publications of the Museum comprise the *Memoirs*, *Bulletin* and *Anthropological Papers*, the *Memoirs* and *Bulletin* edited by J. A. Allen, the *Anthropological Papers* by Clark Wissler. These publications cover the field and laboratory researches of the institution.

The Popular Publications of the Museum comprise the JOURNAL, edited by Mary Cynthia Dickerson, the *Handbooks*, *Leaflets* and *General Guide*. The following list gives some of the popular publications; complete lists, of both technical and popular publications, may be obtained from the Librarian.

POPULAR PUBLICATIONS

HANDBOOKS

NORTH AMERICAN INDIANS OF THE PLAINS. By Clark Wissler, Ph.D. *Paper, 25 cents; cloth, 50 cents.*

INDIANS OF THE SOUTHWEST. By Pliny Earle Goddard, Ph.D. *Paper, 25 cents; cloth, 50 cents.*

ANIMALS OF THE PAST. By Frederic A. Lucas, Sc.D. *Paper, 35 cents.*

ILLUSTRATED GUIDE LEAFLETS

GENERAL GUIDE TO THE COLLECTIONS. New edition issued December, 1914. *Price, 25 cents.*

THE COLLECTION OF MINERALS. By Louis P. Gratacap, A.M. *Price, 5 cents.*

NORTH AMERICAN RUMINANTS. By J. A. Allen, Ph.D. *Price, 10 cents.*

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH. By George H. Pepper. *Price, 10 cents.*

PRIMITIVE ART. *Price, 15 cents.*

THE BIRDS OF THE VICINITY OF NEW YORK CITY. By Frank M. Chapman, Sc.D. *Price, 15 cents.*

PERUVIAN MUMMIES. By Charles W. Mead. *Price, 10 cents.*

THE METEORITES IN THE FOYER OF THE AMERICAN MUSEUM OF NATURAL HISTORY. By Edmund Otis Hovey, Ph.D. *Price, 10 cents.*

THE HABITAT GROUPS OF NORTH AMERICAN BIRDS. By Frank M. Chapman, Sc.D. *Price, 15 cents.*

THE INDIANS OF MANHATTAN ISLAND AND VICINITY. By Alanson Skinner. *In preparation.*

THE STOKES PAINTINGS REPRESENTING GREENLAND ESKIMO. *Price, 5 cents.*

BRIEF HISTORY OF ANTARCTIC EXPLORATION. *Price, 10 cents.*

TREES AND FORESTRY. By Mary Cynthia Dickerson, B.S. *A new edition in course of preparation.*

THE PROTECTION OF RIVER AND HARBOR WATERS FROM MUNICIPAL WASTES. By Charles-Edward Amory Winslow, M.S. *Price, 10 cents.*

PLANT FORMS IN WAX. By E. C. B. Fassett. *Price, 10 cents.*

THE EVOLUTION OF THE HORSE. By W. D. Matthew, Ph.D. *Price, 20 cents.*

REPRINTS

THE GROUND SLOTH GROUP. By W. D. Matthew, Ph.D. *Price, 5 cents.*

METHODS AND RESULTS IN HERPETOLOGY. By Mary Cynthia Dickerson, B.S. *Price, 5 cents.*

THE WHARF PILE GROUP. By Roy W. Miner, A.B. *Price, 5 cents.*

THE SEA WORM GROUP. By Roy W. Miner, A.B. *Price, 10 cents.*

THE ANCESTRY OF THE EDENTATES. By W. D. Matthew, Ph.D. *Price, 5 cents.*

A "pod" of fur-seal pups at an age when they can care for themselves

THE AMERICAN MUSEUM JOURNAL

THE ANIMALS OF BRAZIL . . . By THEODORE ROOSEVELT

FURTHER ARTICLES ON

THE HEALTH OF THE WORLD'S ARMIES

INDIAN LULLABIES AND LOVE SONGS

The American Museum of Natural History

THE AMERICAN MUSEUM JOURNAL

VOLUME XV FEBRUARY, 1915 NUMBER 2

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MARY CYNTHIA DICKERSON, *Editor*

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Photo by Harper
Courtesy of Charles Scribner's Sons

BACK TO THE RANCH FROM A JAGUAR HUNT

Colonel Roosevelt and Kermit, Colonel Rondon, two jaguar trailers with long spears, a brown boy on a long-horned steer with saddle bags holding lunch, a small pack of dogs.

"A naturalist could with the utmost advantage spend six months on such a ranch . . . . He would have to do some collecting, but only a little. Exhaustive observation in the field is what is now most needed. Most of the wonderful and harmless bird life should be protected by law; and the mammals should receive reasonable protection. The books now most needed are those dealing with the life histories of wild creatures."—Quoted from p. 91, Roosevelt's *Through the Brazilian Wilderness*

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Photo by Miller
Courtesy of Charles Scribner's Sons

Roosevelt's canoe disappearing down Rio Téodoro, the River of Doubt. "Ahead of us the brown water street stretched in curves between endless walls of dense tropical forest."

ANIMALS OF CENTRAL BRAZIL[1]

TOGETHER WITH MENTION OF THE GEOGRAPHICAL WORK OF THE ROOSEVELT-RONDON SOUTH AMERICAN EXPEDITION IN EXPLORING THE "RIVER OF DOUBT"

By Theodore Roosevelt

WHEN I contemplated going on this trip the first thing I did was to get in touch with Dr. Frank M. Chapman of the American Museum. I wanted to get from him information as to what we could do down there and whether it would be worth while for the Museum to send a couple of naturalists with me. On any trip of this kind — on any kind of a trip I have ever taken — the worth of the trip depends not upon one man but upon the work done by several men in coöperation. This journey to South America would have been not worth the taking, had it not been for the two naturalists[2]

[1] A lecture delivered before the members of the American Museum of Natural History, December 10, 1914.

[2] As the reader pursues his fascinated way through Colonel Roosevelt's latest book, which recounts experiences on this South American expedition, he becomes impressed — if he is a naturalist, with the positive stand on certain definite points regarding natural history taken by the Author. For instance Colonel Roosevelt puts emphasis on the need for the protracted work in the field of the trained observer as contrasted with the big-game hunter or mere zoölogical collector. We concur so fully in the point made and in fact consider the matter of a complete scientific

from the American Museum who were with me, and for the Brazilian officers skilled in cartographical work who joined the expedition.

I thought of making the trip a zoölogical one only, when I started from New York, but when I reached Rio Janeiro the Minister of Foreign Affairs, Mr. Lauro Müller, whom I had known before, told me that he thought there was a chance of our doing a piece of geographical work of importance. In the course of the work of the telegraph commission under Colonel Rondon, a Brazilian engineer, there had been discovered the headwaters of a river running north through the center of Brazil. To go down that river and put it on the map would be interesting, but he wanted to tell me that one cannot guarantee what may happen on unknown rivers — there might be some surprises before we got through. Of course we jumped at the chance, and at once arranged to meet Colonel Rondon and his assistants at the head of the Paraguay, to go down from there with them.

Photo by Miller

In the canoe ready for the trip down the Unknown River. At camp Rio Téodoro, Matto Grosso, Brazil

We touched at Bahia and Rio Janeiro and then came down by railway across southern Brazil and Uruguay to Buenos Aires and went through the Argentine over to Chili. We traveled south through Chili and then crossed the Andes. That sounds a very elaborate thing to do, but as a matter of fact

record of such pressing importance before conditions be intruded upon in South America and races pushed to the wall by civilization, that various quotations from Colonel Roosevelt on this point have been inserted in the captions of the article and attention is hereby called to them (pages 34, 43 and 45).— The Editor.

Photo by Kermit Roosevelt
Courtesy of Charles Scribner's Sons

WHERE THE RAPIDS WERE NARROW IN THE RIVER OF DOUBT

it was pure pleasure. It was a wonderful trip. The pass through which we crossed was like the Yosemite, with snow-capped volcanic mountains all about. Afterward we went across Patagonia by automobile and then started up the Paraguay. Our work did not begin until we were inside the Tropic of Capricorn. We took mules at Tapirapoan and went up through the high central plateau of Brazil — not a fertile country but I have no question but that great industrial communities will grow up there.

The hard work on the unknown river came during the first six weeks. In those forty-two days we made only an

Photo by Miller

"I shall never forget the spectacle in certain places on the Unknown River where great azure blue butterflies flew about up and down through the sunshine of the glade or over the river" or settled in gleaming masses on the bank

Photo by Kermit Roosevelt
Courtesy of Charles Scribner's Son

We were little troubled by mosquitoes in the level marshy region of western Brazil. For the man who goes through the unexplored jungle however, the real dangers lie in a menace of insects — mosquitoes, gnats, ticks and fire ants — and the fevers that insects cause, instead of in cayman, anaconda or fer-de-lance, or even in the jaguar as might be supposed

average of about a mile and a half a day and toward the end we were not eating any more than was necessary and that was largely monkey and parrot. The parrots were pretty good when they were not tough but I can assure Mr. Hornaday that he could leave me alone in the monkey cage at the New York Zoölogical Gardens with perfect safety.

Both of the naturalists who were with me and I myself were interested primarily in mammalogy and ornithology. We were not entomologists and studied only those insects that forced themselves upon our attention. There were two or three types that were welcome. The butterflies were really wonderful. I shall never forget the spectacle in certain places on the Unknown River where great azure blue butterflies would fly about up and down through the glade or over the river. Some of the noises made by insects were extraordinary. One insect similar to a katydid made a noise that ended with a sound like a steamboat whistle.

We found the mosquitoes bad in only two or three places. On the Paraguay marshes there were practically no mosquitoes. In that great marsh country where I should suppose mosquitoes would swarm, there were scarcely any. Our trouble was chiefly with gnats. These little flies were at times a serious nuisance. We had to wear gauntlets and helmets and we had to tie the bottom of our trouser legs. When we stopped on one occasion to build canoes, two or three of our camaradas were so crippled with the bites of the gnats that they could hardly walk. The wasps and stinging bees were also very obnoxious and at times fairly dangerous. There were ants we called foraging ants that moved in dense columns and killed every living thing that could not get out of the way. If an animal is picketed in the line of march of these foraging ants, they are likely to kill it in short time.

There is also a peculiar ant called the

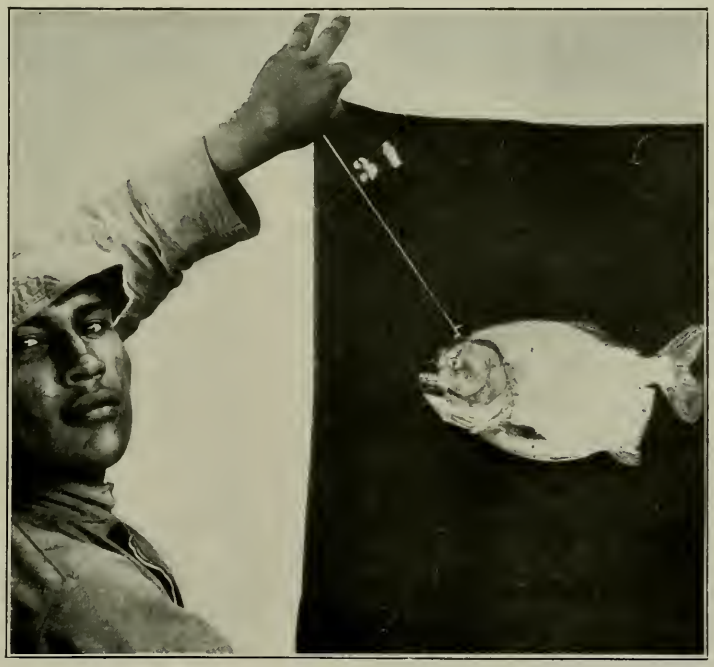


Photo by Harper
Courtesy of Charles Scribner's Sons

Man-eating fish, piranha. "South America makes up for its lack, relatively to Africa and India, of large man-eating carnivores by the extraordinary ferocity or bloodthirstiness of certain small creatures of which the kinsfolk elsewhere are harmless. It is only here that fish no bigger than trout kill swimmers, and bats the size of the ordinary 'flittermice' of the northern hemisphere drain the life-blood of big beasts and of man himself."

leaf ant which doesn't eat a man but devours his possessions instead. I met with a tragedy one night myself. We had come down the Unknown River and had lost two or three canoes and had to portage whatever we had over the mountain. We had to throw away everything that was not absolutely necessary. I reduced my own baggage to one change of clothing. We got into camp late and Cherrie and I had our two cots close together and did not get the fly up until after dark. My helmet had an inside lining of green and I had worn a red handkerchief around my neck. At night I put my spectacles and the handkerchief in the hat. The next morning I looked out of bed preparing to get my spectacles. I saw a red and green line. It was moving. There was a procession of these leaf-bearing ants with sections of my handkerchief and hat. I had had one spare pair of socks and one spare set of underclothing and I needed them both. By morning I had part of one sock and the leg and waistband of the underwear and that was all. It is amusing to look back at but it was not amusing at the time.

Photo by Miller

The caymans, or jacarés, of the Paraguay region are not ordinarily dangerous to man, although they sometimes become man-eaters

The most interesting fish that we became acquainted with was called the "cannibal fish," the "man-eating fish." It is about the size of our shad with a heavily undershot jaw and very sharp teeth. So far as I know, it is the only fish in the world that attacks singly or in shoals animals much larger than itself. Cannibal fishes swarm in most of the rivers of the region we passed through, in most places not very dangerous, in others having the custom of attacking man or animals, so that it is dangerous for anyone to go into the water. Blood maddens them. If a duck is shot, they will pull it to pieces in a very few minutes.

This side of Corumba a boy who had been in swimming was attacked in midstream by these fishes and before relief could get to him, he had not only been killed but half eaten. Two members of our party suffered from them. Colonel Rondon after carefully examining a

Photo by Maza
Courtesy of Charles Scribner's Sons

A non-poisonous snake, the mussurama, swallowing the deadly fer-de-lance after having killed it. The danger from poisonous snakes in South America is very slight, "much less than the danger of being run down by an automobile at home."

certain spot in the river went into the water and one of these fishes bit off his little toe. On another occasion on the Unknown River, Mr. Cherrie went into the water thinking he could take his bath right near shore and one of the fish bit a piece out of his leg.

One of the most extraordinary things we saw was this. On one occasion one of us shot a crocodile. It rushed back into the water. The fish attacked it at once and they drove that crocodile out of the water back to the men on the bank. It was less afraid of the men than of the fish.

We were interested one day in a certain big catfish, like any other big catfish except that it had a monkey inside of it. I had never heard that a catfish could catch monkeys but it proved to be a fact. The catfish lives at the bottom of the water. The monkeys come down on the ends of branches to drink and it seems to be no uncommon thing for the fish to come to the surface and attack the monkey as it stoops to drink. Our Brazilian friends told us that in the Amazon there is a gigantic catfish nine feet long. The natives are more afraid of it than of the crocodile because the crocodile can be seen but the catfish is never seen until too late. In the villages, poles are stacked in the water so that women can get their jars filled with water, these stockades of poles keeping out the giant crocodile and catfish. I had never seen in any book any allusions to the fact

that there is a man-eating fish of this type in the Amazon.

One day when we were going down the Unknown River Mr. Cherrie and I in the same canoe, we saw a flying fish. Of course everyone knows about the flying fish on the ocean but I had no idea there were flying fish on the South American streams. I very much wish that some ichthyologist would go down to South America and come back with not only a collection of the fishes but also full notes on their life histories.

We did not see very many snakes, I suppose only about twenty venomous ones. The most venomous are those somewhat akin to our rattlesnakes but with no rattles. One of the most common is the jararaca, known in Martinique as the fer-de-lance. One of the biggest is called the bushmaster and attains a length of about ten feet. These snakes are very poisonous and very dangerous. The mussurama is another South American snake, and it lives on poisonous snakes. It habitually kills and eats these dangerous reptiles, its most common prey being the jararaca. I saw the feat performed at a laboratory where poisonous snakes are being studied to secure antidotes to the poisons and to develop enemies to the snakes themselves. Such an enemy is this mussurama which must be like our king snake — but larger. The king snake is a particularly pleasant snake; it is friendly toward mankind, not poisonous and can be handled freely. The scientists at the laboratory brought out a big good-natured mussurama which I held between my arm and coat. Then they brought out a fairly large fer-de-lance about nine inches shorter than the mussurama and warning me to keep away, put it on the table. Then they told me to put my snake where it could get at the fer-de-lance. I put down my snake on the table and it glided up toward the coiled fer-de-lance. My snake was perfectly free from excitement and I did not suppose it meant to do anything, that it was not hungry. It put its "nose" against the body of the fer-de-lance and moved toward the head. The fer-de-lance's temper was aroused and it coiled and struck. The return blow was so quick that I could not see just what happened. The mussurama had the fer-de-lance by the lower jaw, the mouth wide open. The latter struck once again. After that it made no further effort to defend itself in any way. The poisonous snake is a

Photo by Kermit Roosevelt
Courtesy of Charles Scribner's Sons

Boy with parakeet and young coati. Parakeets are attractive but noisy little birds flying to and fro in the tops of palms. Coatis in jungle trees look like reddish lanky raccoons and fight savagely with both teeth and claws

Photo by Miller

SOME PRIZES OF THE EXPEDITION

Colonel Roosevelt and Colonel Rondon at Porto Campo with tapirs, white leopard and peccaries.

"Nowadays there is a growing proportion of big-game hunters, of sportsmen, who are of the Schilling, Sclous and Shiras type. These men do work of capital value for science. The mere big-game butcher is tending to disappear as a type. On the other hand, the big-game hunter who is a good observer, a good field naturalist, occupies at present a more important position than ever before.... The big game hunter of this type and the outdoors, faunal naturalist, the student of the life-histories of big mammals, have open to them in South America a wonderful field in which to work." — Quoted from p. 116, Roosevelt's *Through the Brazilian Wilderness*

Photo by Miller

Nine-banded armadillos in sandy pasture country. They may curl up for protection but also may bound off at a run as swift as a rabbit's — as surprising to the observer as to see a turtle gallop away

highly specialized creature and practically helpless when once its peculiarly specialized traits are effectively nullified by an opponent. The mussurama killed the snake and devoured it by the simple process of crawling outside it. Many snakes will not eat if people interfere with them, but the mussurama had no prejudices in this respect. We wanted to take a photograph of it while eating, so I took both snakes up and had them photographed against a white cloth while the feast went on uninterruptedly.

Birds and mammals interested me chiefly, however. I am only an amateur ornithologist but I saw a great deal there that would be of interest to any of us who care for birds. For instance there are two hundred and thirteen families of birds very plentiful there, either wholly unknown to us, or at least very few of them known.

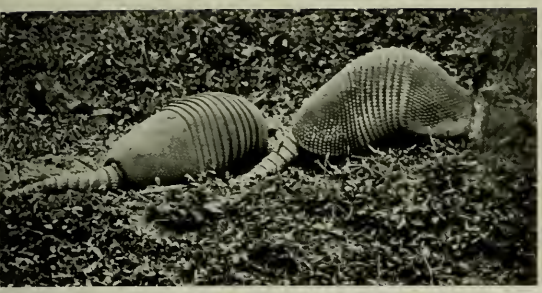
The most conspicuous birds I saw were members of the family of tyrant flycatchers, like our kingbird, great crested flycatcher and wood pewee. All are birds that perch and swoop for insects. One species, the bientevido, is a big bird like our kingbird, but fiercer and more powerful than any northern kingbird. One day I saw him catching fish and little tadpoles and also I found that he would sometimes catch small mice. Another kind of tyrant, the red-backed tyrant, is a black bird with reddish on the middle of the back. We saw this species first out on the bare Patagonian plains. It runs fast over the ground exactly like our pippit or longspur.

Curved-bill wood-hewers, birds the size and somewhat the coloration of veeries, but with long, slender sickle-bills were common about the gardens and houses.

Most of the birds build large nests. The oven-birds build big, domed nests of mud. Telegraph poles offer splendid opportunities for building nests. Sometimes for miles every telegraph pole would have an oven-bird's nest upon it. These birds come around the houses. They look a little bit like wood thrushes and are very interesting in that they have all kinds of individual ways. The exceedingly beautiful honey creepers are like little clusters of jet. They get so familiar that they come into the house and hop on the edge of the sugar bowl.

The people living on many of the ranches in Brazil make us rather ashamed for our own people. The ranchmen protect the birds and it is possible to see great jabiru storks nesting not fifty yards from the houses, and not shy.

Most of the birds in Brazil are not musical although some of them have very pretty whistles. The oven-bird has an attractive call. The bell-bird of the



gray hue (contrasted with the white bell-bird) has a ringing whistle which sounds from the topmost branches of the trees.

The mammals were a great contrast to what I had seen in Africa. Africa is the country for great game. There is nothing like that in South America. The animals in South America are of interest to the naturalist more than to the person who is traveling through the country and takes the ordinary layman's point of view. Only two of the animals found there are formidable. One of these is the jaguar, the king of South American game, ranking on an equality with the noblest beasts of the chase of North America, second only to the huge and fierce creatures which stand at the head of the big game of Africa and Asia. The great spotted creatures are very beautiful. Like all cats they are easily killed with a pack of hounds, but they are very difficult to come upon otherwise. They will charge men and sometimes become man-eaters.

Another big mammal of the Brazilian forest is the white-lipped peccary. The white-lipped peccaries herd together in the dense jungles in packs of thirty or forty or sometimes as many as two or three hundred. They are formidable creatures. The young ones may be no larger than a setter dog but they have tremendous tusks. They surge and charge together and I think that they may legitimately be called dangerous.

Photo by Miller

Colonel Roosevelt in his hunting clothes ready for the day's start.

"I kept continually wishing that they [the naturalists of the expedition] had more time in which to study the absorbingly interesting life-histories of the beautiful and wonderful beasts and birds we were all the time seeing. Every first-rate museum must still employ competent collectors; but I think that a museum could now confer most lasting benefit, and could do work of most permanent good, by sending out into the immense wilderness, where wild nature is at her best, trained observers with the gift of recording what they have observed. Such men should be collectors . . . . , but they should. . . . primarily be able themselves to see, and to set vividly before the eyes of others, the full life-histories of the creatures that dwell in the waste spaces of the world." — Quoted from p. 161, Roosevelt's *Through the Brazilian Wilderness*

Photo by Kermit Roosevelt
Courtesy of Charles Scribner's Sons

Colonel Roosevelt's first South American jaguar, brought down from a tree at seventy yards distance. The jaguar is heavier and more powerful than the African leopard, having the stout frame and muscular build of the lion. It feeds on capybara and cayman, on peccary and deer, and will even pounce on and devour large anacondas

On one occasion Cherrie was hunting peccaries and the peccaries treed him. He was up there four hours. He found those four hours a little monotonous, I judge. I never had any adventure with them myself. They make queer moaning grunts. We spent a couple of days in getting the specimens that we brought back. We had four dogs with us. The ranchmen had loaned them to us although I doubt whether they really wished to let us have them, for the big peccary is a murderous foe of dogs. One of them frankly refused to let his dogs come, explaining that the fierce wild swine were "very badly brought up" and that respectable dogs and men ought not to go near them. We might just as well not have taken any dogs, however. Two of them as soon as they smelled the peccaries went home. The third one made for a thicket about a hundred yards away and stayed there until he was sure which would come out ahead. The fourth advanced only when there was a man ahead of him. The dangerous little peccaries made fierce moaning grunts on their way through the jungle and rattled their tusks like castanets whenever we came up.

Armadillos were unexpectedly interesting because they ran so fast. Once on a jaguar hunt we came upon two of the big nine-banded armadillos, which are called the "big armadillos." The dogs raced at them. One of the armadillos got into the thick brush. The other ran for a hundred yards with the dogs close upon it, wheeled and came back like a bullet right through the pack. Its wedged-shaped snout and armored body made the dogs totally unable to

seize or stop it. It came back right toward us and got into the thick brush and so escaped. Other species of armadillo do not run at all.

The anteaters, most extraordinary creatures of this latter-day world, are found only in South America. The anteater is about the size of a small black bear and has a long narrow toothless snout, a long bushy tail and very powerful claws on its fore feet. It walks on the sides of its fore feet with the claws curved in under the foot. These powerful claws make it a formidable enemy for the dogs. But it goes very slowly. Anteaters were continually out in the big open marshes where we got the two specimens that we sent to the Museum. They were always on muddy ground, and in the papyrus swamp we found them in several inches of water. I do not see how they continue to exist in a country with jaguars and pumas. They are too slow to run away and they are very conspicuous and make no effort to conceal themselves.

The great value of our trip will be shown only when full studies have been made of the twenty-five hundred and more specimens of birds and mammals brought back. We will be able to give for the first time an outline of the mammalogy and ornithology of central Brazil.

Probably the most important feature of the trip was going down the Unknown River, because, of course, at this stage of geographical history it is a rare thing to be able to put on the map a new river, a river never explored, a river the length of the Rhine of which not a line is to be found on any map.

It was a journey well worth taking, a rough trip of course, but I shall always be more grateful than I can say to Professor Osborn and Dr. Chapman of the American Museum for having sent Mr. Cherrie and Mr. Miller with me, thus enabling me to take part in a zoögeographical reconnaissance of a part of the Brazilian wilderness.

Photo by Miller

SOUTH AMERICAN JUNGLE ALONG THE PARAGUAY

Colonel Roosevelt and Messrs. George K. Cherrie and L. E. Miller, the two representatives from the American Museum. [The photographs used in this article are by Mr. Miller]

THE ROOSEVELT-RONDON SCIENTIFIC EXPEDITION

A REVIEW OF ITS MOVEMENTS IN SOUTH AMERICA IN 1913–14 AND OF SOME OF ITS ZOÖLOGICAL ACHIEVEMENTS

By L. E. Miller

Mammalogist of the Expedition

THE plan of the expedition, fully decided upon after consultation with the Brazilian Government on arrival at Rio de Janeiro, took shape as follows: to ascend the Paraguay to the highest navigable point, cross the vast breadth of Matto Grosso on mule-back and descend the unexplored Rio da Dúvida. It was decided also that the main purpose of the expedition should be an exploration of the Rio da Dúvida with zoölogical collecting as we moved along or as opportunity presented itself.

The steamship "Vandyck" remained at anchorage in the harbor of Rio de Janeiro two days, which gave us ample time to view the natural scenic wonders of the harbor, and the beautiful city. The greater part of one day was spent in the botanical gardens which with the avenues of stately royal palms and large collections of plants from all parts of the tropical world, doubtless surpass anything of a similar nature found in South America. Here Colonel Roosevelt left the party, accompanied by his son Kermit and Doctor Zahm; the remainder of the expedition consisting of Mr. George K. Cherrie, Mr. Jacob Sigg, Mr. Anthony Fiala and myself, resumed the voyage and reached Buenos Aires six days later (October 27), twenty-three days after leaving New York. We had stopped a day at Santos, Brazil's great coffee center, and another at Montevideo, the capital of Uruguay.

Although we had read and heard a great deal about the city of Buenos Aires, we were hardly prepared for the pleasant surprise that awaited us. The population of this metropolis of the south is in the neighborhood of two millions, and the city presents a clean, dignified appearance. There is no lack of modern edifices, including large hotels and splendid theatres; an electric subway was just being opened, and the zoölogical park

leaves few things to be desired. The climate also is cool and agreeable. One of the things which especially attracted our attention was the presence of great swarms of dragon-flies hovering above the streets, blown into the city by the violent winds or *pamperos* which sweep across the level plains country.

Mr. Cherrie and the writer were eager to devote every available moment to the zoölogical work, so leaving Messrs. Fiala and Sigg, whose duty it was to look after the handling of the large amount of impedimenta, we secured passage on the Argentine Northeastern Railroad, which had just inaugurated through service to Asuncion, Paraguay. We took only the small amount of equipment necessary for a few weeks' work, as the two others were to come up with the remainder of our luggage via the first available freight boat. Our train was the second to make the through trip, and was scheduled to run biweekly. It was composed of seven Pullmans, two baggage cars and a dining car, and the service was good. Leaving Buenos Aires on the afternoon of Sunday, November 2, we reached Rosario at about dark. Here the train was run on to a steel boat and carried up river for about four hours, after which it continued the journey on the east bank of the Paraná. The next night we recrossed the river on a ferry boat and were landed at Encarnacion, Paraguay. Asuncion was reached late in the afternoon of Tuesday.

The railway journey had been through level plains country, interspersed at long intervals with small clumps and strips of low woods; but it is essentially a grazing country, and we passed numerous herds of cattle contentedly grazing in the vast, fence-inclosed ranges. Stalking calmly among the herds were small bands of rheas, semi-domesticated, but they were not abundant. I doubt if we saw thirty during the entire trip. Caracaras,[1] glossy ibises, jacanas,[2] rails and spur-winged plovers were numerous along the line, and frequently we saw the domed mud-nests of the oven-bird perched upon fence-posts or lower branches of trees. Villages are few and far between, and the natives, a motley crowd of dark-skinned individuals, usually left their shambling, grass-thatched huts and came down *en masse* to see the train.

Asuncion is a quaint old town, plainly showing the marks of violence that have been left by frequent revolutions. Mr. Ferris, the American Consul, who rendered us every courtesy possible during our stay in the city, had witnessed five revolutions during his five years' residence in the capital; there had been seven presidents in the same period of time. The streets are narrow and paved with cobblestones; the buildings are of the usual adobe style, white-washed and with tile roofs. There are one or two banks, a college, several churches, a public market and a number of good hotels, as well as fair electric car and light service; there is also the inevitable lottery. There is practically no business activity. An air of depression hangs over the people like a pall, and this may readily be accounted for when one recalls the tragic history of their country. Many of the women were in deep mourning, and one authority estimated that the proportion of women to men in the country was eleven to one, but I cannot vouch for the accuracy of his statement.

After spending a few days at Asuncion, we were invited to the home of Professor Fiebrig, who lives at Trinidad, a short distance away. Professor Fiebrig is a scientist of more than local note, an instructor in the University of Paraguay and curator of the Museum. Our first zoölogical work was done on his estate. All about were tracts of low forest of considerable size, patches of brush country, grassy fields and cultivated plots. Birds were very abundant, and as practically everything was new to us, our work was doubly interesting. We here formed our first intimate acquaintance with the peculiar white ani[1] (*Guira*), large flocks of which were in the palm trees. The birds sat soberly on their perches, awkwardly jerked their tails from side to side and mewed dolefully. They seemed to be utterly out of place among the vivacious tanagers, creepers and finches, and to belong more properly to the fauna of some remote and unrecorded past. Mammalian life was scarce, but considering the short time available, a comparatively representative collection was made, including a series of a small rare wolf (*Canis*). We spent four days at Trinidad.

Through the courtesy of the President of the Republic, a launch was placed at our disposal, and on November 11 we started on

[1] Caracara: a member of the hawk family.

[2] Jacana: a bird that combines certain characteristics of both plover and rail.

[1] Member of a subfamily of the cuckoos.

a short voyage up the Rio Pilcomayo into the Grand Chaco of Paraguay. We reached a small settlement called Porto Galileo that night, where we were the guests of the "Quebracho" Company. A large mill had been erected for the extraction of tannin from logs brought in from the surrounding country, and a narrow-gauge railway was being constructed in the interior, a distance of sixty kilometers, fifteen kilometers of which was already in operation. We proceeded to the end of the line and pitched camp on the bank of a small stream, the Rio Negro, infested with piranhas.

Our camp was merely a rough shed built of sheets of corrugated iron supported on poles driven into the ground. The river water was salt and unfit for use, so each morning several large jugs of drinking water were sent us from Porto Galileo, together with a supply of fresh provisions. All about lay marshes, swamps and large grass-

The public market place in Asuncion, Paraguay.— Asuncion, which has been the scene of five revolutions in as many years, shows plainly the marks of violence which it has suffered. An air of depression hangs over the city, business activity is at a standstill and women are seen everywhere in deep mourning

Fort Coimbra on the Paraguay River.— Built on the rocky hillside near the dividing line between Brazil and Bolivia, it has figured in many of the conflicts between these two countries

covered areas, the latter type of country predominating.

It is in the dark swamps that the precious quebracho trees grow. It was also from these same swamps that clouds of ravenous mosquitoes issued with the first signs of failing daylight, and drove us to the refuge of our net-covered hammocks. There we sweltered through the long hours of the night, listening to the angry buzzing of our outwitted assailants, which was not unlike the sound produced by a swarm of enraged bees. I could distinguish a number of different pitches and qualities in the music, blending harmoniously in one general chorus. The varying size of the insects, which ranged from individuals nearly an inch long to the small, infection-bearing *Anopheles*, doubtless accounts for the different tones produced by the vibrations of the wings. Small brockets[1] were plentiful in

[1] Brocket: a small South American deer having unbranched horns.

Through the courtesy of the Brazilian government, the steamer "Nyoac" was turned over to the expedition for its exclusive use. The men of the expedition lived on board for many weeks and traveled wherever they wished

A portion of the expedition's camp at Utiarity, a village occupied by Parecís Indians. It is half a mile away that the river dashes over a precipice two hundred and fifty feet high. This proved to be a profitable collecting place for small rodents, birds and a few larger mammals

the swamp and came out into the fields to feed morning and night, and in the tall grass, cavies[1] abounded. Ocelots had worn well-defined paths through the fields in their nightly raids on the cavy community. In the trees we found black howlers, night monkeys and tayras[2]; on the ground, opossums and various small rodents held sway. When time permitted us to take a few moments' recreation, we fished for piranhas[3] in the stream, the ravenous creatures throwing each other clear of the water in their frantic struggles to get at the meat bait.

After a profitable week's work on the Pilcomayo we returned to Asuncion, where we were joined by the two commissaries who had just arrived with the equipment. Two days later we boarded the comfortable little steamer "Asuncion" and sailed for Corumbá. The four and a half days' trip on the Paraguay was most interesting, although the heat was intense and insects at times were troublesome. We had entered the great *pantanal* country, and the vast marshes teemed with bird life. As the "Asuncion" plowed her way through the water, countless thousands of cormorants and anhingas[4] took wing; lining the pools and dotting the marshes were hordes of wood and scarlet ibises, together with herons and a sprinkling of spoonbills; egrets covered the small clump of trees as with a mantle of snowy white, and long lines of jabirus patrolled both shores. Scarcely a moment passed in which we did not see hundreds of birds. Many of the passengers were armed with rifles and revolvers, with which they kept up more or less of a fusillade on the feathered folk, but fortunately their aim was poor so that little injury was inflicted. The day before reaching Corumbá we passed an interesting old land-mark, the fort of Coimbra, built on a rocky hillside with a cluster of thatch-roofed huts nestling against the base. It is near the Bolivian border and in by-gone years figured prominently in several of the bloody controversies between the neighboring republics.

Corumbá is a very hot, dusty town built on a high rocky elevation on the west bank of the Paraguay. The city bears the unenviable reputation of being the rendezvous for fugitives from justice from many climes, but we saw nothing of the lawlessness and disorder which was said to prevail, and the treatment we received was all that could be desired.

Having heard of a place called Urucúm, but a short distance away, which seemed to offer unusual opportunities for collecting, Mr. Cherrie and the writer immediately moved to that place and established headquarters. Urucúm proved to be a garden spot of clear, cold springs, shady groves, and plantations of tropical fruits and vegetables. Easy of access were fields, forested hillsides, marshes and lagoons in which dwelt an abundant and varied fauna. Swarms of bats of several species inhabited the mango trees as well as the culverts and manganese mines in the hillsides, and furnished an unfailing supply of material; squirrels, coatimondis,[1] monkeys and marmosets lived in the trees; on the forest floor ranged agoutis,[2] deer and peccaries. Traps left overnight, caught wooly opossums (*Metachirus*), small rodents and giant black lizards that fought viciously when we sought to release them. One of the mammals added to the collection at Urucúm was of unusual interest; it was the formidable *guaraguasú*, a yellow wolf which equals or exceeds in size the great gray wolf of our own north woods; it is an animal of solitary habits and is so rare that it is seldom met with. It was not previously represented in the American Museum's collection. From the hosts of birds, we secured pigmy owls, tinamous, thrushes, grebes, rails and ant birds that were out of the ordinary. We spent nearly three weeks at Urucúm, and each day we added a number of species that were new to us. In the meantime, Colonel Roosevelt and his Brazilian escort had reached Curumbá, and a hunting trip on the Rio Taquary had been planned to secure specimens of the large game that is found in that region.

December 16 found the hunting party aboard the "Nyoac" steaming up the Taquary. This boat had been placed at the disposal of the expedition by the Brazilian

[1] Cavy: a rodent of South America allied to the guinea pig and capybara.

[2] Tayra: a South American mammal resembling the weasels and martins.

[3] Piranha: the most ferocious small fish in the world, a deadly enemy of man, known as the cannibal fish. It is generally about twelve inches in length.

[4] Anhinga: the American snake-bird.

[1] Coatimondi: also *costimundi* and more popularly known as *coati*. An American carnivorous quadruped, most nearly related to the racoon, called also *tejou*.

[2] Agouti: a rodent about the size of the rabbit.

Government, and was our "home" during the weeks that followed, until we reached Porto Campo. Besides Colonel Roosevelt, there were on board, Colonel Candido Mariano da Silva Rondon, Mr. Kermit Roosevelt, Captain Amilcar de Magalhães, Mr. Reis the photographer, a physician, a taxidermist and myself. Mr. Cherrie remained at Urucúm to finish the work in that locality, and the commissaries were detained in Corumbá. We reached the landing at the Estate Palmiras just at dusk and spent the night aboard, preparing the skin of a giant anteater which had been shot by Colonel Roosevelt near the river. Early next morning the party was in the saddle, galloping across the grassy marshes. Here and there small clumps of trees and thorny bushes dotted the marshes, and these were teeming with birds of many species: parrots, parrakeets and macaws flashed by with raucous shrieks, and fly-catchers calmly surveyed the cavalcade from the uppermost branches. Occasionally we flushed a small flock of teals and, in the distance we saw ibises and jabirus standing in the long grass, like white specks in a sea of green. In spots the marshes were drying, the ground covered with fish; in the small pools an almost solid mass of fishes wriggled in the shallow water which had been churned into thin mud, and at the borders, numbers constantly leapt out; the ground was strewn with the dead and dying myriads of many species.

The ranch house or *fazenda* was reached at noon; it was an interesting place, the long, low rambling buildings forming a square with an open court in the center in which trees and flowers grew, and chickens and pigs roamed at will. All about lay marshes, papyrus swamps, fields and forests. Numerous herds of half-wild cattle grazed on this vast range, and in the papyrus thickets, marsh deer were not uncommon. The main object of this excursion, was the lordly jaguar and a magnificent pair were taken by Colonel Roosevelt and his son after several all-day hunts. Another giant anteater, several deer and a capybara[1] were collected; also a splendid series of the rare and beautiful byacinthine macaw was added to our rapidly growing list of treasures.

Returning to Curumbá on the evening of December 24, we were joined by the other members of the expedition and immediately proceeded on the up-river voyage toward São Luis de Cáceres. A short side trip was made up the Rio São Lourenço, with brief stops at various points where there were evidences of game; and numbers of birds, including screamers, penelopes,[1] parrots and various species of water-fowl were collected, also numbers of small rodents, monkeys, deer and peccaries. The jabiru storks were nesting on the São Lourenço, their great platform nests of sticks perched in the crotches of giant trees. The young storks, two in number and fully feathered, were continually exercising their limbs by running back and forth in the nest, flapping their wings all the while, preparatory to launching forth into the big world.

Caymans were particularly plentiful in the Upper Paraguay. Scores of the evil-looking creatures lay on the sand banks, with wide-open mouths and staring glassy eyes. A fringe of trees flanked the water through which we could see the boundless wastes of *pantanals* beyond; troops of black howling monkeys ambled leisurely away as the boat drew near, and a species of curious gray-throated parrakeet was building tremendous nests in the branches; occasionally in the same tree there were two or three nests each several feet in diameter, which the birds were entering and leaving like bees at a hive.

São Luis de Cáceres was reached January 15, and at noon the next day the "Nyoac" weighed anchor again and pointed her nose up-stream. That night we reached a small station known as Porto Campo, and as the river was too shallow to permit the steamer to ascend further, our effects were taken ashore and tents erected for a temporary camp. A few days' hunt at this point resulted in an addition to the collection of tapirs and white-lipped peccaries shot by Colonel Roosevelt, besides a goodly amount of smaller material. The preservation of the larger specimens was somewhat of a problem as the time at our disposal was wholly inadequate, and there was practically no available native help. All the skinning and preparation was done by Kermit Roosevelt and the writer, although at times valuable assistance was rendered by Mr. Sigg.

January 13 found the expedition aboard a launch (one boatload had preceded us) struggling against the swift current of the

[1] Capybara: the largest existing rodent, resembling the guinea pig.

[1] Penelope: a small South and Central American bird, a small curassow, related to the guan.

Sepotuba. A heavy houseboat-full of provisions and luggage was towed alongside and we made slow progress. There is an end to all things of earth however, and the end of our river journey came on January 16. We had reached Tapirapoan, the furthest outpost on the frontier, and immediately preparations were begun for our long dash across the *chapadão* of Matto Grosso.

Tapirapoan presented a scene of festive gaiety upon the arrival of the expedition at that point. The large, open square around which clustered the low mud-walled huts was decorated with lines of pennants, while the American and Brazilian flags fluttered from tall poles. Flag-raising and lowering was always an impressive ceremony; everybody lined up and stood at attention while the banners were solemnly raised or lowered, as the case might be, to the strains of martial music.

A large number of horses, mules and oxen had been gathered from the surrounding country; the army of natives or *camaradas* who were to have charge of them and the impedimenta, had assembled, and the warerooms were filled with cases and bags of provisions and equipment. To organize properly a cavalcade of such large proportions required some little time, but within six days after our arrival order had been restored out of chaos and the first detachment of the expedition started. This included all of the Americans, and several Brazilians to whose number Lieutenants João Lyra and Joaquin de Mello Filho had been added. Captain Amilcar was to follow the next day with the remainder of the caravan. This division of the party was absolutely necessary as, on account of the great quantity of men and animals required, the expedition would have been unwieldly if it had attempted to move in one body.

The first day's ride was a short one. Early in the morning the men started to load the pack animals, many of which were apparently fresh from the ranch and had never been broken to work of any kind, so there was a good deal of confusion at first. But gradually the men became more adept at their work, the mules and oxen quieted down and little squads left the corrals, wound up the trail and disappeared in a cloud of dust. We did not follow until noon. Our mounts were good strong animals; we had both horses and mules, and comfortable saddles were also provided by the Brazilian Commission. A four hours' canter through brush and forest-covered country brought us to the Sepotuba again, quite some distance above Tapirapoan, and we crossed the stream on a pontoon ferry made by laying a platform of boards across three dugout canoes. There were a number of new palm-leaf houses on the river-bank, so these were used for the night's camp instead of erecting the tents.

Next day we were in the saddle by nine, riding through tall virgin forest with occasional stretches of sandy soil in which only low bushes grew. It was evident as we penetrated farther into the interior that the forest zone was fast disappearing, to be replaced by the vast *chapadão*.[1] The heat was intense; there was no rain, and troublesome insects were lacking. At three o'clock in the afternoon we entered an old clearing. Formerly rice, plantains, mandioca[2] and corn had been cultivated here, but now the place was deserted and overgrown with weeds. Kilometer 52, as the spot was called, had been an important camp of the telegraph commission while work was being prosecuted in that region, but had long since been abandoned.

On January 23, a 32-kilometer ride took us to the site of an old Indian village, known as Aldeia Queimada. We were adhering closely to the telegraph line, following the wide swathe that had been cleared to protect the wires from falling trees and branches, except when a short detour was desirable to find a better crossing for some small stream. The country was of a gently undulating character, covered with wiry grass and a very sparse growth of stunted, gnarled trees. This vegetation is typical of the *chapadão*. With the exception of a few small deer and a number of birds (woodhewers and jays) there were no evidences of animal life. A clear, cold spring rippled over a pebbly bottom near our night's camp. It was the last stream we should see which discharged its water (via the Sepotuba) into the Rio de la Plata system.

Colonel Rondon had employed a number of motor trucks in constructing the telegraph line through this section of the country, several of which were still in serviceable condition. It was therefore decided that a part of the luggage should be sent ahead on the cars as far as the trail permitted, and as there

[1] *Chapadão:* high, nearly level upland covered with scanty scrubby forest.

[2] Mandioca: also called "manioc", the cassava-plant.

would be a wait of several days while the remainder of the expedition caught up, Mr. Cherrie and I went along to devote to collecting the time thus gained. Doctor Zahm and Mr. Sigg accompanied us. We started two days beyond Aldeia Queimada, from a point called Rio Mandioca. There were three trucks, great well-built machines of German make [Saurer], laden to their fullest capacity with the heaviest and most cumbersome pieces of the baggage. It was a strange sight to see them racing across the uninhabited *chapadão*, at a speed of thirty miles an hour, and frequently through blinding rain and deep mud. One of the cars had a full-blooded Indian mechanician who seemed to be fully initiated into the mysteries of handling an automobile, from gathering up branches and

Parecís Indians playing head-ball.— The men show wonderful dexterity in striking with their heads the hollow rubber sphere a foot in diameter which they manufacture for the game. So far as is known this game is played by no other tribe of Indians

Native Parecís Indians returning from the field.— These semi-civilized Indians raise large crops of mandioca, corn and sweet potatoes and make clothing, hammocks and various articles for ornamental purposes

NHAMBIQUARA MEN WEARING LABRETS

The labrets worn are generally made of bamboo although the quills of feathers are sometimes used. All the members of the tribe wear the hair short. In spite of their good-natured appearance, they have fought with deadly weapons to prevent any inroads of civilization

NHAMBIQUARA WOMEN AND CHILDREN

These people probably represent the lowest type of civilization on the South American continent. Clothes are unknown to them and their only ornaments are those which have been presented by Colonel Rondon

UTIARITY FALLS, SOUTH AMERICA

Previous to the expedition's visit, Utiarity Falls had never been mapped or described. When it is remembered that these falls are about two hundred and fifty feet high, one can easily picture the wonderful spectacle that meets the eye of the traveler in this virgin country

stones with which to fill up the roadway when the broad wheels mired deep in the loose sand, to repairing the engines on the rare occasions when such a procedure was necessary.

We reached the Rio Sacre, beyond which point the trucks could not proceed, on the evening of the 28th. The river is here broken by a fall one hundred and fifty feet high. As elsewhere in South America, we were constantly reminded of the appalling lack of animal life. During the entire three days required to reach the Rio Sacre we saw only a few rheas, a seriema [1] or two, and a number of deer.

On the morning of the 29th, we crossed the Sacre on a pontoon ferry, and using a number of animals which had been held in readiness there, rode the two leagues to Utiarity, a village of the Parecís Indians; the Rio Papagaio, a clear, swift stream flows past the settlement, and half a mile away dashes over the brink of a precipice two hundred and fifty feet high.

The Parecís are a small tribe of semi-civilized Indians who live in substantial huts and cultivate large fields of mandioca, corn and sweet potatoes. Some of them wore clothes while many wore only a breech-cloth of their own weaving. They also make hammocks and various articles for ornamental purposes. The youths of the tribe engaged in a curious game of head-ball, using for the purpose a hollow rubber sphere a foot in diameter, which they themselves manufacture. They chose sides and batted the ball back and forth across a line, with their heads. The hands were not used, and they displayed remarkable dexterity and tireless energy at this form of amusement. One evening just before sundown, practically all of the men joined in a sacred dance. For this occasion they were clothed in gaudy red head-bands from which protruded the brilliant feathers of the great blue and yellow macaw; bead neck-chains and belts, and anklets made of bunches of curious dry seeds which kept up a continuous rattling sound as the dancers stamped in rhythm with the low, wailing music of reed

Type of Indian assistants or camaradas, who were employed by the expedition to take charge of the horses, mules and oxen and the impedimenta

[1] Seriema: a large, long-legged crested bird, probably related to the cranes.

flutes. They stopped frequently to drink *chicha*,[1] and at intervals they sang the names of their dead warriors and mighty hunters, and called upon them for guidance and assistance.

Utiarity proved to be a profitable collecting place. Many small rodents and a few larger mammals, including a soft-shelled armadillo collected by Colonel Roosevelt, were taken, besides a number of birds. We spent five days in the village (Colonel Roosevelt arrived three days after we did) at the end of which time Doctor Zahm accompanied by Mr. Sigg left the party and started back home. A short time later Mr. Fiala began his homeward trip down the Papagaio and Tapajos.

Utiarity had been the first telegraph station in operation along the new line; the second was on the banks of the Rio Juruena, approximately one hundred kilometers away, and it required five days to reach this point. We had been compelled to reduce the amount of our baggage very materially shortly after leaving the Parecís village, as many of the cargo animals had given out on the trail, and the others were weakening perceptibly. Most of the tents were abandoned, and all superfluous clothing was left behind. The equipment for collecting and preserving specimens, unfortunately had to be reduced also, on account of its weight, so that we retained only a few hundred cartridges and about a dozen traps with which to prosecute the natural history work. This reduction of the impedimenta was unavoidable and affected every member of the party either directly or indirectly. It was one of the several instances where individual interests had to be sacrificed for the good of the whole expedition.

At Juruena we made the acquaintance of a primitive tribe of Indians who probably represent the lowest type of civilization to be found anywhere on the South American continent. They are known as the Nhambiquara. As we drew up on the river bank they gathered about and stared at the party curiously, but betrayed no hostile feelings. Colonel Rondon had but recently succeeded in establishing amicable relations with them. On his first visits to the country, numbers of his men had been slain by their poisoned arrows, and they had resented his every step into their stronghold; but having been persistently treated with kindness, they have learned to look upon him as a friend, and some of them even appeared to be heartily glad to see him.

In stature the Nhambiquara is short, but well-built, and of a very dark brown color. Clothes are absolutely unknown to them, and practically the only ornaments in their possession are strings of beads which they had received from Colonel Rondon. Some of the men have the nose and upper lip pierced and wear pieces of slender bamboo in these perforations. Their huts or *malocas* are rude structures of grass or leaves, and they cultivate small areas of mandioca, but wild fruits, game and wild honey form the principal articles of their diet. Bows six feet tall and made of palm wood, and long bamboo arrows are used both in hunting and in warfare. Frequently hunting parties go on long tramps through the jungle, subsisting entirely on the fruits of their prowess. At night a rude lean-to is built of branches, the game is roasted in a roaring fire and eaten, and then they stretch themselves on the bare ground to sleep.

We remained a day at Juruena to rest and to develop films. The pictures taken by the various members of the party form one of the important records of the expedition, and great care has to be exercised in developing all exposed films promptly or they would be spoiled because of the hot, damp climate.

The country beyond the Juruena is somewhat rolling, but there is no appreciable change in the vegetation. We rode twenty kilometers the first day, camping on the banks of the Rio do Fomiga (February 10). Next day we travelled but twelve kilometers, reaching the Jurina, a shallow though rapid stream six hundred feet wide; the crossing was slow and laborious as there was only a very small *balsa* or ferry. Camp was pitched a league beyond, on the banks of a small stream. Near by were several deserted thatched huts, and the comparatively new graves where three Brazilians, one an army officer, had been buried. They had been slain by the Nhambiquara and buried in an upright position with the head and shoulders protruding above the ground. The following night, on the Rio Primavera we saw two other graves. The two men who had been interred here were slain while asleep in their

[1] *Chicha*: a fermented drink made from maize or cane sugar.

hammocks. This was the most dangerous part of the whole Nhambiquara country.

Campos Novos was reached February 16. Formerly the third telegraph station was located here, but it now stands on the Rio Nhambiquara, a league away. We were on the border of the great Cerro de Norte, a vast tract of country comprised of high, broken plateaus or mesas covered with luxuriant grass. Many small streams flowed through deep gorges, and near some of the water-courses, tall dense forest grew. The soil is fertile and would produce crops of corn and rice; cattle in great numbers could be reared on the extensive mesas, and the climate is cool and healthful. There are few portions of South America so well suited for colonization by Europeans, but on account of the remote location and the lack of means of communication, it will be several decades before this vast and fruitful region will become inhabited.

After leaving the Cerro de Norte, February 23, we again entered *chapadão* country; but the wiry grass and stunted trees were gradually being superceded by forest. Occasionally all other vegetation gave way to large areas of wild pineapples. There were many square miles of them, bearing fruit which was small but of delicious flavor.

We added few specimens to the collections after leaving Utiarity. Animal life was not abundant, and the rapid pace at which the expedition was compelled to move left no time for collecting. At José Bonofacio, which was reached February 23, an interesting rodent, somewhat resembling a gopher, was taken. In order to secure the single example it required a half day's time and the assistance of five Nhambiquara. A reward of bunches of coral beads had been offered the Indians if the animal was secured, so they immediately began work with sharpened sticks and with their hands. By noon they had excavated ten cubic yards of earth and won the prize. The expedition had gone on ahead but was overtaken in the evening.

At a camp named Siete de Setembre the two divisions of the expedition were reunited. Captain Amilcar and his party had arrived a day or two before, and a halt was made to divide the equipment and provisions between what were to be the Dúvida and Gy Paraná parties. The Rio da Dúvida was only ten kilometers away, and on February 27 we stood on the bridge that spans the river and watched Colonel Roosevelt and his party in seven canoes disappear down the stream. Colonel Roosevelt was accompanied by his son Kermit, Colonel Rondon, Lieutenant Lyra, Mr.

Parecís babies at Utiarity

Cherrie and Doctor Cajazeira, and fifteen native assistants.

The Gy Paraná party was composed of Captain Amilcar, Lieutenant Mello, a geologist, a taxidermist and myself, besides a number of natives. We traveled three days longer to reach the Commemoracao. The spot was called Barao de Melgaço, and marked practically the end of the telegraph line. The trip from Tapirapoan to the Commemoracao had required exactly forty days; the distance is approximately five hundred and forty-eight miles. Many of the pack animals were in such poor condition that they had to be shot. It is impossible to say how many had been lost on the way, but the number was very large.

Barao de Melgaço seemed to be the headquarters of annoying insects and disease. Most of the handful of men at work on the telegraph line were ill with fever and beriberi, and there had been twelve deaths just before our arrival.

We had expected to find canoes awaiting us, but as there were none, the men cut down a tree of ample size and began making one. This work, we estimated, would require a month; but after a wait of two weeks a large canoe arrived from down river.

The time at Barao de Melgaço was profitably if not pleasantly spent. All about the little clearing rose the stately Amazonian forest, providing admirable collecting grounds. Many birds and mammals were taken, all new to the collection. The latter included an undescribed spider monkey and a saki[1] of a new genus.

We started down the Commemoracao

Photo by Cherrie

Nhambiquara women and children with baskets of vegetables from the field

[1] Saki: a South American monkey with a bushy tail and a ruff of long hair around the face.

March 13, and traveling rapidly with the current reached the Pimiento Bueno, eighty kilometers below, that night. The junction of the two rivers forms the Gy Paraná.

The Gy Paraná at its very beginning is a mighty river, a thousand yards wide, and day by day as we raced with its swirling torrent we watched its rapid growth until near the mouth it reached a breadth of at least two miles. The country on both banks is heavily forested, and along the upper course is inhabited by a tribe of Indians which had been absolutely unknown. We were the first white men to see them, and they had never seen white men before. In appearance they differed greatly from their neighbors, the Nhambiquara. We met seven, all men, and finally induced them to accept gifts of beads and knives, in return for which they gave us wonderfully decorated arrows six feet tall.

The Gy Paraná abounds in formidable rapids, like many South American rivers, and we had numerous overland portages, the longest being about three miles, around the falls of São Vicente. Insects are abundant, and the whole region is a vast breeding ground for malaria. A number of rubber camps are situated on the lower river, the forests being rich in hevea. We reached Manaos April 10, having stopped at Calama, a station on the Madeira, for a short period of collecting.

As the Dúvida party had not arrived, I almost immediately left for the Rio Solimoes where several weeks were spent to advantage adding to the collections. Among the large number of specimens collected were agoutis, woolly monkeys, squirrel monkeys, sloths, many small rodents and squirrels, all new to us; and the complete material for a group of hoatzins or lizard-birds was also collected. The collections now numbered about fifteen hundred birds and about four hundred and fifteen mammals, practically all of species unknown to us, and some of which are no doubt new to science.

Colonel Roosevelt's party reached Manaos the last day of April, but the story of their experiences on the unexplored river is too well known to warrant review.

Loading canoes for the start down the Rio da Dúvida

ROOSEVELT'S "THROUGH THE BRAZILIAN WILDERNESS"[1]

By J. A. Allen

IN a volume of four hundred pages, with numerous half-tone illustrations, Colonel Roosevelt has given a charming narrative of his eventful expedition through a little known part of the Brazilian hinterland. The main journey of exploration was up the Paraguay River to its source, across the low divide to the head of the Gy-Paraná, and down the unexplored "River of Doubt" (Rio da Dúvida), now the charted Rio Téodoro,[2] as since named by the Brazilian Government, in honor of the eminent American field naturalist, its first explorer.

The trip had been for a considerable time in contemplation, but the initiative steps were only taken early in June, 1913, following a luncheon at the American Museum at which both Father Zahm, one of Roosevelt's companions on the expedition, and Colonel Roosevelt were guests. As told by the author in his first chapter, entitled "The Start," Curator Chapman of the Museum suggested the coöperation of the Museum, and brought the matter to the attention of President Osborn, who cordially approved the plan. As a result, Colonel Roosevelt offered to take two naturalists, to be selected by the Museum, as members of the expedition. Fortunately the Museum was able to secure George K. Cherrie, widely known as a field naturalist and explorer in the American tropics, as one of its representatives, and for the other Leo E. Miller, who was already in the employ of the Museum in South America, and had shown unusual efficiency as a collector and field naturalist through several years of difficult service. The two men proved to be most congenial companions for the head of the expedition, resulting in harmonious and enthusiastic team work.

For some months in advance of the journey down the Dúvida, Cherrie and Miller were making good use of their time, collecting birds and mammals for the Museum on the upper Paraguay River, while Colonel Roosevelt was engaged with his lecture tour to the principal cities of southern South America. Later Cherrie accompanied him down the Rio Madeira, Miller again joining the main party at Manaos. The success of the natural history work is already a matter of record in the AMERICAN MUSEUM JOURNAL.

The narrative, *Through the Brazilian Wilderness*, is a book of unusual interest for the lay reader and one of rare charm for the naturalist and explorer. The pages teem with information about the country, its natural history, its economic resources and its human inhabitants, whether wild unclad Indians or European colonists, written with the inspiration that only the fresh impressions of daily events and experiences, jotted

[1] THROUGH THE BRAZILIAN WILDERNESS. By Theodore Roosevelt. With illustrations from photographs by Kermit Roosevelt and other members of the Expedition. New York: Charles Scribner's Sons. 1914. 8vo., pp. xiv + 383, 49 full-page half-tone plates and 2 maps.

[2] Besides this general review and consideration from the zoölogical standpoint by Dr. Allen, the JOURNAL will print in the March issue a review by Dr. W. L. G. Joerg of the American Geographical Society. Dr. Joerg will review *Through the Brazilian Wilderness* from the standpoint of the geographical work accomplished by the Roosevelt expedition. — THE EDITOR.

down in the field, can impart. Add to this the personality of the writer, his wide interests, exceptionally varied experiences and the knowledge of an expert in many lines of natural history research, and the elements are happily all present for the production of a book of just the kind the author has given us. The excellent illustrations with which it abounds add greatly to its value, graphically reproducing scenes and animals mentioned in the text.

The journey down the River of Doubt proved one of great danger and much hardship, and only the fitness of the party for difficult undertakings saved the expedition from complete disaster. All this is simply told, such experiences being accepted as part of the day's work in the exploration of unknown wilds.

The physiographic and natural history observations so well set forth in the narrative are immensely supplemented by the large collections secured and safely transported to New York. Only small portions of the country traversed had ever been visited by a natural history collector, and no museum in America possessed specimens of the birds and mammals of the country visited. The five hundred mammals and two thousand five hundred birds obtained, thus add enviable riches to the resources of the Museum. They prove not only to contain a considerable number of species new to science, particularly among the mammals, but also all are new to the American Museum as well as to the available material for research in America. The species that are not new are of quite as much importance as those that are so, since they throw new light upon the faunal characteristics of an almost unknown country, and upon the geographic ranges of species previously known only from elsewhere. The field notes of the collectors, Cherrie and Miller, are perhaps almost as valuable an asset to science as are the specimens to which they relate. We may therefore well congratulate Colonel Roosevelt on the outcome of his expedition from all points of view, and the American Museum for its modest share in the undertaking.

Capybaras of Brazil are pig-like rodents, as large as small sheep, which swim and dive with great facility, often hiding under the water lilies of the pond with only the nostrils at the surface. Perhaps their greatest enemy is the jaguar. If the expedition shot a capybara and it fell into the water, it was devoured in a very few moments by piranhas, the cannibal fishes

THE AMERICAN SOLDIER'S DIETARY

Sample ration for a soldier of the United States Army in the field. From the military hygiene exhibit in the hall of public health of the American Museum

GUARDING THE HEALTH OF ARMIES

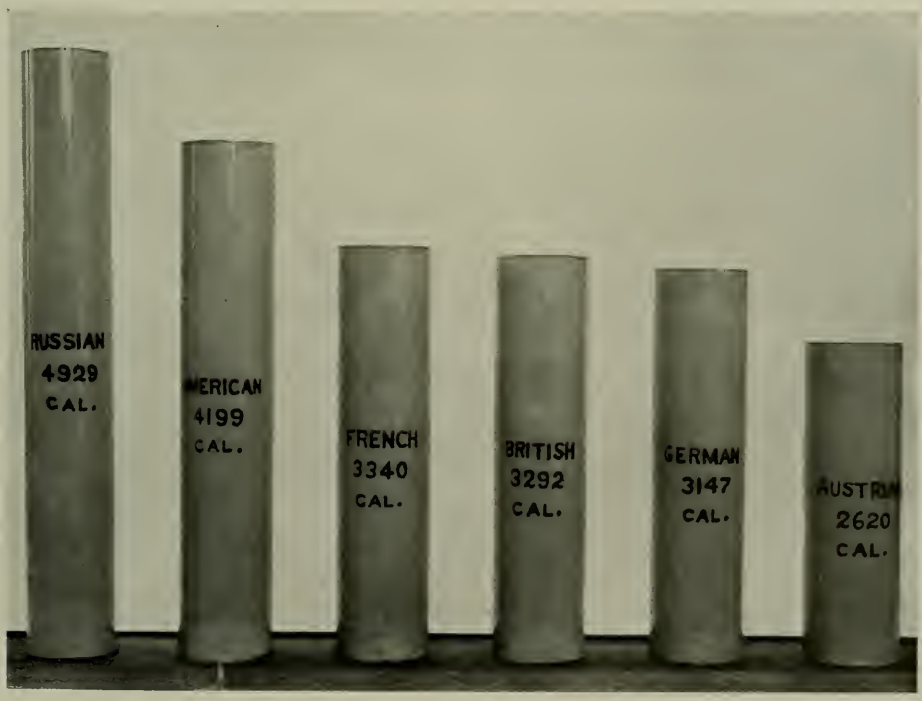
FOOD ALLOWED THE SOLDIER IN THE WORLD'S VARIOUS ARMIES — PROTECTION OF THE SOLDIER FROM DISEASE

By C.-E. A. Winslow

IN the midst of the shock of the European war it is at least satisfactory to realize that the sufferings of the battle-field are not aggravated by the concomitant horrors of pestilence, to the extent which has been the case in earlier wars.

In many ways the present European conflict presents sanitary problems of unusual difficulty. In permanent fortresses health conditions may (except under conditions of prolonged siege) be guarded against pestilence with comparative ease. On the other hand, field armies operating in the open and fighting only occasionally as in earlier campaigns enjoy many sanitary advantages. Almost incessant daily warfare between troops established in hastily constructed trenches where such fundamentals of sanitation as good drainage are almost out of the question, makes the protection of the health of the soldiers a task of stupendous difficulty.

The seed which might bear fruit in devastating epidemics was not lacking last year. Just before war was declared cholera had been prevalent in certain provinces of southwestern Russia just in the path of the armies which invaded

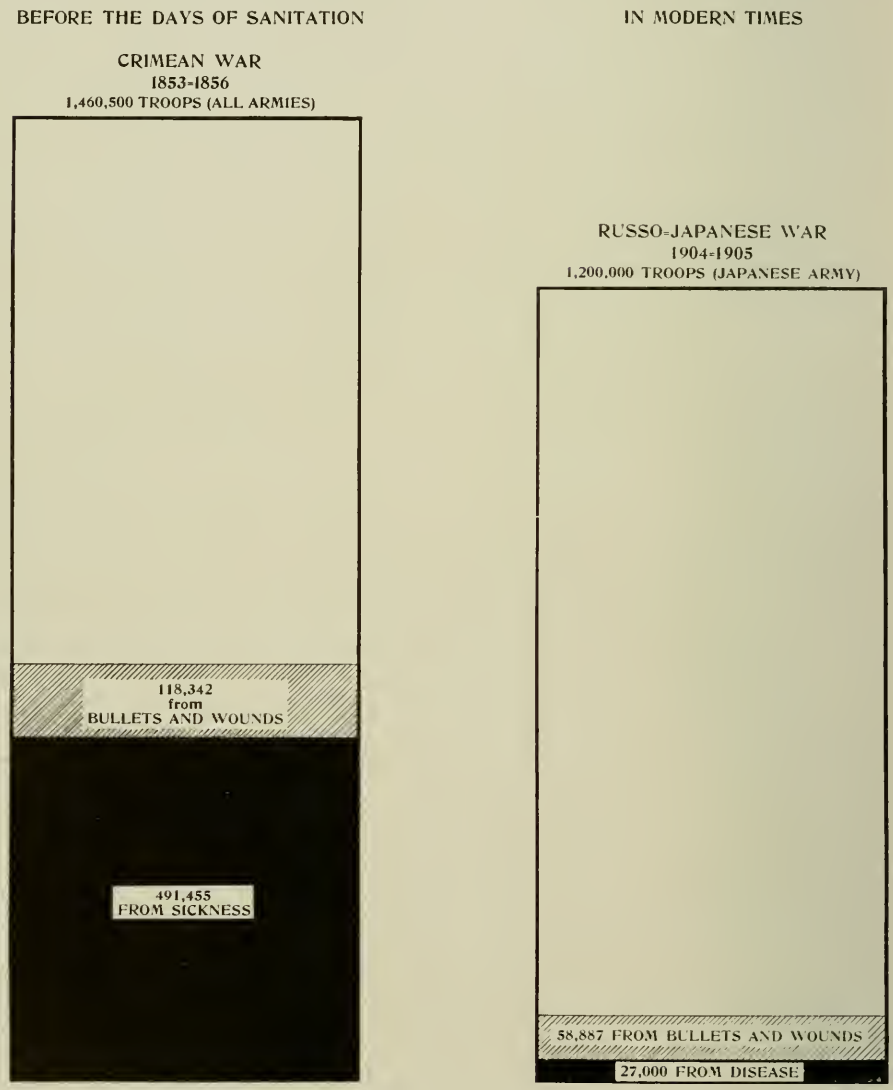


Comparative dietary allowance in various armies. Energy allowance in calories allowed in the soldier's dietary of various nations. From the military hygiene exhibit in the hall of public health of the Museum

Austrian Galicia, and this disease did spread to a considerable extent last fall among both armies and in the civil population of the war zone.

No epidemic of large proportions resulted however, and although we do not know what the next year may bring forth, we have good ground to believe that the old-time wholesale pestilence will be effectively prevented by the application of the art of modern sanitation. In view of the wide public interest in all that concerns the World war a special exhibit has been installed in the hall of public health of the American Museum of Natural History to show by what methods the modern army in the field is protected against the ravages of disease.

In the Crimean war of 1853, 23 per



RELATIVE DEADLINESS OF BULLETS AND DISEASE

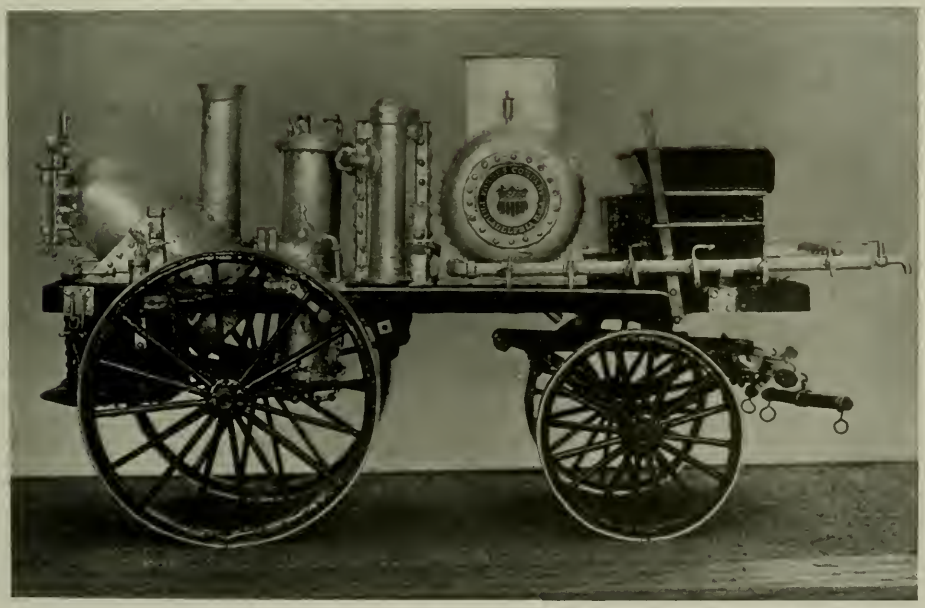
A striking diagram from the military hygiene exhibit in the Museum's hall of public health

cent of the British soldiers died of disease, and in the Franco-Prussian war of 1870–71, 14 per cent of the French soldiers perished in the same way. The German forces in the Franco-Prussian war, the English army in the Boer war and the Japanese who fought Russia in 1906 lost in each case about 2½ per cent of their men from disease, a splendid record compared to that of earlier wars, but still one that represents a fearful waste of human life. In the Boer war the English lost over 14,000 men from disease and less than 8,000 from wounds. In our own Spanish-American campaign, typhoid fever alone cost more than fourteen lives for every thousand soldiers, and bullets only two for every thousand.

The chief diseases of the camp are those which, like typhoid fever, are caused by sewage pollution of water and food supplies. In the Spanish war the typhoid fever, which affected one out of every five of our volunteer soldiers, was mainly due to careless exposure of excreta and the spread of the germs to food by flies. In a modern military camp the excreta are received in a trench away from the water supply, the kitchen and food stores, and are immediately covered with earth to prevent access of flies.

The water supply of the army is safeguarded with the greatest care. When the troops are in the field all water for their use is purified either by heat, filtration or chemical disinfectants, and the most stringent regulations forbid drinking from roadside wells and streams. The Japanese use a field filter in which the water is strained and at the same time disinfected by chemicals. In the French army the water supply of the troops is sterilized by the use of ultra-violet light.

The most common procedure for purifying water in the field is perhaps sterilization by heat, or distillation. The Forbes sterilizer (on this principle)



Model of the Forbes water sterilizer used in the United States Army for the purification of the water supply of troops in the field. From the military hygiene exhibit in the hall of public health

was officially adopted by the U. S. Army after competitive tests conducted by a special board in 1898. In this ingenious apparatus the water is distilled in a closed chamber so that it is not deprived of its natural gases and the outgoing water warms the incoming water and is cooled by it (on the regenerative principle) so that economy of fuel is ensured. Such an apparatus, including boiler, pumps, filter, sterilizer and storage tanks, is mounted on an army wagon and carried everywhere along with the troops.

Red Cross Field Hospital.—Model on exhibition in the military hygiene exhibit of the hall of public health, American Museum of Natural History

The strength and efficiency of the soldier is conserved and his resistance against disease is built up by a carefully selected and scientific dietary designed to furnish the necessary energy in the most compact and convenient form. The energy allowance varies in different armies — the Russian and the American receiving a larger and the Austrian a smaller allowance than the French, English or German soldier.

The average daily field ration of the United States Army is made up as follows: bacon, 12 oz., or fresh meat, 20 oz.; bread, 18 oz.; beans, 2.4 oz.; potatoes, 20 oz.; prunes or preserves, 1.28 oz.; coffee, 1.12 oz., sugar, 3.2 oz.; evaporated milk, 5 oz.; vinegar, .16 gills; salt, .64 oz.; pepper (black), .04 oz.; lard .64 oz.; butter, .5 oz. Of this ration, just a portion is carried individually by the soldier, the rest, such as butter, lard, pepper and syrup are given in bulk to the companies and then distributed to the men at meal time.

When communicable diseases do break out, the medical officer is provided by the advances in bacteriology with prompt and effective means of diagnosis by which the infected individuals may be promptly picked out and isolated so as not to endanger their fellows. Against smallpox and typhoid fever the modern soldier may enjoy practically complete protection, thanks to smallpox and typhoid fever vaccination. The perfection of the vaccine for typhoid fever is the most recent and perhaps the most important of all advances in military hygiene, and the terrible typhoid death rate of the Boer war and the Spanish war will never again occur where this preventive has been used.

The death rate from typhoid fever in the United States Army per 1000 mean strength was 3.20 in 1908 with no vaccination, 3.58 in 1909, 2.43 in 1910, .85 in 1911 with voluntary vaccination, and those rates dropped to .31 in 1912 and .03 in 1913 when compulsory vaccination was introduced. The reservists in certain European armies were not protected against typhoid fever at the opening of the European war, but the difference in the incidence of disease among them and the vaccinated regulars soon taught the lesson that this precaution could not be neglected.

In connection with the after effects of the wounds received in battle the resources of modern bacteriology have also been drawn upon extensively. Each soldier is of course provided with a first aid kit for the treatment of minor wounds; and the splendid organization of the International Red Cross is of course on hand to provide prompt and efficient hospital care; but there has been in the present European war a terrible loss of life from tetanus, or lockjaw. The tetanus bacillus is abundant in the soil of manured land, and wounds have become infected with this germ on a far larger scale than was the case in such wars as that in South Africa fought over virgin soil. Antitoxin, if administered early, will generally prevent fatal results from this disease and laboratories in the United States are working night and day to provide this specific for the European combatants.

Modern sanitation has produced even more striking effects in military than in civil life, because its teachings have there been more consistently applied. The result has been that many diseases once very terrible have become of minor importance in armies; and as the table shows, measles and mumps are to-day more common causes of invalidism for the United States soldier than either typhoid fever, tuberculosis or diphtheria.

Relative Importance of Causes of Sickness in the United States Army [in rates per 1000 mean strength]

	1904–1906	1907–1909	1910–1912
Venereal	193.	196.	166.
Malaria	85.3	49.3	31.4
Diarrhea	80.0	45.4	33.0
Bronchitis	50.7	38.5	32.4
Influenza	29.6	32.5	17.0
Alcoholism	27.5	29.3	22.9
Mumps	19.3	9.5	11.7
Dysentery	17.9	9.8	4.5
Rheumatism	17.5	14.3	10.0
Dengue	14.8	19.9	17.3
Measles	8.7	11.4	9.9
Typhoid	4.8	3.9	1.1
Tuberculosis	4.7	4.5	3.7
Diphtheria	.4	.6	.8

Models from the Museum's hall of public health showing the relative effects of bullets [above] and typhoid [below]: one wounded and none dead of a company of soldiers in 1908; thirteen sick and one dead, victims of typhoid, from a company in 1898

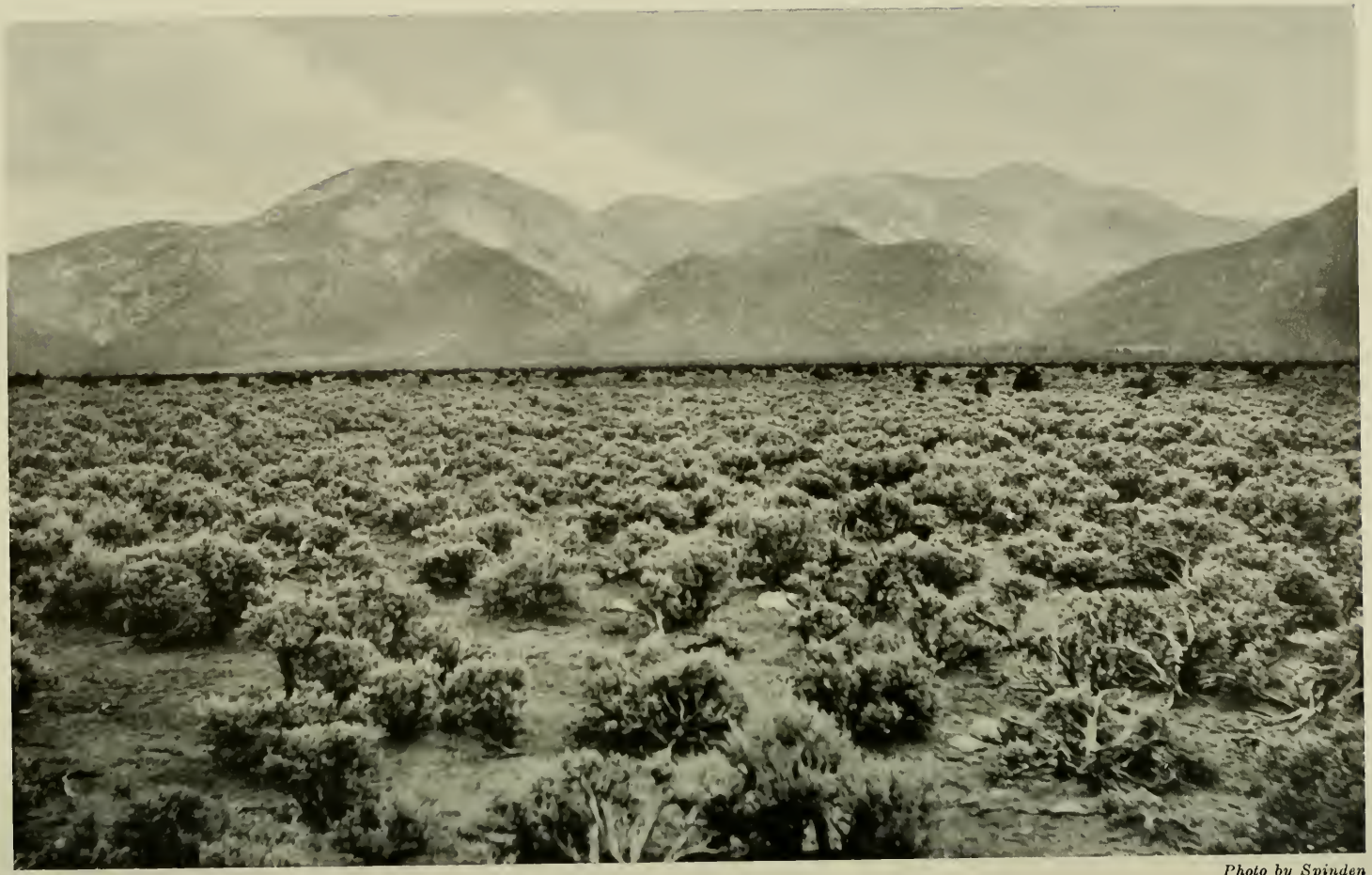


Photo by Spinden

SANGRE DE CRISTO MOUNTAINS FROM THE SAGE PLAINS NEAR TAOS

HOME SONGS OF THE TEWA INDIANS

By Herbert J. Spinden

THE songs of the Tewa Indians may be divided into two broad groups, the first religious, the second familiar. The songs that are primarily religious are the ones used in the great ceremonies and dances and those that refer to warfare and the chase. All songs which are supposed to be endowed with magical power are called "Pina^{ng}" or "Magic Songs." Such songs in the ceremonies are supposed to induce the gods to bring rain and fruits or whatever else is required. War songs bring confusion to the enemy. Hunting songs, sung either by the hunter himself or by a female relative who remains at home, are supposed by merely mentioning the lion and the bear to transfer the hunting abilities of these animals to the hunter, while naming the deer is sufficient to deliver game into the hands of the hunter. The songs that occur in the myths nearly always have a deep religious significance. There are also witch songs which have power to do evil unless they are warded off.

Familiar songs include lullabys, avocation songs, love songs and homesick songs — songs which are intimately connected with life and which reflect the everyday philosophy of the people. I will not discuss the question of their music, largely because this phase of Pueblo life has already been treated by persons much more competent to handle it than I. What I wish particularly to call attention to is the word content, the sentiment and the poetic construction of the songs.

Here are two songs in the original text and in translation. The first is a little song which might be called the "Home Sweet Home" of the Tewa:

Navi âwi näwä, âwi näwä
Navi âwi näwä ndi o^{n} sha
O'i^{n} pi^{n} ndo mu'iri ká^{nyi} na nandi
Nâ re sitä â hi yo he'e wä
Â hi yo he'e wä, â hi yo he'e wä
Navi âwi näwä ndi o^{n} sha.

My home over there, my home over there,
My home over there, now I remember it!
And when I see that mountain far away
Why, then I weep. Alas! what can I do?
What can I do? Alas! what can I do?
My home over there, now I remember it.

Whether it is the result of accident or intent, this appealing lyric has an almost perfect poetical construction. The repeated phrases which are used so skillfully here, are found in almost all examples of Pueblo songs. The sentiment is simple, direct and fundamentally human; yet as we all know, such simple emotions are often hardest to express.

In translating this song and the others that follow, I have taken no liberties with the text. Tewa sentence construction is not unlike English in the general order of words and in no case have I found it necessary to shift the order of a phrase. The ordinary prose seems to have many more connectives than does the poetry, which is characterized by condensation and by more or less conventionalized phrasing. Aside from following the text accurately in the matter of the meanings of words, I have endeavored to give something of the atmosphere of the language which is peculiarly rich in exclamations. Words with such emotional connotation as "How I wish it were otherwise!" or "What can I do, alas!" occur frequently.

The second song is supposed to have been originally sung by a boy from Tesuque Pueblo, at the trysting place to which the girl no longer came.

Su k'wa k'e we na povi tsha nde
I^{n} povi i^{n} povi ndo mu iri
Ka^{nyi} na na ndi nâ re sitä
I^{n} povi i^{n} povi ndo mu iri
Ts'e oki t'agi na povi tsha

At Su k'wa k'e there used to bloom a flower —
That flower, that flower, whene'er I see it now
Alas, so far away, why then I weep;
That flower, that flower, whene'er I see it now,
For yellow, fresh and full-blown once it bloomed.

This little song is interesting as a sustained metaphor. It may be noted in passing that Tewa children are usually given a name in accordance with the time of the year they are born. Flower names are very frequently given to girls so the age-worn comparison of the girl and the flower fits in nicely with local usage.

Certain phrases that recur in these two examples indicate that poetical forms are pretty well set. Like all home-loving people there is no phrase quite so sad as *ka nyi na na ndi* — "far, far away." Even the men are not too brave to have recourse to tears when they think of the village in the green valley that holds their loved ones.

Among the most charming of all songs are lullabys. The Tewa mother singing her little baby to sleep sometimes takes advantage of what we call sympathetic magic, to achieve her purpose. The song is addressed not to the child but a bird called "Puye." This bird is very sleepy by nature and of course has power to teach the child to follow its example. My earlier informants seemed to think that the little puye birds are bats but an old woman of Santa Clara declares they are not bats but instead small drowsy birds that live in the high mountains. In former times these birds were tamed as household pets and their sleep-producing faculties were appealed to by the mothers of crying children.

There are many sleepy little birds,
Sleepy little birds, sleepy little birds,
So go to sleep, my little girl,
My little Frosted-Cockle-Burr,
O, come you sleepy little birds
And slumber on her hollow eyes
That she may sleep the livelong day,
That she may sleep the livelong night.

You may have noticed that the name of the child is interpolated in the song. The little girl of my informant was born in the winter time and was named Frosted-Cockle-Burr.

When children grow up so they can talk and run about they soon learn to fear the Säveyo Sendo or "Giant Canni-

bal Old Men." These bogies are impersonated at Christmas time by men who wear masks and carry whips. When they enter the pueblo the children run and hide in the inner rooms but the masked men go from house to house asking how the children have behaved during the year. In case one has been incorrigible he is severely whipped. As a rule the punishment is not severe and a promise to mend one's ways is sometimes sufficient to ward off the dreaded whips of wide-leaved yucca. A wholesome discipline is introduced by these men; the parents themselves seldom punish their children. Sometimes a child may have a dislike for his morning porridge for instance, and in such a case the Säveyo Sendo call for a brimming bowl and stand over the child until every spoonful is gone.

This song about the Säveyo Sendo is sung as a lullaby to children four or five years of age. As in the preceding example the child's name may be interpolated.

Stop crying! Go to sleep, my little boy, Primrose.
That Säveyo Sendo will take you if you cry.
Over there he will chew you, if you do not stop crying;
Right now he will chew you, if you do not stop crying.
That Säveyo Sendo in his bag he will put you.
Stop crying! Go to sleep, my little boy, Primrose.
Over there he will take you, then I will be crying!
Very thick now are the leaves of the cottonwood;
Very thick now are the leaves of the willow.
There he will take you in under the willow.
That Säveyo Sendo, his teeth we all fear.
Over there now, if you do not stop crying,
Over there now, on the crest of the mountains,
Those Säveyo walk and they hear every sound.
And there in the mountains that one he will take you
Where now they are taking the big boys and girls.

Other lullabys threaten the child with being carried off by a coyote and forced to live on juniper berries. They dilate on the stony paths for bare feet, the thorns that tear the little garments, the heat of day and the cold of night, and the mourning of the playmates and of the parents for the little boy that will never find his way home again.

When I asked whether it was considered wise to frighten children in this way, my interpreter, who was the mother of six children, answered very properly that no child could be frightened seriously when in its mother's arms. No doubt the Tewa child looks upon the Säveyo Sendo with the same delicious trembling that we ourselves used to feel when hearing of the dangers of Jack in the giant's house.

Among the songs of labor are "grinding songs" sung by the women and girls as they bend over the metate. Then there are the "shouting songs" which the men sing in the fields and about the village. The hunting songs are, as has been stated, primarily magical and do not come in for discussion. Certain dances are of a purely social nature and may be begun at any time. Most of the songs used in these dances do not have words. Concerts by the men are sometimes arranged, usually at grinding "bees."

The grinding songs are various. Some relate to the Corn Girls, the Corn Youths, and other personages that enliven the myths, and some comment upon the sprouting leaves, the flowering meadows and other pleasing aspects of nature. Many are love songs pure and simple, while others are rather cynical reflections on the instability of love and the hardness of life. Some are humorous songs. It is pretty clear that the Tewa formerly had definite sequences in girls' grinding songs that covered all times of

the day and year. I was not fortunate enough to get one of these sequences. The grinding songs are sung to keep time with the grinding. If there is any peculiar rhythm in them as a result of this, it is brought out by an analysis of the music rather than of the words.

Photo by Walton

As an example of a grinding song, we have this simple song of good humor:

There by the river runs a little rabbit
Why did you not catch him?
Why did you not kill him?
We feel just like doing that.
Bent over like a little old man
Off he goes with a watermelon;
Bent over like a little old man
Off he goes with a muskmelon!

A love song that has a universal appeal is the following one which is a favorite with Tewa girls. It is sung by two or three who bring their corn to the same house so they can grind together.

That somebody, my own special one,
Even his shadow and his voice are loved.
His footfall even! But what can I do?
That other one, O how I hate his shadow!
His shirt is fine and white, his hat is gray,
His leggings and his shoes are beaded bright,
His neckkerchief is gay and yellow — but
For all his clothes, his face, his face is black!

Many songs that are associated with individuals were doubtless extemporized to fit a special occasion. Many love songs have a little story connected with them telling the conditions under which they were originally sung. As an example of a song associated with an individual we may take this bit of cynical observation which is accredited to a man named "Thamu" or "Dawn" who lived in Santa Clara within the memory of the oldest people. When he found several girls grinding corn and singing about their lovers according to custom, he would tell them, "This is the way you should sing about your lovers":

Alas! this man of mine!
His words were like truth
When he talked to me.
His words were like truth,
But right away he proved
To be an arrant liar!

After this he would find safety in flight.

One example has already been given of the homesick songs sung by the young people who are away from home. Here is another one relating to the Pueblo of San Juan:

In San Juan I wonder how my home is,
Surrounded by green cottonwoods my home is.
Now I remember all and now I sing!
Now I remember how I used to live
And how I used to walk amid my corn
And through my fields. Alas, what can I do!

Sometimes in the songs of this simple people there is an artfulness that takes you by surprise. Who can doubt that the young girl who sang the following lyric about her lover had a secret thought to comfort her?

Oh, somewhere yonder in the west
You go away to gather wood.
And now you shout and now you sing.
Oh yes, I remember! Abruptly you left me!
Laughing was I, nevertheless, you left me!

The gentle raillery of these verses might be contrasted with the unmistakable sarcasm of another girl whose whilom swain returns from a far country and seeks to reëstablish the old relations. The song takes the form of a dialogue as do several others that I obtained.

He speaks:

Oh, Little Blue, at your door I wish to be,
At your door that once was blue and open wide,
But now is closed. At your door, I wish to be
Oh, my little breath! Oh, my little heart!

She speaks:

To Comanche girls you paid those words, those eyes!
Your wish concerns me not and I can't be killed
For that! It was under guns that you dared to pay!

It may be explained to those who do not catch the figure of speech that the girl's name was really Povi tsâ wä i, that is, Blue Flower, and that the blue about her door was the flower after which she was named. The last sentence in the girl's high-spirited answer, "It was under guns that you dared to pay" means, of course, that he took an open risk of losing her when he turned his attention to others.

Songs of disillusion, supposed to be sung by young persons soon after marriage are a common type. The woman is usually the complainant. She tells how a few short weeks before she wore

Photo by Walton

her gayest dress and went along by the side of her "arm-holding mother" while the man in brand new clothes followed by the side of his "arm-holding father." But the marriage ceremony over, gay dresses became a thing of the past. She continues in this fashion: "Now in the morning you wrap yourself in a

ragged blanket when you go down to wash your face in the brook and I cover my head with a tattered shawl when I go into the village. You promised to go to Texas and send me checks and money but you got no farther than Truchas when you grew homesick and turned back. But I don't care! If anyone should find me crying around the corner of the house and should ask me what the matter is, I would answer: "Oh, it is nothing, I have only been kicked by a goat."

This is another song of disillusion, less circumstantial but no less bitter.

Long ago how nice was everything!
Fat mutton was all I ate,
Coffee and sugar were all I ate,
But now all I eat is the whip!

I have no compunction in saying that the violence was doubtless of the purely theoretical sort. This final beautiful and vivid poem I give as the type of true love song of the Tewa:

My little breath, under the willows by the water side we used to sit
And there the yellow cottonwood bird came and sang.
That I remember and therefore I weep.
Under the growing corn we used to sit,
And there the little leaf bird came and sang.
That I remember and therefore I weep.
There on the meadow of yellow flowers we used to walk.
Oh, my little breath! Oh, my little heart!
There on the meadow of blue flowers we used to walk.
Alas! how long ago that we two walked in that pleasant way.
Then everything was happy, but, alas! how long ago.
There on the meadow of crimson flowers we used to walk.
Oh, my little breath, now I go there alone in sorrow.

The sacred lake of the Taos Indians[1]

[1] NOTE BY THE AUTHOR: The Indians of New Mexico and Arizona are of two kinds, nomadic and sedentary. The latter are called Pueblo Indians after the Spanish name for village. Art, religion and everyday life vary little from one of the twenty-five or more villages to another, although four distinct language stocks are represented. The Tewa speak a dialect of the Tañoan language stock and inhabit five villages (San Juan, Santa Clara, San Ildefonso, Nambé and Tesuque) along the Rio Grande north of Santa Fé, and one, Hano, in northern Arizona. Taos is a finely preserved pueblo in northern New Mexico whose inhabitants speak a different Tañoan dialect. The Hopi villages adjoin Hano and have been only slightly affected by European contact.

Photo by Karl Moon

TAOS FLUTE BOY

The flute is the Indian instrument of the serenade

Photo by H. J. Spinden

SACRED LAKE IN TAOS MOUNTAINS

A small glacial lake 11,000 feet above the sea, where the Indians hold sacred ceremonies. All Pueblo Indian tribes have sacred lakes although not many are so beautiful as this

HOPI BABY

Hopi children when very young play about on the flat roofs of the houses and adventurously climb the ladders leading thereto

Photo by H. J. Spinden

THE PUEBLO ON THE VALLEY ROAD

The Santa Fé Mountains in the distance

Photo by Karl Moon

HOPI GIRL GRINDING CORN

Photo by Karl Moon

AT THE BRIDGE — San Juan Pueblo

Photo by Karl Moon

INDIAN COURTSHIP — San Juan Pueblo

Photo by H. J. Spinden

TAOS MOUNTAIN

In one of the high cañons is a refuge to which the Indians have fled when attacked by Spaniards at various times during the three hundred years of Pueblo history. The last time was in the Mexican war of 1847

MEMORIES OF PROFESSOR BICKMORE

By L. P. Gratacap

THE death of Professor Albert S. Bickmore[1] of the American Museum seems to mark in the development of the institution the completion of a period which encloses the earliest steps in establishment and a later era of unrivaled enlargement, while ushering in the present day of scientific ambitions and, it might so be called, of scenic animation. To-day research embraces continents and their zoölogical and ethnological relations, while the intensive study of the past contributes new revelations of evolution, yet with even foot, the skill of installation, the recording power of the artist, preparator and naturalist advances, filling the museum halls with exquisite pictures of life. The scenario has become the whole wide world, the drama all that lives and breathes in it, and the composer he or she who understands that life and reproduces it with tenderness and skill.

On one who has lived through simpler days, when however ardor was not less patient, accomplishment not less difficult, days wherein a certain humility of hope accompanied effort, the present produces a really bewildering impression. It is all so different, so — as Dominie Sampson might have said—"prodigious."

The foundation of all this superstructure of activity and recreation was laid by one whose death the Museum mourns to-day. Compared with the ample provisions of room and light — not inconsiderably associated with bodily comforts and relaxations — enjoyed now in the Museum, that cramped, little, low-ceilinged attic room in the old Arsenal where Professor Bickmore worked, over half a century ago, seems paltry enough. There was charm in the outlook from this attic room's windows over the ornamented stretches of the park below, but usually the windows were not quite clean enough to see through or the clustering leaves of climbing ivy effaced them. Crowded along the walls were the Professor's books and at a small desk in the center the Professor sat and wrote, not bulletins or erudite lucubrations, but appeals, summonses, plans, reports, his agile pen skimming over page after page of foolscap as he exhorted a trustee, reminded the mayor, pleaded to a legislator, implored a possible benefactor, or reproached a member for his unpaid dues.

Professor Bickmore at that time executed a composite rôle — and those were not days of the obedient typewriter, the unfailing telephone, of superintendent, curator, secretary, trustee, designer, and although he had assistance, his vibrant energy vitalized and controlled everything.

This paper written from a past dimly realized by the younger men of to-day, can neither consider the historical phases of the Museum's inception and growth, nor can it assume a biographical character in regard to Professor Bickmore's later years and conspicuous success in

[1] A memorial meeting in honor of Albert Smith Bickmore was held in the auditorium of the American Museum of Natural History on Friday, January 29. Addresses were made by President Henry Fairfield Osborn, Honorable Joseph H. Choate, Mr. Cleveland H. Dodge, Dr. J. H. Finley and Mr. L. P. Gratacap. Quotations from these addresses will be presented in a later issue of the JOURNAL.

educational fields. For the reason of emphasis, it must be limited to those initial moments of preparation within the walls of the Arsenal in Central Park, and must recall the first personal impressions of a man who imbedded, as it were, his life and talent in this institution; it will revive the memory of an intimacy as it first began, under circumstances half humorous and half serious, in an environment that gathers from a reminiscent affection for it, a charm both whimsical and sad.

The Arsenal is externally to-day the same picturesque structure as it was then — the confession of what *then* implies need not be too curiously asked— but it has, I understand, undergone extensive renovation and I trust that that antique atmosphere which once assailed the visitor, has been modernized or banished. In spite of their remote elevation the top rooms of the old Arsenal were the most cheerful parts of the ancient building, almost the most interesting, for there was the library from Dr. John C. Jay (with which came to the Museum his celebrated and historic collection of shells); there was Dr. Draper and his whirling, rotating, automatic meteorological recorders, and there too, an amazing southern colonel, Dr. Draper's assistant, whose smooth loquacity always gained a fine dignity by a slight — O! very slight — admixture of Vergilian phrases. As for instance, when he descended those abominably steep winding stairs that led up to the attic eyrie, he muttered, "*Facilis descensus Averni*" and when he painfully, under excruciating protest of rheumatism, climbed them he less contentedly exclaimed, "*Hic labor, hoc opus est.*" There too, after you had crossed a dim room, piled with boxes and desolate with dust, you found in a tower apartment, almost cheerful in its half comfortable seclusion, the Professor; found him, as I found him, studying plans, drawing forecasts, calculating possibilities for the great new structure that was growing in Manhattan Square at Seventy-seventh Street and Eighth Avenue, itself a new fact in the steady civilizing process of the city northward.

My very first impression of Professor Bickmore, studying him with a keen sensitiveness to outward signs, was of admiration for his verbal facility. Almost instantly he plunged headlong into that incessant preoccupation of his mind, the new Museum building, its future, its uses, how it should develop, how it would feed school, college and university, how it must rise to the occasion of its new responsibilities illustrating to zoölogist, botanist, geologist and engineer the vital facts of their professions, how to the plain man it would be a page of revealing wonders, to the artist a new incentive for his creative or copying industry, how it should become focal in relation to all the scientific activities of the city, how pride in it would gather to its support financial adequacy and how it would expand commensurately with the new continent's metropolis, until it outrivaled — so it seemed to me — the collective shows of all the world.

Of course it quite took my breath away, and hopelessly incompetent to stem the flow of this splendid prophecy [Is it not to-day being fulfilled?], I suggested that he look at my letters. They were reassuringly signed by Egleston, Chandler and Newberry; the Professor did look at them, read them attentively, and actually became contemplative and silent. An instant later, almost eagerly, he invited me to luncheon. I have always felt that, coming from the School of Mines at Columbia, my application struck him favorably as significant of the approaching capitulation of that

university to the monopolistic designs of the Museum.

Well, that first impression grew inordinately. There was an unmistakable Napoleonic strain in the Professor's make-up, and more and more clearly I saw that his unflagging industry, his unshakable resolution was supported by an almost sublime optimism. Perhaps there he was not altogether Napoleonic, for with the great consul the fatalistic shadow darkened many a sombre hour. The commentary of the poet on human hopes, "One moment seen then gone forever," had no meaning to Bickmore, at least in his waking and working moments. Once seen, his designs were potentially realized; he never met himself coming back. And then he temperamentally possessed wonderful resiliency. Of course there were reverses, repulses even, but if a clumsy image may be permitted, expressed in terms congenial to modern scientific linguistics, after every differentiation Professor Bickmore integrated so rapidly that you never discovered he had been pulverized.

There were proud moments too in the old Arsenal. Reception days were really momentously fashionable. The large upper hall with mammals and birds and skeletons, rather crowded, but luminous and interesting, the subterranean (as regards light) second floor, with more skeletons, snakes, alcoholics, building stones, corals and shells, both overflowed with a gallant company of young and old, somehow evoked by the Professor's own enthusiasm and by the social prestige of the trustees, amid whom the Professor with gaiety and confidence spread his roseate predictions. Music swelled from one of the tower alcoves, and an effective corps of reporters, assiduously entertained also by the Professor, duly recorded the wonders of the place and the splendor of the company. These receptions were successes and they efficiently helped the lengthening list of members. They kept the Museum *idea* before the great public and Professor Bickmore intended to make and succeeded in making that great public understand the meaning of the new design more and more as the event of its dedication drew nearer.

The transference of the contents of the Arsenal to the new building on Manhattan Square was itself accomplished with amazing rapidity and here again the unequivocal impetus of the Professor was manifested. By a Fabian stroke of prudence he maintained his hold on the Arsenal by keeping there a much diluted mixture—it must be confessed—of museum properties or exhibits, which however still further assisted his designs, as all visitors, always numerous because of the proximity of the Park menagerie, met a repeated exhortation to cross the park to see the "real thing."

Already the Museum had taken on a quasi-national reference, for had not President Grant laid its cornerstone; and now President Hays, himself a storm center of political dispute, was to open its halls with the added intellectual decorations of President Elliot and Professor Marsh as speakers and promoters! The glory of that occasion need not divert these lines from their simple purpose, but I do recall its immense excitement wherein by an odd trick of association, the clearest visual memory is that of the President's wife, a lady whose tact and charm had already captivated the nation, and that of Professor Marsh, vexed over the absence of a looking-glass for the regulation of his not over-abundant hair.

In regard to the friends who have departed this life, it is all too easy to succumb to the temptation of adulation, but, so far as the American Museum of

Natural History is to-day a most impressive fact, the history of its origin, of its development, of the growth of its later vital educational influence, is indissolubly part of the life of Professor Albert S. Bickmore. Inseparable factors in the institution's astonishing success were his enduring hopefulness, the prescience that foresaw the boundless opportunities for the Museum's growth in this city of equally boundless prospects, the incessant watchfulness that nursed its first years into the self-sufficiency, at least of adolescence, his industry, his power of audacious importunity, the manipulative skill of the politician and the skillful ardor of the eulogist, and perhaps lastly the magnificence of his vision of possible ultimate attainments.

Certainly there were other elements, other minds and personalities, other influences even, but — when there is fame enough for all — let no invidious suspicion be permitted to lessen by the smallest scruple the full measure of Professor Bickmore's merit.

Finally, Professor Bickmore from the beginning I think, fully appreciated the scientific rôle the Museum would assume. It was by his strenuous exertions that the great Hall collection of fossils was purchased which gave the Museum a unique distinction in invertebrate palæontology. Very shortly after the occupation of the new building, he secured the location in it of a section for the United States Geological Survey, represented by Arnold Hague, Charles D. Walcott, Joseph P. Iddings and the mining geologist, T. B. Brooks. The Zirkel collection of rocks from the 40th parallel survey was then deposited in the Museum, probably the first extensive petrographic assemblage of slides and field specimens made in this country. These were subsequently at the Museum, studied by Mr. E. Wadsworth, and gave rise to a very pretty altercation, as many lithologists may recall. Professor Bickmore, I know, entertained, with Clarence King, the idea of building electrical furnaces in the basement of the new building, which might have anticipated some of the startling successes in modern electrolytic chemical processes. He conferred with Asa Gray on the project of removing to the Museum the Torrey Herbarium; I was present when he suggested to Professor Chamberlain that the Geological Society of America make its headquarters at the American Museum, and again and again he spoke to me exultingly of a project to transform the first floor of the new building into an immense aquarium. Many of these plans were indeed premature and overstated, but they evinced the fertility of Professor Bickmore's mind, and illustrated his resourceful propaganda in all directions in the interests of the Museum.

MUSEUM NOTES

Since the last issue of the Journal the following persons have become members of the Museum:

Life Members, Messrs. Lewis Sayre Kerr, Jr., Samuel Kissam Kerr and Sewell Tappan Tyng;

Annual Members, Mrs. Alfred Noroton Phillips, Mrs. Julia Seligman, Mrs. Alice E. Shoenberger, Mrs. Fitch W. Smith, Mrs. Jenny K. Stafford, Mrs. David McNeely Stauffer, Mrs. S. M. Stroock, Mrs. Gustavus A. Walker, Mrs. Isidor Wormser, the Misses E. J. Barnard, Louise G. Crabbe, Christobelle Crain, Eva Hawkes, Emma Fellowes Taylor and Evelyn M. Thomson, Dr. John B. Knapp, and Messrs. Otto T. Bannard, Arthur Cleveland Bent, John W. A. Davis, Theodore G. Eger, Leopold F. Goeller, George A. Holden, Edward M. House, Fay Ingalls, William Michaelis, Frederick H. Sanborn, Donald Scott, Abraham Shiman, William Skinner, Rochester B. Slaughter, Frederic E. Sondern, Arthur P. Sturges, Howard Taylor, Myles Walsh, Eugene W. Watkins, and T. W. Williams.

Mr. H. E. Anthony, accompanied by Mr. David S. Ball as assistant, left New York January 29 to join Mr. W. B. Richardson in southern Panama for a four month's collecting trip. There is little known zoölogically of the high mountainous region between Colombia and Panama, and the results of the expedition must prove of unusual interest in showing a possible connecting link between the extinct fauna of North and South America. The party hopes to secure a representative collection of the birds and mammals of the region, which will serve to connect the Museum's recent work in Colombia with the earlier work done in Central America. The expedition hopes also to round out the Museum's accessions of mammals and birds so that they include a practically continuous collection from Mexico down into Peru.

The Jesup Lectures will be given in the auditorium of the Museum on Friday evenings during February and March, from February 5 to March 25 inclusive. In these lectures, Charles P. Berkey, associate professor of geology in Columbia University, will speak before the friends of the University and of the American Museum of Natural History on the "Origin and Meaning of Some Fundamental Earth Structures." The subjects of the individual lectures follow one another as follows: February 5, "Concerning the Origin and Nature of the Earth"; February 12, "Earth Movements"; February 19, "The Place and Work of Volcanism"; February 26, "Metamorphism"; March 5, "Primary and Secondary Structures"; March 12, "Petrographic Cycles"; March 19, "Application to Local Studies"; March 26, "Relation of Structural Geology to Practical Undertakings."

The American Ethnological Society in conjunction with the Section of Anthropology and Psychology of the New York Academy of Sciences met on January 25, at the American Museum of Natural History. Rev. John W. Chapman presented a paper, "The Medicine-Men of Anvik, Alaska," and an informal discussion followed. Some of the questions asked were referred to Mr. Thomas Reid of Anvik, Alaska, an educated half-breed who was visiting the Museum at the time to follow out certain studies in the anthropological department.

Apropos of the visit of Sir Douglas Mawson to the Museum, it may be noted that the map of the South Polar regions [at the foot of the stairway on the first floor] has been revised and brought down to date, so that it includes the discoveries of Sir Douglas and other recent Antarctic explorers.

The loan collection of Dr. J. Leon Williams illustrating the skulls of the "Men of the Old Stone Age," a series of restorations of ancient types of prehistoric man by Professor J. H. McGregor, and a selected series of flint implements and works in ivory illustrating the art of the Old Stone Age, have been sent to the Panama-Pacific Exposition at San Francisco. Professor McGregor's series of restorations includes skulls and busts of the following subjects: *Pithecanthropus erectus*, the Neanderthal race and the Piltdown man, besides reconstructed brain casts of these stages.

The evolution of the vertebrates is set forth in a general way in the exhibition halls of the Museum, but the subject covers such an extended field of detail that the casual visitor would hardly be likely to grasp the main outlines. Indeed it requires considerable technical training to give an accurate account of the general stages in the evolution of the skull of vertebrates from the lowest fishes to man or to follow the transformation of the teeth and jaws as they are diversely modified for different functions from primitive or generalized types. Perhaps it is still a matter of general interest and it is deemed still worth while that a few specially equipped students should work out for themselves and in detail the steps by which the human backbone and limbs have been evolved from lower types. Such topics are developed in the Columbia University graduate courses which are given at this Museum under Dr. W. K. Gregory. A study collection comprising over one thousand selected specimens of recent and fossil vertebrates has been brought together through the coöperation of Museum curators and others. This collection has proved of constantly increasing value in the past few years not only to the graduate students in the courses mentioned but also to Museum curators and other investigators. A class from Hunter's College also makes constant use of this collection. The resources of the Osborn Library and of the Museum library are likewise used in these courses.

Dr. E. O. Hovey will sail February 5 for the West Indies to continue the studies on the volcanoes of the Lesser Antilles, which he began some years ago when the great eruptions on the islands of Martinique and St. Vincent occurred. He will be absent about three months and will devote his time particularly to the Grande Soufrière of Guadeloupe, Mount Pelé of Martinique, the Soufrière of St. Vincent and the boiling lake of Dominica, collecting gases from the fumeroles and making temperature observations, and taking note of the changes which have occurred since his visit in 1908. The expedition is undertaken through the aid given to the Museum by the Angelo Heilprin Exploration Fund established by Mr. and Mrs. Paul J. Sachs.

An exhibition of photographs of North American Indians is to be held at the Museum from February 1 to 27. These photographs were made by Mr. Edward S. Curtis, under the patronage of the late J. Pierpont Morgan, and include some of the largest and most striking of his recent pictures taken on the North Pacific Coast. Many of them will appear in the coming volume (Volume X) of Mr. Curtis's life work on the North American Indians.

The autochrome plates, as exhibited by Mr. Frank M. Byerly in the Museum auditorium, January 7, proved to be a decided evidence of the success of obtaining nature's colorings by automatically absorbing the color directly from the object or the landscape. The exhibition was particularly interesting to practical workers in photography as showing the progress that has been made in the rapidity of autochrome plates and in their adaptability to use by non-professionals. Two of the most pleasing pictures were companion pieces, the first showing the clouds of a gathering storm, the second the rainbow stretching over the valley after the cloudburst. A series of flower pictures illustrated the extreme value of this art in that it loses no detail of the coloring of the original.

The formal opening at the Metropolitan Museum of the Riggs Collection of Armor, installed under the supervision of Bashford Dean, curator of arms and armor, took place on the evening of January 25. This collection forms the most considerable gift that the Metropolitan Museum has ever received aside from the famous Rogers bequest. Combined with the collection of armor already in the Museum's possession and supplemented by loans from Dr Dean's private collection, it makes a very full and instructive exhibit. Mr. Riggs is one of few collectors who wish their collections arranged chronologically as well as for artistic effect. It thus happens that from the present installation the student can get an excellent idea of the history of the development of armor and of its decadence and disappearance as gunpowder came in and firearms improved.

Two reels of motion picture films showing Blackfoot Indian life were exhibited to the Museum staff January 22, by Mr. E. W. Deming, who during the past summer lived in a lodge near the Blackfoot Indian camps in Glacier National Park. The pictures include various tribal dances and the ceremonies with which these dances are connected

and are perhaps unusual in being authentic unposed records. Mr. Deming returns to Glacier Park in the summer of 1915 and hopes to continue this picture record of Blackfoot ceremonies and also to obtain phonograph records of Blackfoot songs.

THERE were shown in the auditorium of the Museum on December 31, motion picture films telling the story of the rescue of the Stefánsson survivors from Wrangell Island. In June, 1914, news of the sinking of the Stefánsson exploration ship "Karluk" the previous January, and the marooning of the survivors on Wrangell Island, had been brought to civilization by Captain Robert E. Bartlett, across the ice from Wrangell to Siberia. The rescue of the survivors from Wrangell was made on September 7 by Mr. Burt M. McConnell (who but recently had been of the supporting party with Stefánsson on his ice trip north into Beaufort Sea) in the "King and Winge,"— although he would give all credit for the rescue to Olaf Swenson, commander of the "King and Winge," and to Captain Jochimsen, ice pilot. The pictures showed the "King and Winge" bucking the ice on its way to the island and the taking off of the twelve people from the flat ice-covered shores leaving only the frail tent, the flag at half-mast and the cross above the graves of the three dead, to mark what had been a camp for human beings for eight months. The pictures showed also Stefánsson, commander of the expedition, removing supplies from the "Belvedere" and later starting out on the ice trip from Martin Point; and included besides remarkable photographs of bear and walrus hunting from the decks of the "King and Winge."

AT the recent session of the American Association for the Advancement of Science the following honors were conferred upon members of the anthropology staff of the Museum: Dr. Pliny E. Goddard was reëlected president of the American Folk Lore Society and was elected editor of the *American Anthropologist*, the foremost anthropological publication of America; Dr. Robert H. Lowie, who performed the duties of acting secretary in the absence of Professor George Grant MacCurdy, was reëlected associate editor of the *American Anthropologist*, and Mr. Alanson Skinner was elected assistant secretary of the American Folk Lore Society.

THE lectures for the blind classes in the public schools of New York City, given under the direction of the department of public education of the American Museum of Natural History, began November 12 and will continue until June 15. Two schools from Brooklyn, one from the Bronx, and eight from Manhattan are regular visitors, each class receiving individual attention, and, during the year, having from four to seven meetings at the Museum. The schedule for 1914–1915 will include simple illustrated talks on "Fur Babies and Their Ways," "Animal Life at the Seashore," "Bird Neighbors and Their Homes," "Flowers of the Springtime," "The Story of the Trees," "How the Trees Protect Themselves in Winter," "Hiawatha's People," "Inside the Indian's Wigwam," "Our Little Eskimo Cousin," "The Story of Cotton, Silk, and Wool," "A Journey from Pole to Pole," and "The Story of Animals and Vegetation of Different Climates."

A new work entitled *The Indians of Greater New York* by Mr. Alanson Skinner has been published by the Torch Press. This exhaustive study has been written to meet the constant demands of those interested in the history of our local Indians. Mr. Skinner has had opportunity to examine many of the original sources of information which were rare and difficult to procure, and has not hesitated to quote freely their quaint phraseology. The book is written in popular style and deals with the history, archæology and ethnology of the Manhattan Indians and their neighbors.

THE department of geology has been fortunate in securing for the meteorite collection fourteen falls and finds which are entirely new to the Museum's series. The most interesting of these is an eight hundred and eleven gram slice of the Big Skookum siderite. This meteorite was found at a depth of sixty feet from the surface in the glacial gravels near the Yukon River, Alaska, and is therefore supposed to be of glacial age.

THE exhibits in the Peruvian hall have been recased to make room for the collection of Nasca pottery purchased through the generosity of Mr. A. D. Juilliard, a trustee of the Museum. This collection has been installed in two large wall cases at the west end of the hall.

Recent additions to the hall of fossil mammals include a skeleton and a series of skulls of the clawed ungulate *Moropus*. These are part of the series of skeletons obtained by recent Museum expeditions to the great fossil quarry at Agate, Nebraska. Skeletons of the sabre-tooth tiger and the great extinct wolf from the asphalt deposit near Los Angeles, as also skulls of the fossil horse and the great American lion from the same locality are likewise placed temporarily on exhibition, although not yet mounted. Attention may also be called to the fine series of skulls in the Oreodont alcove on the north side of the hall.

The following papers were presented before the recent session at Philadelphia of the American Association for the Advancement of Science by members of the staff of the American Museum of Natural History.

Geological Society of America

Chester A. Reeds, "Geologic Deposits in Relation to Pleistocene Man," and "Graphic Projection of Pleistocene Climatic Oscillations."

George F. Kunz, "John Boyd Thacher Park — The Helderberg Escarpment as a Geological Park."

Palæontological Society of America

Henry F. Osborn, "Migration and Succession of Human Types of the Old Stone Age of Europe." Presidential address before the Palæontological Society, "The Addition and Evolution of 'Characters' in Palæontologic Phyla."

Carlos de la Torre and W. D. Matthew, "Megalocnus and other Cuban Ground Sloths."

W. D. Matthew "On the Affinities of Hyopsodus."

Barnum Brown, "The Ankylosauridæ; second contribution."

Walter Granger, "New Evidences on the Affinities of the Multituberculata."

William K. Gregory, "American Eocene Primates"; and "On the Relationships of Anaptomorphus, Necrolemur and other extinct Lemuroids."

W. D. Matthew, "Reconstruction of the Skeleton of Brachiosaurus."

L. Hussakof and W. L. Bryant, "The Fish Fauna of the Conodent Bed (Basal Genesee) at Eighteen Mile Creek, near Buffalo, New York."

The American Society of Naturalists

Henry F. Osborn, "The Museum in the Public Service."

The American Folk-Lore Society

Pliny E. Goddard, Presidential address, "The Relation of Folk Lore to Anthropology."

American Anthropological Society

Herbert J. Spinden, "Nahua Influence in Salvador and Costa Rica."

Clark Wissler, "The Diffusion of Modern Ceremonies in the Plains Area," and "Types of Clothing and their Distribution in the Plains Area."

Nels C. Nelson, "Chronological Data on the Rio Grande Pueblos."

Alanson Skinner, "Ethnology of the Eastern Dakota."

Robert H. Lowie, "Exogamy and the Classificatory System of Relationship."

Social and Economic Science

C.-E. A. Winslow, "Community Defense of National Vitality."

Physiology and Experimental Medicine

C.-E. A. Winslow, "Standards of Ventilation — Hygienic and Æsthetic."

The Society of American Bacteriologists

Israel J. Kligler, "A Study of the Correlation of the Agglutination and Fermentation Reactions among the Streptococci."

Through the generosity of Mr. Ogden Mills, the Museum has added to its collections a beautiful specimen of bandolier or beaded bag, secured in Fort Leavensworth, Kansas, in 1854 from the Delaware Indians.

Dr. Frank E. Lutz, of the Museum's department of invertebrate zoölogy, has been appointed a member of the board of editors of the *New York State List of Insects*. Mr. Charles W. Leng, honorary curator of Coleoptera is also a member.

There have been so many calls for the moths mentioned in Gene Stratton Porter's books, *Girl of the Limberlost* and *Moths of the Limberlost* that a special exhibit of these species has been installed in the gallery case, east wing, third floor.

Among recent important accessions to the department of geology mention may be made of the Ysleta siderite, weighing 310 pounds, from Ysleta, Texas, and the Culbertson aërolite, weighing 13 pounds, from

Culbertson, Nebraska, the gift of Mr. Arthur Curtiss James. Neither of these meteorites has yet been described. Eight kilograms of additional material from the Holbrook stone shower of July, 1913, have been obtained for use with what the Museum already possesses, to arrange a special case in the hall of geology to represent the mode of occurrence of such a meteoritic fall. There have been secured also a slice of the Mt. Edith siderite showing particularly excellent Widmanstätten lines, and representatives of the Rio Arriba, Wairarapa, Elm Creek, Aumières and St. Marks falls. An interesting slab and its counterpart of Triassic limestone showing footprints and ripple marks have been obtained from a quarry near West Orange, New Jersey; also a slab of orbicular granite from Vermont; a series of salt and other minerals from Great Salt Lake, Utah; and a specimen of native iron in basalt from Bühl, Germany. The Albert Manufacturing Company has presented to the department an interesting series of specimens illustrating the occurrence of gypsum at its famous quarries near Hillsborough, New Brunswick.

On January 26, Mr. Roy W. Miner of the department of invertebrate zoölogy lectured before the Linnæan Society on "The Fauna of Our Tide Pools." Mr. Miner described with the aid of colored lantern slides the environmental conditions determining the animal life of the tidal zone of our northern rocky coast from Nahant to New Brunswick. The tide pools of Nahant, Massachusetts, with their wonderful flora and fauna were then depicted. This is the locality from which Mr. Miner has drawn the theme for the new tide-pool group which is under course of construction for the Darwin hall. Overarched by a natural bridge of rock below the high-tide mark at the bottom of a sixty-foot cliff, this tide pool with its gorgeous display of animal and plant life presents all the aspects of a veritable fairy cavern. It is expected that the group will be finished within the current year and will form the most striking in the series of window exhibits in the Darwin hall illustrating the natural history of the invertebrates of the North Atlantic coast.

An introductory exhibition of drawings in color of "Our Common Home Birds" by Mr. H. C. Denslow was held at the Museum in the west assembly hall from January 15 to January 29 inclusive.

A group of the California ground squirrel has been placed on exhibition in the hall of public health. The significance of this exhibit is realized when we know that the flea carrying the germ of the bubonic plague to man, is common to this rodent as well as to the rat — for some years recognized as a carrier of the disease. This condition has been and still is a serious problem, as the trappers who come in contact with the animal become infected and in turn transmit the disease to other individuals. The plague has spread in the West to such an extent through this agency that the United States government has found it necessary to conduct a strenuous campaign to exterminate the ground squirrel. Up to September, 1913, nearly two thousand squirrels of this species had been found infected with the plague bacillus in California alone.

The last shipment of South American birds and mammals sent north by the Roosevelt party, has just arrived in New York. About three hundred and fifty mammalian specimens and ninety Brazilian birdskins were enclosed. Among the specimens new to the Museum collections are three birds, the very small manikins, two male and one female.

The groups in the Darwin hall are being provided with index labels some of which have already been installed. Those used in connection with the window exhibits which represent an extensive and complicated series of invertebrates in their natural environment, are particularly adapted to aid in identifying the forms shown. The label recently completed for the Woods Hole group describes in a series of five panels the principal marine specimens represented and identifies them by water-color diagrams placed immediately below the portions of the exhibit to which they refer.

An eight-foot nurse shark (*Ginglymostoma cirratum*) was received from the New York Aquarium several weeks ago, and a plaster mold of it was made while it was still in good form. This is now being prepared in the taxidermist workrooms of the Museum, and will make a valuable addition to the series of large fishes mounted along the walls above the cases in the hall of recent fishes.

On the afternoons of January 22 and 29, Mr. Alanson Skinner who is honorary curator of anthropology of the Staten Island Association of Arts and Sciences, delivered two lectures for children, "Life Among the Indians" and "Indian Fairy Tales," at the Association's Museum at St. George.

There has been placed on exhibition in the hall of North American mammals a small group of pikas, a small rodent called by many names, such as little chief hare, rat hare, cony, and known also as the "starved rat" among hunters and miners. The pika belongs to the only living genus *Ochotona* of its family (Ochotonidæ). *Ochotona alpinus* and *Ochotona ogotena* are found in Europæa-Asiatic altitudes of from 11,000–14,000 feet among the northern mountains. They are found along the Volge and Ural rivers, through the steppes of Orenburg, in the Ural mountains, and in western Russia including districts along the Obi River, around Lake Aral, and through the steppes between the Obi and Volga rivers. *Ochotona saxatilis* is found in North America and it is a group of this species that the Museum owns. This particular pika comes from Estes Park, Colorado, but the American pika is also found in all the western mountains, is especially abundant on the Snowy Range in the vicinity of the Platte River (in southern Wyoming and northern and central Colorado), and inhabits regions even as far south as New Mexico and Arizona.

The pika exhibited is a small gray-brown rodent resembling a guinea-pig except that it is never longer than seven inches and has large, short, rounded ears. It frequents dry rocky places almost destitute of vegetation, living upon sappy plants and the twigs of bushes in summer, and in winter upon the grass which it has stored between the rocks of its home during the summer. It is found almost always at higher altitudes than any rabbit lives, from the timber line up to the line of perpetual snow.

Maps have been placed at the entrances of the North Pacific Coast hall and the Eastern Woodland hall showing the location of the important tribes of Indians in North America north of Mexico. These tribes have been grouped into nine culture areas as recently plotted by Dr. Clark Wissler. An index accompanies the maps, not only for the purpose of indicating the location of the tribes on the map but also to serve as a guide to the collections on exhibition in the four halls devoted to North American ethnology.

An instructive new exhibit to illustrate the relation of animals to environment has recently been placed in the synoptic hall of mammals. It consists of a map of the United States on which are fastened the actual mounted skins of various species of chipmunks to call attention to the fact that in arid regions these chipmunks are small and pale in color while in forested moist regions they are large and dark-colored — in accordance with the law formulated by Dr. J. A. Allen.

A recent important acquisition in the department of geology is a slice of a meteoritic iron known as "Sams Valley". This meteorite was originally found in 1894 but was not brought to the attention of the Museum and scientific world until twenty years later. The entire mass was a small one, weighing only about fifteen pounds. The Museum however has been fortunate in securing an entire section weighing 1093 grams and measuring about $6\frac{1}{8}$ by $4\frac{1}{4}$ inches. The polished and etched surface of this meteorite is particularly beautiful through the abundance of the mineral schreibersite which is present in small masses and broad thin plates, the latter showing on the etched surface as slender rods and the thin lamellæ of nickel-rich taenite. The latter are prominent in certain lights as brilliant lines. This meteorite receives its name from the post office of Sams Valley near the locality where it was found. Its nearest geographical neighbors among the siderites are Willamette two hundred miles to the north in Oregon, and Oroville two hundred miles to the south in California, both of which are entirely different from Sams Valley in appearance of the etched surfaces.

The American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

Open free to the public on every day in the year.

The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people. It is dependent upon private subscriptions and the fees from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world. The membership fees are,

Annual Members	$ 10	Patrons	$1,000
Sustaining Members (annually)	25	Associate Benefactors	10,000
Life Members	100	Associate Founders	25,000
Fellows	500	Benefactors	50,000

Guides for Study of Exhibits are provided on request to members and teachers by the department of public education. Teachers wishing to bring classes should write or telephone the department for an appointment, specifying the collection to be studied. Lectures to classes may also be arranged for. In all cases the best results are obtained with small groups of children.

The Museum Library contains more than 60,000 volumes with a good working collection of publications issued by scientific institutions and societies in this country and abroad. The library is open to the public for reference daily — Sundays and holidays excepted — from 9 A. M. to 5 P. M.

The Technical Publications of the Museum comprise the *Memoirs*, *Bulletin* and *Anthropological Papers*, the *Memoirs* and *Bulletin* edited by J. A. Allen, the *Anthropological Papers* by Clark Wissler. These publications cover the field and laboratory researches of the institution.

The Popular Publications of the Museum comprise the JOURNAL, edited by Mary Cynthia Dickerson, the *Handbooks*, *Leaflets* and *General Guide*. The following list gives some of the popular publications; complete lists, of both technical and popular publications, may be obtained from the Librarian.

POPULAR PUBLICATIONS

HANDBOOKS

NORTH AMERICAN INDIANS OF THE PLAINS. By Clark Wissler, Ph.D. *Paper*, 25 *cents: cloth*, 50 *cents*.

INDIANS OF THE SOUTHWEST. By Pliny Earle Goddard, Ph.D. *Paper*, 25 *cents: cloth*, 50 *cents*.

ANIMALS OF THE PAST. By Frederic A. Lucas, Sc.D. *Paper*, 35 *cents*.

ILLUSTRATED GUIDE LEAFLETS

GENERAL GUIDE TO THE COLLECTIONS. New edition issued December, 1914. *Price*, 25 *cents*.

THE COLLECTION OF MINERALS. By Louis P. Gratacap, A.M. *Price*, 5 *cents*.

NORTH AMERICAN RUMINANTS. By J. A. Allen, Ph.D. *Price*, 10 *cents*.

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH. By George H. Pepper. *Price*, 10 *cents*.

PRIMITIVE ART. *Price*, 15 *cents*.

THE BIRDS OF THE VICINITY OF NEW YORK CITY. By Frank M. Chapman, Sc.D. *Price*, 15 *cents*.

PERUVIAN MUMMIES. By Charles W. Mead. *Price*, 10 *cents*.

THE METEORITES IN THE FOYER OF THE AMERICAN MUSEUM OF NATURAL HISTORY. By Edmund Otis Hovey, Ph.D. *Price*, 10 *cents*.

THE HABITAT GROUPS OF NORTH AMERICAN BIRDS. By Frank M. Chapman, Sc.D. *Price*, 15 *cents*.

THE INDIANS OF MANHATTAN ISLAND AND VICINITY. By Alanson Skinner. *In preparation*.

THE STOKES PAINTINGS REPRESENTING GREENLAND ESKIMO. *Price*, 5 *cents*.

BRIEF HISTORY OF ANTARCTIC EXPLORATION. *Price*, 10 *cents*.

TREES AND FORESTRY. By Mary Cynthia Dickerson, B.S. *A new edition in course of preparation*.

THE PROTECTION OF RIVER AND HARBOR WATERS FROM MUNICIPAL WASTES. By Charles-Edward Amory Winslow, M.S. *Price*, 10 *cents*.

PLANT FORMS IN WAX. By E. C. B. Fassett. *Price*, 10 *cents*.

THE EVOLUTION OF THE HORSE. By W. D. Matthew, Ph.D. *Price*, 20 *cents*.

REPRINTS

THE GROUND SLOTH GROUP. By W. D. Matthew, Ph.D. *Price*, 5 *cents*.

METHODS AND RESULTS IN HERPETOLOGY. By Mary Cynthia Dickerson, B.S. *Price*, 5 *cents*.

THE WHARF PILE GROUP. By Roy W. Miner, A.B. *Price*, 5 *cents*.

THE SEA WORM GROUP. By Roy W. Miner, A.B. *Price*, 10 *cents*.

THE ANCESTRY OF THE EDENTATES. By W. D. Matthew, Ph.D. *Price*, 5 *cents*.

"Moses" was captured in the early days on the Paraguay and traveled thereafter with the Roosevelt expedition. He crooned and chuckled whenever taken from his basket to be fed and petted, and he was often an interested spectator during the packing of specimens for the Museum

THE AMERICAN MUSEUM JOURNAL

AMERICAN INDIAN DANCES
STEFÁNSSON IN THE ARCTIC
JOHN MUIR
ROOSEVELT'S GEOGRAPHICAL WORK

The American Museum of Natural History

The American Museum Journal

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Mary Cynthia Dickerson, *Editor*

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The Journal is sent free to all members of the Museum.

Photo by DeWard, New York

MR. WILL S. TAYLOR, MURAL ARTIST

Mr. Taylor is at present engaged on the great mural canvases in the North Pacific hall of the American Museum. These decorations are painted to show the industries and ceremonies of the Indians of the North Pacific Coast.

[See reproduction in sepia of a photograph of one of Mr. Taylor's recent canvases opposite page 104]

Photo by DeWard, New York

MR. E. W DEMING, THE MAN WHO HAS FOR MANY YEARS PAINTED THE AMERICAN INDIAN WITH GENIUS AND POWER

Mr. Deming has recently been engaged to provide mural decorations for one of the Indian halls of the American Museum

Photo by Harris and Ewing, Washington

REAR-ADMIRAL ROBERT E. PEARY

On February 20, a lecture on "Children of the Ice and Snow" was delivered by Rear-Admiral Peary before the children of the members of the American Museum. This was the opening lecture of the Museum's fifth series of "Science Stories" for children

Photo by Thomson, London

SIR DOUGLAS MAWSON

Sir Douglas Mawson has returned from the Australasian Antarctic expedition, 1911–14, with a story of much accomplished for science, despite hardship and disaster

His pictures, both still and moving, are some of the most remarkable ever taken in polar regions. He lectured recently in New York under the auspices of the American Geographical Society and the American Museum of Natural History

Copyright photo by E. S. Curtis

COSTUMES OF INDIAN DANCERS IN BRITISH COLUMBIA

A group of various ceremonial dancers, showing representations of such animals as ravens and frogs, the bear, goat and sea-lion. The Museum owns a large collection of masks from the Northwest Coast

THE AMERICAN MUSEUM JOURNAL

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AMERICAN INDIAN DANCES

THE INDIAN DANCE OFTEN A PRAYER BY THE TRIBE TO THE GODS OF THE HARVEST, OF WAR OR THE CHASE—USUALLY IN CONTRAST WITH PLEASURE-SEEKING, SENSUAL DANCING AS KNOWN AMONG CIVILIZED RACES

By Robert H. Lowie

THE word "dance," as applied by the Indians has a meaning very different from that which it carries in our own language. When we hear of dancing, we think, first of all, of music and steps. These features are of course not lacking in aboriginal dancing, but they are completely overshadowed by other aspects of culture with which they are associated. To put it briefly, our dancing appears in the same context with restaurants, hotels, débutantes, attempts at a social rapprochement of the sexes. In Indian society, dancing is largely connected with war and agriculture and the chase, with processions, magical performances and religious observances, in short, with the serious affairs of life.

Indian dances as far as the steps are concerned are often of remarkable simplicity. A widespread "squaw dance" found among the Shoshone, Crow and other northwestern tribes, consists simply in the circle of dancers shuffling the feet alternately to the left, each man in the circle standing between two women, with his right arm around his partner's shoulder or waist, or in some cases with arms encircling a partner on each side. With short intermissions and an occasional introduction of the war dance for variety's sake, a squaw dance of this type is sometimes kept up all night, to the supreme gratification of the performers.

The Tobacco Dance of the Crow Indians, is, if possible, of even simpler character. The participants stand up several in a row, holding sacred objects in their hands, and alternately bend each knee and raise or lower each hand without at all moving from their position. The highly popular Grass Dance of the Plains Indians is of a more strenuous character. Only men take part, and they move about briskly, sometimes in

pairs, sometimes separately, vigorously stamping the ground with their feet, and frequently mimicking martial exploits.

The orchestral equipment of the Indians is not very comprehensive. The flute (or flageolet) is restricted to use in courting. For dancing, the drum and the rattle are by far the most important instruments, although other types were used over a relatively large area; this applies, for example, to notched sticks rasped with other sticks and bird-bone whistles, usually worn suspended from the neck. The drum varies considerably in form. On the Northwest Coast the natives merely beat a plank or box. The Plains Indians commonly use a skin stretched over a hoop, held by strings crossing underneath, but a large double-headed drum suspended from four sticks also occurs. Rattles are likewise of widely varying kind, such as gourds containing small pebbles and ring-shaped or globular rawhide bags — for which in the dance of to-day baking powder cans make favorite substitutes. Sometimes a certain instrument is considered distinctive of a particular dance or of a society performing the dance, and various forms of costume are also considered badges. Thus dress comes to occupy in the Indian dance a place of significance to which there is no correspondence in the dances of civilized races. Sometimes, to be sure, the apparel merely is designed to give an appearance of picturesqueness, while in other instances lack of clothing is sometimes compensated for by face and body paint or by a profusion of regalia held in the hand. In a Northern Blackfoot Grass Dance which I witnessed in 1907, some performers were naked save for moccasins and a breechcloth, but many carried ornamental objects such as mirrors, swords, and feathered and hooked staffs. When dances are the property of special organizations, as is often the case, there is naturally a tendency to differentiate between these by some visible token of dress or regalia. Thus the members of one Arapaho dancing society are marked off from the rest by wearing a headdress of buffalo skin; in another society every one wears feathers at the back of the head; a third is characterized by the carrying of clubs. Similarly where a single organization has several officers there is again a natural attempt to distinguish them through some external means. Thus a leader in the dance may carry an otter-wrapped pole, while the privates of the rank and file have none.

The Crow Grass Dance might be chosen as an example of the social type of Indian dance, the Pawnee Iruska and the Mandan Buffalo Women's dances as representatives of shamanistic or religious performances, while the Mandan Okipa illustrates well the great tribal festival type of dance.

The Crow Grass Dance, or as the natives call it the "Hot Dance," is regarded as the joint property of four clubs, to some one of which nearly every man of the tribe belongs. In a sense these are mutual benefit organizations, for whenever a member is confronted with a difficulty his comrades are expected to help him in every way. In each of the districts of the Crow Reservation, these four societies share with one another a substantial dance house. When the time for dancing comes, a committee of men proceeds from lodge to lodge, planting a stick in front of each. This means that each household is to contribute to a feast to be held by the clubs after their dance. A crier rides through camp heralding the performance and calling on all members to present themselves at the dance house. On one occasion I have known four marshals to be appointed to punish the

laggards; those who had disobeyed the summons either had to pay a fine or submit to the indignity of being thrown into the creek. In the meantime, the people assemble until the dance house is charged to its utmost capacity. Then the musicians, seated in the center around a big drum, strike up a tune, later reinforced by the voices of some of the women, and the members of some one of the four societies rise to perform the vigorous turns and bendings characteristic of the dance. They give vent to penetrating cries in rapid succession, they brandish weapons at an imaginary foe, and thus proceed around the lodge until the ceasing of music makes them come to a sudden stop.

Photo by E. W. Deming

Two figures from a performance of the Grass Dance twenty-six years ago when Sitting Bull was still alive

While the dancers rest from their exertions, some Crow eager to enhance his social prestige may decide to give away a horse. He comes riding in through the door (he has to bend low not to bump his head), the horse may balk or shy at the unexpected spectacle indoors and the noisy crowd, but the rider proceeds to go around the dance circle four times, whereupon a herald announces whom the donor desires to honor with the gift. It may be a Sioux visitor or some poor old man or woman from the clan of the donor's father. In the latter case the receiver of the horse leads it away singing as he leaves the dance house, a song in praise of his benefactor. Meanwhile the music recommences and the members of a second of the four clubs begin to dance in accompaniment. Any members who are loth to rise and perform this part are whipped into dancing by an officer armed with a quirt for this purpose.

All sorts of minor incidents may enliven the scene. On one occasion when I was a spectator while the Hot Dance was being performed, a group of boys came dashing through camp, painted with mud and disguised in clowns' costumes. They dismounted in front of the dance house, entered and to the extreme amusement of the onlookers, took part in the dance. At another

Photo by E. W. Deming

Grass Dance by Sioux Indians, just previous to the death of Sitting Bull, at Running Antelope's camp on Grand River, South Dakota. Some of the participants in the dance are Sitting Bull, Rain-in-the-Face, Chief Gaul, Chief Grass, Running Antelope, Red Tomahawk and Charging Thunder

Hot Dance which I witnessed, a man took off his clothing and gave it away to a guest. In former days this dance was made an occasion for men in a spirit of bravado to cast off their wives, often merely to show their strength of mind. The famous warriors of the tribe utilize the intermissions between dances to recite their great deeds, each exploit being greeted by a drumbeat, and each recital entailing on the narrator the obligation to give away some property. At a certain time visitors are warned to be off, for the door of the house is to be shut. Then the feast takes place — originally of dog meat. Thus ends the Grass or Hot Dance, a mixture of all sorts of merriment, self-advertisement, feasting and dancing.

A very different phase of dancing is presented by the Pawnee Iruska. The members of the society practicing this dance were supposed to be masters of fire, and their attitude toward it was to be like a Pawnee's attitude in facing the enemy. Spectators were invited to their gatherings, their songs were chanted and the members began to dance. After

the third set of songs had been sung, the attendants built a big fire and hung a kettle of water and dog meat (or buffalo) over it. The leader advanced to the kettle when it was full of boiling soup, plunged his arm into it and took out a piece of meat. All the other members followed suit and unscathed pulled out meat, for they had secured medicine power that enabled them to overcome the force of the fire. An evidently related ceremony occurs among other tribes. In the Hot Dance of the Mandan and Hidatsa, the performers not only executed the trick practiced by the Pawnee, but also danced with bare feet on glowing embers until they had stamped out the fire. This was likewise a usage of the Crazy Dancers of the Arapaho, who indulged in other queer antics, such as doing everything in reverse fashion and expressing the opposite of their intended meaning, thus lending to an otherwise solemn performance an aspect of buffoonery.

While the activities just described seem to have had no object beyond the exhibition of the performer's supernatural power, the dance of the Mandan Buffalo women's society was intimately connected with tribal welfare. Whenever the supply of buffalo had failed and the village was threatened with famine, the members of this organization were

Photo by Alden Deming

Scene from a social dance largely participated in by women. Photograph taken among the Blackfoot Indians, Montana, summer of 1914. The main properties necessary for the dance are the tall feather hats. The women in turn dance wearing these hats once around the camp ground until all have worn them in the dance. Usually a circle of wagons is formed when the dance takes place out of doors. A feast is always given in connection with the dance. The Museum collections are rich in dance costumes of the Blackfoot Indians

Photo by P. E. Goddard

Assiniboine Indians in a social dance near Battleford, Saskatchewan, 1912. The structure in which the dance takes place resembles that used for the Sun Dance, now discouraged if not forbidden by the Canadian government

From a painting by Catlin

SCENE FROM MANDAN INDIAN CEREMONY

The Mandan Okipa was a great several days' annual festival corresponding to the Sun Dance among other tribes. It commemorated the subsidence of the deluge as recorded in Indian mythology, and combined religious sacrifices and voluntary submission to torture with various dances and dramatic performances.

This halftone is from the original painting in the possession of the Museum

called upon to execute their dance in order to attract the herds. According to an early observer, they never failed for they simply never ceased dancing till buffalo had been sighted. Prince Maximilian of Wied-Neuwied gives a good first-hand account of a performance witnessed by him in the early thirties of the last century. There were two men acting as musicians, with rattles and drums, one of them holding a gun. The leader was an elderly woman wrapped in the skin of an albino buffalo cow. In her right arm she held a bundle of twigs, tipped with plumes, with an eagle wing and a drinking-vessel secured to the grip. There were seventeen women, all told, who took part. Two of them wore skunk-skin head bands, the rest wore headdresses of white buffalo skin, decorated in front with owl or raven feathers. All the dancers had vermilion paint on the left cheek and eye, with two blue spots on the opposite temple. They formed a circle, the musicians began to sing and the women danced, taking up the tune at the same time. They waddled like ducks from side to side, raising each foot alternately higher than the other but never shifting their position.

The Mandan Okipa represents again a wholly different type of dance. It was the great several days' annual festival that corresponded to the Sun Dance of neighboring peoples. Ostensibly it was a commemoration of the subsidence of the deluge recorded in native mythology, and some of the important characters of the myth were impersonated by performers. On the other hand, there was a great deal besides. A marked dramatic feature was supplied by numerous mummers representing animals and closely mimicking their peculiarities. Prominent among these were buffalo masqueraders who imitated the wallowing of the animals represented and whose actions were expected to entice the game to the village. Many tribesmen voluntarily submitted to torture: their breasts were pierced, skewers inserted, and they were then made to swing suspended from a pole as in the more familiar Sun Dance. Altogether the Okipa was evidently a composite ceremony. Religious sacrifices and prayers were mingled with dramatic performances, magical rites and activities of a purely social order; and there can be no doubt that to the average Mandan who had no special office in the performance, it served the purpose of a free spectacular show "on the grandest scale within tribal comprehension."

The wide scope of activities embraced by the dances of our native American population makes perhaps the main point of interest over and above all special features. For what must strike every observer of primitive cultures most forcibly is that things which we consider quite distinct, men of a ruder civilization join. Thus the stars are to us a subject for purely scientific study, but even our ancestors invested them with all sorts of mystical properties, and the North American Indian personifies them and identifies them with the heroes of his folk-tales. Thus too, we have ornamental designs and often do not give them any symbolic interpretation. Primitive man is indeed less given to symbolism than perhaps has been supposed; nevertheless his tendency to invest a geometrical pattern with meaning remains greater than our own. So dancing, which to us is merely a form of amusement and exercise, becomes in primitive communities an important social function, an opportunity for sleight-of-hand performances, for religious ritualism, and may become charged with an atmosphere of supreme holiness.

From copyright painting by Will S. Taylor

DANCING TO CURE THE SICK

Ceremony of Tlingit Indians, North Pacific Coast. The dance of the shaman or medicine man is accompanied by chanting and the beating of drums. Scene, the interior of a house illuminated by firelight

Photo by F. W. Fleming, San Ildefonso, 1893

THE BUFFALO DANCE IS A PRAYER TO THE GODS OF THE CHASE

From Engraving after Bodmer

BUFFALO DANCE BY MANDAN INDIANS, NORTH DAKOTA, 1832

Very wonderful paintings of Indian ceremonies were made in 1832-34 by a Swiss artist, Charles Bodmer, working under the direction of Maximilian, Prince of Wied-Neuwied

From copyright photograph by Edward S. Curtis

DANCING TO RESTORE AN ECLIPSED MOON, KWAKIUTL INDIANS, NORTH PACIFIC COAST

INDIAN DANCES OF THE SOUTHWEST

By Herbert J. Spinden

THE numerous dances of the Pueblo Indians are never entirely free from a religious idea. Some are so deeply religious that they are jealously guarded from all profane eyes and are held at night in underground lodges. The War Captain's men keep watch at every road so that no outsider can glimpse the masked dancers impersonating gods. Even in the underground lodges the faces of the uninitiated children are covered while the dance is in progress so that they may hear but not see. This secretiveness is most developed in the villages along the Rio Grande, in New Mexico, where the native religion has encountered the opposition of the Catholic Church for nearly four hundred years. Other dances are held in the plaza of the village, and here visitors are usually tolerated while on the annual feast day of each pueblo they are welcomed to a more or less innocuous entertainment.

Photo by E. W. Deming

From a performance of the Buffalo Dance twenty-two years ago

The characteristic dances of the Pueblo Indians are strikingly different from those wild gyrations that we associate with the nomadic and warlike Plains Indians. There are, to be sure, a number of such dances — Enemy Dances they are called — that have been taken bodily from this or that wild tribe and are known by the tribe's name, such as the Cheyenne Dance, the Pawnee Dance, the Navajo Dance. These foreign dances are mostly concerned with war and are not regarded as having any important religious character. Yet it is significant that title to use them was obtained by purchase or trade before the dances were included in the village repertory. Of course the foreign songs had to be learned by rote and a special set of costumes made in keeping with the place of origin.

In one of the introduced dances that is popular at Taos — a woman's dance and therefore not gymnastic — there is first, in the center, a chorus of men. Some of these sit around a large drum

Photo by N. Kendall

On the feast day of Santo Domingo (forty miles north of Albuquerque) on August 4 of each year a memorable dance is celebrated. Besides the ordinary dancers in two divisions are the Chiffoneti or clowns who play pranks and dance with abandon

Photo by N. Kendall

As far as the steps, songs, regalia and general idea of Pueblo Indian dances are concerned, there has been little change during the three hundred and fifty years since the Spaniards came

Photo by N. Kendall

THE GREEN CORN DANCE

The many dances of the Pueblo Indians are never free from the religious idea. The Green Corn Dance at Santo Domingo Pueblo is a variant of the Tablet Dance and is danced in the summer time to insure the success of the corn crops. Several hundred Indians participate. There is rarely the slightest body contact between dancers of different sexes and never an embrace such as characterizes the dances of civilization

Photo by N. Kendall

DANCERS AND CHORUS

A feature of many Pueblo dances is the chorus which sings to the beat of a large drum. The dancers also may sing but as a rule do not

which they beat in unison, while others kneel and mark time by scraping notched sticks that rest on a log for a sounding board. Around them in a circle, or half-circle, are dancing girls. These are not in their everyday Pueblo attire of woven blanket dress with colored belt and whitened deerskin boots but in the fringed deerskin dress of their Plains-bred sisters, with moccasins and leggings. Scarcely lifting their feet from the ground, as they keep time to the song and the throbbing rhythm of the drum and the notched stick instruments, the girls move slowly round the circle using their two hands in a graceful warding-off motion. Outside the circle of girls is a larger circle of men in blankets, each resting his right arm across the shoulder of the man in front and all moving in a direction opposite to that taken by the girl dancers. These men represent Pueblo Indian visitors at the camp of the Plains Indians. The girl dancers and the inner chorus of men are the hosts who provide the entertainment. We see in this the dramatic instinct which in many Pueblo ceremonies is developed to a high degree. The famous Snake Dance of the Hopi is a partial dramatization of an important myth.

Photo by H. J. Spinden

The costumes of the Tablet Dance at San Ildefonso are simple but pleasing. The men wear dance aprons embroidered with designs representing clouds and rain. From the back of the belt hangs a fox skin. Sprigs of aspen are stuck in the arm bands. The women wear the old-fashioned Pueblo dress and are barefooted

While the steps in many Indian dances are simple in the extreme, there is a delicate pulsing rhythm that affects the

whole body and makes the dance almost impossible of imitation for one of another race. Dances in which both men and women appear are perhaps more common among Pueblo Indians than elsewhere in North America. There is rarely the slightest body contact between dancers of different sexes and never an embrace such as characterizes our own dances of pleasure. Pueblo dances are conducted decorously — if we omit the religious orders of clowns whose antics are often none too delicate. Both men and women seem to be imbued with a sense of religious solemnity and seldom smile but there is no doubt that the sway of the dance is no less a source of sensuous delight to them than it is to ourselves.

Pueblo dances proper are mostly concerned with rain, fruitful harvests, and abundant supplies of game. Much of the prescribed regalia represents clouds, falling water and blossoming plants. The symbolism is worked out in feather headdresses, embroidered aprons, painted wands, etc., and is magical or coercive in character. Wild animals are supposed to be pleased by dances in which they are mimicked and to allow themselves to be killed in return. All the persons chosen for important dances have to undergo four days of preparation and purification during which they are isolated from their townsfolk. The religious heads of the village, called "cacicques," are masters of ceremonies and the War Captain and his men are watchers, warders and providers.

The public dances in the plaza are more or less processional but the advance is very slow and the trail of footprints in the dust shows how the dancers have inched their way. There are definite spots for stationary dancing and here countermarching is used to make new quadrille-like formations.

A good example of this sort of dance

Photo by E. W. Deming

The Tablet Dance twenty-two years ago at Santo Domingo

is the so-called Tablita Dance which takes its name from a painted tablet representing clouds that is worn on the heads of the women. It is a spring and summer dance connected with maize and is designed to bring rain for the growing crops. The costume is especially devised for this occasion and every detail of dress and ornament has a special import Of course, variations are to be noted from one pueblo to another. On the great feast day of Santo Domingo in August this dance is celebrated and several hundred persons take part in it. Besides the men and women dancers, who are divided into two divisions according to the social grouping of the clans, there are Chiffoneti or Delight-takers in two orders and a number of individuals painted to represent special mythological beings. The Chiffoneti are clowns whose naked bodies are painted with broad stripes of black and white and whose hair is smeared with mud and tied with corn husk. The ostensible purpose of these clowns is to make merry and do what mischief they can but in reality they are the only persons who can conduct the gods of rain and fruitfulness into the village and they thus occupy an important esoteric place in Pueblo religious life.

Photo by E. W. Deming

The Tablet Dance takes place in the spring and is a prayer for rain

Photo by E. W. Deming

Clowns in the Santo Domingo Tablet Dance. It is their duty to rush through the village and with little whips drive all the workers or dancers to fulfill their respective parts in the ceremony

The Buffalo Dance, the Deer Dance and the Eagle Dance are examples of mimic animal dances. Headdress and body coverings are made when possible from the skins of the animals in question or color is used where skins cannot be worn. The characteristic cries and postures of the animals are often cleverly imitated. In the Buffalo Dance a number of animals, including deer, antelope and elk, are represented in addition to the Buffalo Men and the

Photo by E. W. Deming

Chanters in the Tablet Dance, Santo Domingo

Buffalo Maid. Except in case of the last-mentioned person, all the dancers wear animal head-dresses. They are brought into the village at daybreak by herders dressed in buffalo robes and carrying bows and arrows. A chorus meets them and escorts them, between a double file of ordinary men and women dancers, to the dancing places. The dance lasts about twenty minutes and is repeated several times during the day. At sunset the dancers retire into the hills and resume their ordinary clothing. In the Deer Dance the same mimicry is seen and when the last dance is over, the deer run away into the hills at top speed. The girls try to catch one of the little deer and sometimes succeed.

At the secret dances held at night in the underground lodges the dancers wear masks and impersonate the mythological beings. Most of these have definite and well-known characteristics and are at once recognized. Although dances of this sort in the Rio Grande region

The Eagle Dance is exhausting physically to the dancers, but interesting to the spectators for its dramatic quality. The eagle men are guided from the underground lodge to the dancing place by a line of sprinkled corn. They imitate very cleverly the characteristic postures of a bird

Photo by T. P. Martin

PAWNEE DANCE AMONG THE PUEBLO INDIANS

The Pueblo Indians have certain introduced dances taken bodily from the dances of wild tribes and known by the given tribe's name. This represents the Pawnee Dance at Taos (a pueblo eighty miles south of Santa Fé and having the most intercourse with the Plains Indians). In this dance the Pueblo Indians represent the Pawnee, a nomadic tribe who shave the head leaving only a roach of hair. Skull caps with a slit through which the hair is drawn make possible an imitation of this custom

cannot be seen by outsiders and must be studied from information and native drawings, still similar ones are danced in the open in the Hopi villages of Arizona. The dramatic instinct comes out strongly in some of these secret dances. This is particularly true of the ceremonies preceding the arrival of the masked dancers who represent mythological beings. These mythological beings are supposed to live in the under world and to come up through lakes and springs when they visit the upper world. The Chiffoneti or clowns are the intermediaries between mortals and these gods.

The caciques determine when a masked dance is to be held and they select the dancers. The latter are locked up for four days and purified by fasting and ablution. At the appointed time all the villagers go to the underground lodge and seat themselves in readiness for the performance. Soon two clowns appear at the hatchway in the roof and come down the ladder. They make merry with the spectators. Then one says to the other, "My brother, from what lake shall we get our masked dancers to-night?" "Oh, I don't know. Let's try Dawn Cañon Lake. Maybe some Cloud People are stopping there." Then one clown takes some ashes from the fireplace and blows it out in front of him. "Look brother," he says, "do you see any Cloud People?" They

Photo by E. W. Deming

One of the side dancers in the Buffalo Dance, San Ildefonso Pueblo Indians, 1893. A buffalo horn on one side and three eagle feathers on the other decorate the head. The crosses painted on the body are magical devices supposed to aid in the hunting of buffalo

Photo by E. W. Deming, 1893

Forward movement of side line of dancers in Buffalo Dance, San Ildefonso. To the rhythmic beat of drums the dancers advance slowly, swaying alternately to right and left and shaking their rattles toward the ground on the one side and then on the other

Photo by E. W. Deming, 1893

In the center between the side lines of the buffalo dance are the Indian dancers representing animals and imitating their movements, three buffalo (two bulls and one female), two black-tailed deer and two antelopes. The Indians representing buffalo wear the complete buffalo head as a headdress. Specimens of these headdresses as well as those worn in the Deer Dance are on exhibition in the American Museum

peer across the ash cloud and one says, "Yes, here they come now. They are walking on the cloud. Now they stop at Cottonwood Leaf Lake." Then the other clown blows ashes and the questions are repeated. Thus the Cloud People are drawn nearer and nearer until they enter the village. The clowns become more and more excited and finally cry: "Here they are now!" and the masked dancers stamp on the roof and throw game, fruit, and cakes down the hatchway. When the masked dancers enter, the children are covered but the older people drink in the divine presence with the palm of their hands as one scoops up and drinks water. These masked dancers may not talk although they make peculiar sounds. Their wishes are told in pantomime.

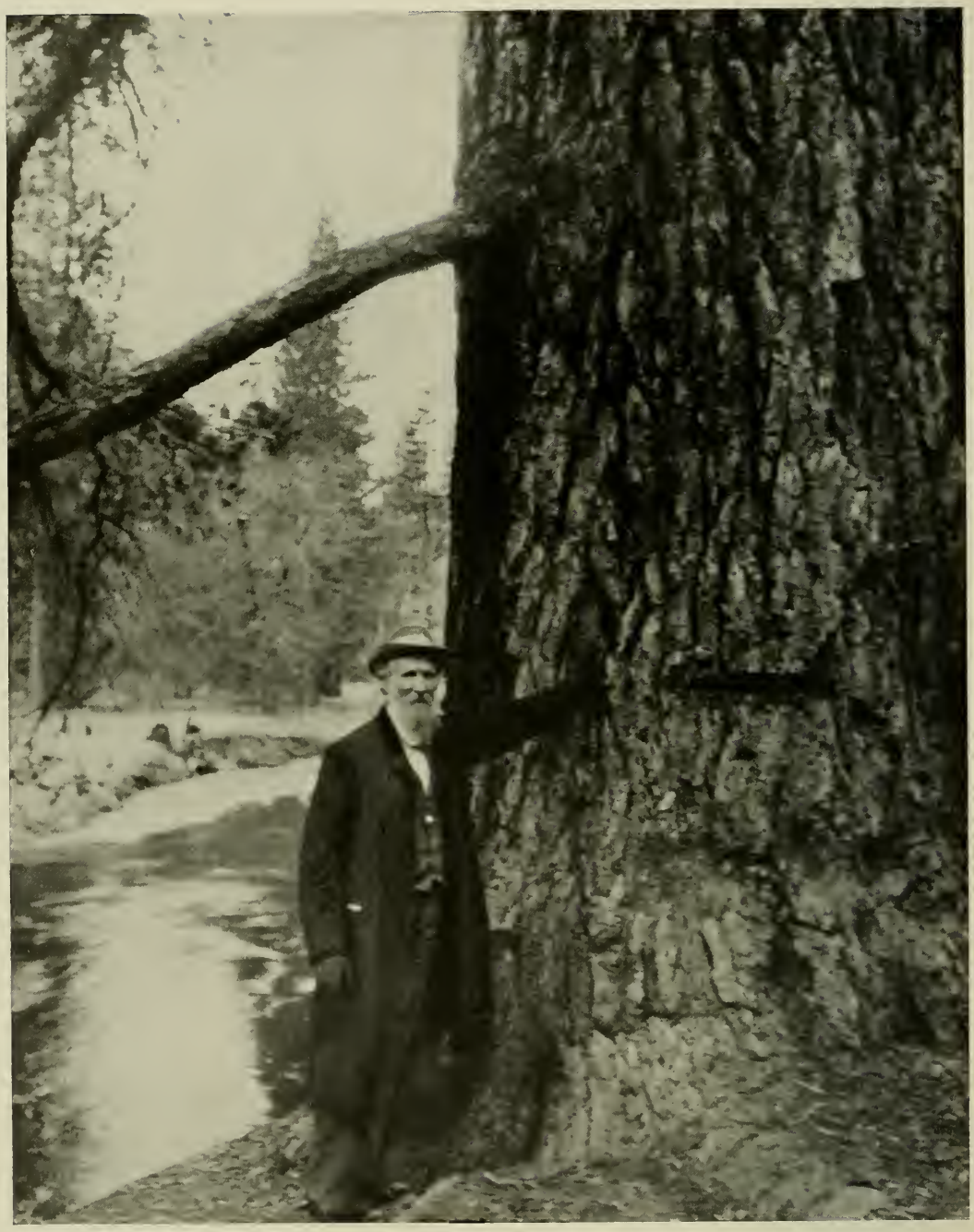
The songs used in these ultra-sacred ceremonies have words and sometimes a sentiment that is beautiful. More commonplace dances may be accompanied by songs without real words and only a jumble of meaningless syllables. Here is a song from the Turtle Dance — one of the winter dances of sacred type. It refers to the coming of spring.

Povi ts'e anyu
Povi tsâ nyu anyu
Khu^{n} p'i nyu anyu
Khu^{n} tsâ nyu anyu
Gi na^{ng} ak'o
Gi na^{ng} ak'o
Nde wa pa he ra^{ng}
Na we ndi powa

Yellow Flower Girl!
Blue Flower Girl!
Mottled Corn Girl!
Blue Corn Girl!
Thus on the plain,
Thus on the plain,
Everything they revive
And hither return!

Photo by H. J. Spinden

The circuit of the Antelope Priests in the great Snake Dance ceremony at Walpi (in the Hopi country, Arizona). This dance is a collaboration of the Antelope and Snake societies and is a partial dramatization of an ancient Indian myth. Many of the Southwest dances are carried out with great solemnity, often at night in underground lodges, the masked dancers impersonating gods. [The March, 1913, JOURNAL reproduced a long series of photographs of the Snake Dance by the artist, Mr. Howard McCormick]



JOHN MUIR, AMERICAN NATURALIST, EXPLORER, AUTHOR, 1838-1914
BESIDE ONE OF THE TREES HE LOVED

The mountains and flower-covered foothills of the Sierras, the glaciers of Yosemite, giant sequoias — these were the comrades of his high spirit. He lived among them for many years — often in loneliness for human comradeship, studied them with devotion, with the close observation of a scientific mind, and wrote and talked of them with charm and power. He persistently championed their preservation for the people and to his efforts we owe to-day our sequoia groves, the Yosemite Valley and Yellowstone Park

[Photograph presented by John Muir to Professor Henry Fairfield Osborn in 1911]

THE CONVERSATION OF JOHN MUIR

By Melville B. Anderson

Professor of English Literature, Leland Stanford University

JOHN MUIR is beyond care for what we do, yet I am a little disturbed by the feeling that, if he knew what I am doing now, he would not spare me a shaft of his irony; perhaps, with allusion to Burns, his prince of poets, he would enquire what he had done that I should be discharging my musket over his grave! Certainly I have no claim to be heard upon him, just as I had no claim to his friendship, with which, nevertheless, I was graced for nearly a quarter of a century. Yet I like to think of "the way that love began."

When John Muir, then a shy youth, best known at the University of Wisconsin as a mechanical genius, left his Alma Mater to start upon his great quest, he carried a letter from Professor Butler to Miss Catharine Merrill of Indianapolis, a lady whose memory is ever blessed among the elder generation there. At Indianapolis he stopped for awhile to earn some money by working in a machine-shop, where, however, he met with an accident which deprived him of sight in the right eye and threatened him with total blindness. During this trying time Miss Merrill, who was a busy teacher, showed herself a friend in need. In a memorial notice of her, he says: "She came to my darkened room an angel of light, with hope and cheer and sympathy purely divine." It was from the lips of this lady that I first heard of Muir, and through my friendship with her and her family that it became natural and necessary, when coming to California, that I should know him. Thus one of the most perfect of women is beautifully linked in my memory with one of the noblest of men. Now that they are both gone, it is pleasant to think that what I had in him I owed to her grace.

Muir had set out for South America, and the next stage of his trip was a tramp from Indianapolis to the Gulf. There he suffered another setback in the shape of an attack of some malignant fever. Recovering from this, he changed not his mind but his goal; the tropics, he decided, were not for him — he would go to California. He has often told me of his landing in San Francisco one April morning in I know not what year in the sixties. Strolling up Market Street and peering timidly into the faces of the people hurrying to the business of the day, he at length singled out a carpenter carrying a box of tools on his shoulder, as one who might safely be accosted. The momentous question was one to which, for the rest of us, the speaker's future life was to be a large answer: "How can I get out of town?" — The reply of the carpenter was: "Well, sir, you just go back the way you came and take the Oakland Ferry." — Oakland was then but a straggling village, and the way out was not the problem that it now would be for a stranger on foot. Instantly Muir turned his back upon all that San Francisco might have to show, and found himself an hour later at home and happy in the hills above Oakland. Following the line of the hills and mountains, he sauntered day after day, botanizing as he went, as far as Pacheco Pass, whence he had a Pisgah view of his Land of Promise, the distant Sierra. Descending

into the San Joaquin Valley, he found it everywhere glowing with beautiful flowers. Men with their cattle had not yet broken into this garden of Nature to such a degree as to devastate it, and to push out of existence scores of plant-genera. He would lie down in his track at night and look up at a luminous and friendly sky through a canopy of Mariposa lilies. Making his way across the great plain and up along the Merced River, he found himself after a few days on the brink of Yosemite. What followed is told in *My First Summer in the Sierra.* Equally interesting would have been his account of his first winter there. Someone employed him to build a sawmill and to cut lumber, so that within a few months he had earned, as he once told me, enough money to last him for the next fifteen years.

Then began the series of patient hardy explorations of which his books and articles are but a fragmentary record. More than once, during the last year of his life (which no one thought of as the last!), I urged him to continue the autobiography which he seemed to have dropped just at the outset of his real career. His answer was that the writing would require another lifetime. Possibly he may have felt that whatever he wrote was in the best sense autobiographical; it is indeed peculiarly true of his writings that they bear the stamp of his character. Then, too, he detested the drudgery of composition. Whenever I went to see him, he was doggedly at work upon some literary task; the Scot in him kept him forever at it, although not forbidding him the luxury of an occasional lament. I am sure his writings have cost him more groans by far than all the hardships incident to his explorations. Less than a fortnight before the unforeseen end, going up as usual through the lonely house without the ceremony of knocking, I found him sitting before the fire at work upon his typewritten manuscript. Showing me the new bookshelves he had had made since my previous visit, he said, upon my congratulating him on the orderly state of his library, which for years had been lying in dusty heaps and tiers along the floor: "I am going to begin buying books now." — "What," I could not help saying, "do you expect to do much reading?" — "O yes"; and then with a sigh, "If I only had not so much writing to do!" —

He always appeared eager to put everything aside for the sake of a long talk. After the marriage of his daughters he lived alone in the old mansion, which stands on a mounded knoll rising from amid the narrow alluvial valley of Alhambra. He took his meals at the neighboring house where his elder daughter with her husband and growing family lives, and was otherwise cared for by a faithful old Chinaman who had been in his employ for some thirty years. This old gardener was a man of deeds, not words. Orders were received in silence, and did the master wish to assure himself that an order was understood, the reply would be: "Too muchee talk!" — In thirty years the taciturn fellow had not learned thirty words of English. For all his inward resources, and notwithstanding the pleasure he took in the family of his daughter, perhaps Muir had moments of loneliness. Whenever I wrote asking permission to visit him for a day, he would telephone or telegraph that I should come soon and stay as long as possible.

Scarcely would the guests be seated, when Muir would begin, as if thinking aloud, pouring forth a stream of reminiscence, description, exposition, all relieved with quiet humor, seasoned with pungent satire, starred and rainbowed with poetic fancy. What would one not

give for a phonographic record of those wonderful talks! One recalls them as one recalls the impressions of travel, or the pictures in a gallery, or sweet music which one is impotent to reproduce. Taking a text from what was uppermost in his mind, or from a chance question, or from a leaf or pebble or petrifaction, he would begin very quietly and without the slightest hesitation, and would soon lead the spellbound listener into the inward parts of the subject. Sadly considering how little I can recall, I respect more than ever the talent of a Boswell. Whatever one attempts to reproduce seems to fade like those pebbles which Emerson brought home from the brook. I venture to offer here two imperfect snatches of his talk, which I owe to a friend who accompanied me to visit Muir last August, and who jotted down a few notes. Muir rarely referred to current events, but some reference to the invasion of Belgium brought out the following deliverance:

It all reminds me of an experience of mine soon after leaving the University of Wisconsin. I wanted to go to Florida to see the plants down there; so I set out afoot toward the fall of the year. I traveled along the western foothills of the Appalachian Mountains where the people were none too hospitable. It was just after the War and they were distrustful of Northerners. When refused shelter I would creep into the thickest brush I could find under the large trees. Often it would rain, and again it would not be safe to light a fire, so that I got pretty chilly by morning. Then, when the sun was up, I'd crawl into an open, sheltered spot and try to get another nap. But I didn't generally sleep long. The people there all keep hogs and let them run on the mountainsides to feed on the acorns. In order to keep the herd together, they throw out a few ears of corn in the morning about the cabin, at the same time calling the hogs. I'd hear a shout away down the valley somewhere, then a crackling of the brush all round, and those razorbacks would come charging down the hillside right through my little camp and right over me, if I didn't look out — snorting and squealing, blind and mad to get at that corn.

And that's the way with us in these days of our modern civilization and automobiles and a' that, rushing pellmell after something and never getting anywhere. We imagine if we make a big disturbance we're "progressing"! — Progressing down hill like the Gadarene swine! —

Much later on in the same conversation, he chanced to be speaking with humorous indignation, but not unkindly, of certain differences he had had with an Eastern naturalist, and wound up about as follows:

. . . . But I got the better of him once. A number of us, botanists and foresters and others, were examining the mountain region of Tennessee and North Carolina and on down the ridge. The autumn frosts were just beginning, and the mountains and higher hilltops were gorgeous. My friend and the rest were making a little fun of me for my enthusiasm. We climbed slope after slope through the trees till we came out on the bare top of Grandfather Mountain. There it all lay in the sun below us, ridge beyond ridge, each with its typical tree-covering and color, all blended with the darker shades of the pines and the green of the deep valleys.— I couldn't hold in, and began to jump about and sing and glory in it all. Then I happened to look round and catch sight of —— standing there as cool as a rock, with a half amused look on his face at me, but never saying a word.

"Why don't you let yourself out at a sight like that?" I said.

"I don't wear my heart upon my sleeve," he retorted.

"Who cares where you wear your little heart, man?" I cried. "There you stand in the face of all Heaven come down on earth, like a critic of the universe, as if to say, Come, Nature, bring on the best you have: I'm from BOSTON!" —

Sallies like these were not infrequent, but the main current of his talk was deeper and graver. One hobby, upon which he would discourse for hours with poetic eloquence, interspersed with philippics against those chamber geologists

who "never saw a glacier in the life," was the glacial origin of the Yosemite and kindred gorges. On one occasion, when my companion was a colleague interested in mechanical subjects, the conversation turned all upon inventions, and Muir brought out the remnants of the celebrated machine for facilitating early rising, described in his autobiographical volume. I remember that we had that day propelled our bicycles the ninety odd miles from Stanford University to the Alhambra Valley, and the exhausted flesh quenching the spirit, I was obliged to interrupt our host early in the wee sma' hours. I have no doubt he would have talked all night and would in the morning have been as fresh as Socrates after the Symposium. Last August, I chanced early in the conversation to ask him why the prairies of the Middle West were treeless, since it is proved that trees flourish there. To answer that question he took an hour or more, talking freely with great wealth of detail and illustration, but without diffuseness. He liked also to give long accounts of his great journey round the world, when he visited the Himalaya, Australia, Africa, Chili, all apparently with the guiding purpose of studying certain kinds of trees.

Perhaps the secret of his pleasure in narrating episodes of his life is to be found in the illusion of living over again, feeling the thrill of past emotion, sensing the flow of spent springs of joy. As he revisited in the light of vivid memory beautiful landscapes and memorable places, he carried along with him the sympathetic listener, who received much of the delight and profit of travel without expense, without fatigue, and without that sense of wasted time which the traveler suffers in the dreary intervals of waiting and transit. What was told was so interesting in subject and manner that one did not think until afterward of the wonderful qualities of the teller — his alertness and flexibility of thought, his photographic memory, his wit and poetic imagination, his selfless regard for whatever seemed true to him — his scorn, too, for the man who, having knowledge of the truth, stoops for a mean end to flatter the public with the falsehood for which poor human beings chiefly crave. Despite his fullness of talk and the unusual remoteness of his interests from those which, unhappily, chiefly claim our solicitude, I never found him either tedious or garrulous. Simple and almost childlike as he seemed, the hearer felt, upon reflection, that in this simplicity was the most cunning refinement of art. I used to fancy that he used conversation as a means of shaping his material and trying out his effects for composition. One was struck with the masterly way in which he handled long and complicated sentences, whose members would fall into line with the precision of a well-trained military company after the confusion of a sudden change of face. Finally, his vocabulary was choice and arresting; to slang he never needed to descend to produce a telling effect; his talk had none of the cheap devices by which we Americans are especially prone to seem witty at no expense to ourselves. He was indeed saturated with the homely proverbial wisdom of Scotland and with the wit and satire of Burns, and loved to lighten his discourse with them; but he never stooped to any hackneyed or vulgar phrase.

In the high Sierra there are trails which lead along the axis of the range, sweeping in great curves far back toward the river-heads in order to avoid the deeper gorges, in places climbing nearly level with the snow-line up where the hardy pines crouch on all-fours — nay, all-twenties, all-hundreds — as if to provide

shelter for storm-bound man or beast; again plunging far down through the shadowy forest to embowered stream-beds where the traveler pauses in the sheen and fragrance of the azalea, and where the water ouzel dances to the fluting and tinkling of the rivulet. Like such a trail in varying charm was the talk of John Muir, dwelling much upon the heights, anon descending to pleasant homely places, giving glimpses at times of Nature's jealously guarded arcana, freely turning aside on the spur of every casual fancy, and when apparently most vagrant, bringing you at last safely into camp at the goal for which you started.

Courtesy of Houghton Mifflin Company

"....I wandered away [after four years' study at the University of Wisconsin] on a glorious botanical and geological excursion, which has lasted nearly fifty years....always happy and free, poor and rich, without thought of diploma or of making a name, urged on and on through endless inspiring, Godful beauty."

Fame pushed its way however to John Muir. His books will live for many a generation to read with delight and with reverence for the man.— And he will be greatly missed in practical work. At the time of his death he was president of the Society for the Preservation of National Parks and vice-president of the California Associated Societies for the Conservation of Wild Life, and always his judgment and personal influence came as authority. [Photograph from *The Story of My Boyhood and Youth*]

Map to show the extent of unexplored territory in the north polar region, and the various points of activity of the Canadian Arctic expedition commanded by Vilhjálmur Stefánsson. The unexplored region is supposed to contain somewhere within it, as proved by a study of the tides, a body of land of continental proportions or an archipelago of islands, such as seen to the eastward

+3. "Karluk" frozen solidly in the ice pack broke from what had been considered permanent winter quarters and drifted westward, September 23, 1913, leaving Stefánsson and hunting party stranded on shore

+4. "Karluk" crushed in the ice pack in which it had been carried four months, and sank, January 10, 1914. Twelve survivors rescued from Wrangel Island, September 7, 1914

+Martin Point. Stefánsson and two companions, March 22, 1914, started north over the sea ice for a thirty-day exploration journey into the unknown region, having heard nothing from the "Karluk" to that time and having arranged for various activities of the southern party of the expedition in winter quarters at Collinson Point. Nothing has been heard from this exploration party to date, one year later in 1915

+1. One of the small vessels of the expedition probably at this point in winter quarters, 1914–15. Proceeded under charge of Wilkins in the summer of 1914 to form base of supplies for Stefánsson should he be able to reach Banks Land instead of returning to the north coast of Canada or Alaska

+2. Winter quarters 1914–15 of the southern land party under R. M. Anderson, having proceeded to this position with two small vessels of the expedition in the summer of 1914 for scientific study of the Eskimo there, of the copper deposits, etc.

WITH STEFÁNSSON IN THE ARCTIC

A BRIEF HISTORY OF STEFANSSON'S MOVEMENTS FROM SEPTEMBER 20, 1913, WHEN HE LEFT THE "KARLUK" ON A HUNTING TRIP INLAND, UNTIL APRIL 7, 1914, WHEN HE WAS LAST SEEN ON DRIFTING ICE, OVER 180 FATHOMS OF SEA AT THE EDGE OF THE CONTINENTAL SHELF IN THE ARCTIC OCEAN

By Burt M. McConnell

Of the Canadian Arctic Expedition, 1913–1914

WHEN early in September, 1913, the drifting ice-field in which the "Karluk" was frozen became stationary about eighteen miles off the mouth of the Colville River in 149° W. longitude and remained in that position for ten days, Stefánsson and Captain Bartlett concluded that the ship was in safe winter quarters. Our four Eskimo, although excellent marksmen, had been unable to hunt seals successfully because the animals were not at that season covered with a layer of blubber sufficient to keep them afloat after being killed, and as fresh meat is the only known preventive of scurvy in the Arctic, Stefánsson decided to take ashore a party, consisting of Jenness, Wilkins and myself, to hunt caribou forty miles inland on the Colville River.

The "Karluk," as is probably known to most readers of the JOURNAL, was carried to the westward by a gale a few days after our departure, and four months later, on January 10, 1914, was crushed by the ice at a point about eighty miles northeast of Wrangel Island which is in 180° W. longitude and 71° N. latitude. She sank the next day, leaving her company of twenty-five marooned on the ice. Under the leadership of Captain Bartlett, sixteen members of the expedition succeeded in reaching Wrangel Island on March 12. Here they maintained themselves in two camps until September 7, 1914. On this date they were rescued by Olaf Swenson in the power schooner "King and Winge," word of their plight having been brought to the outside world by Captain Bartlett. Eight of the original company, including two of the world's foremost scientists, James Murray, oceanographer, and Henri Beuchat, anthropologist, became separated from the main party and have never been heard from since. George S. Malloch, geologist, Bjarne Mamen, his assistant and George Breddy, a fireman, perished on Wrangel before aid could reach them.

The story of the rescue of the survivors from Wrangel Island was told in the February number of *Harper's Magazine*, and in the April issue of the same magazine, will be told the story of Stefánsson's various activities after reaching shore and of the trip over the ice from which he and his two companions have not returned.—Anyone who knows Stefánsson, who is familiar with his singular psychology, his resourcefulness and his determination, would understand that he would let nothing, not even separation from the "Karluk" and the larger part of his scientific staff, interfere with the accomplishment of one of the main objects of the Canadian Arctic Expedition—which was the exploration of as much as possible of the unknown area north of Alaska and western Canada. There could be no surprise therefore at his plan to go northward with dog teams over the ice in search of the group of islands or the hypothetical continent which students of tidal phenomena have argued exists in that area, although the

original plan had been to make the search from Banks Land or Prince Patrick Land with the well-equipped "Karluk" as base.

Our hunting party from the "Karluk," on September 20, 1913, found the ice between the ship and the shore one continuous jumble of chaotic ridges. Often they were thirty-five feet high. We were two days in covering the distance to a small sandspit five miles from Beechey Point on the mainland. Finding the ice over the warmer river water of the Colville delta dangerously thin, Stefánsson decided that during the necessary waiting he would send me with one Eskimo back to the ship for two more men and another dog team — so sure was he of obtaining more than the amount of game the additional team could haul. On the night of September 22, he wrote a letter to Captain Bartlett and gave me explicit instructions covering every possible contingency that could arise on the journey back to the ship.

These instructions were not needed however, for just after midnight a furious northeast gale arose. This increased and continued unabated for three days at the end of which time the sea ice was broken off within a mile of shore. It was very evident that unless the "Karluk" had been able to free herself, she must be drifting before the wind westward in the ice field which had so long been her berth. About one week after reaching "Amouliktok" as the sandspit is called, we ventured over the ice of the delta, gaining the shore September 28.

On October 3 we started westward on the sled journey to Point Barrow. Reaching there we found that what the Eskimo thought was the "Karluk" had drifted past a week before, and that no one had come ashore from her. Stefánsson decided to proceed to Collinson Point three hundred sled-miles east of Point Barrow. We had learned that here Dr. R. M. Anderson and the southern party, which had sailed from Nome at the same time as the "Karluk," in the auxiliary vessels "Alaska" and "Mary Sachs," were in safe winter quarters.

Our journey to Collinson Point was without noteworthy incident. We had rapidly become accustomed to sled travel and soon Stefánsson's extraordinary ability as an ice traveler ceased to excite our comment. His accurate knowledge of local conditions often saved us from making unnecessary marches. Driftwood is plentifully distributed every few miles from Point Barrow to Herschel Island, with the exception of a stretch of forty miles across Harrison Bay and another stretch of twenty miles across Smith Bay. Stefánsson knew just where to look for this and could tell us approximately how long it would take us to travel from our camp of that morning to another suitable site.

Before leaving Point Barrow, he had sent out to various Eskimo villages along the coast south from Point Barrow to Kotzbue, letters of instructions for Captain Bartlett in case he should reach the coast at any point, and on the way to Collinson Point, we left several of the letters with Eskimo at different places for the information of anyone who might come ashore from the ship.

On the last day of our journey, we gained from Stefánsson a demonstration of his ability in sled travel. He had taught Wilkins and me how to pitch camp in a blizzard and how to find our way without the aid of a compass by referring to the snow-drifts made by prevailing winds. On this occasion in a southwest blizzard, with wind blowing at the rate of forty-five miles an hour and in a blinding snowstorm, Stefánsson led us without a trail or a landmark

of any sort for twenty miles, and at the end of the journey was only one hundred yards out of the way. On several occasions that day, the last few hours of which we traveled in darkness, we entirely lost sight of him, although at no time did he ever go more than twenty feet ahead of the dogs.

Arriving at Collinson Point too late to catch the outgoing mail, Stefánsson, with one companion, started for Fort Macpherson to send out despatches, reports and letters. He also made arrangements there for boats and men to help the geographers of the southern party in the work of locating a navigable channel from Fort Macpherson to the mouth of the Mackenzie; he purchased the gasoline schooner "North Star" and her complete outfit of tools, arms, ammunition and provisions to take the place of the "Karluk"; engaged experienced men, Storker Storkersen, who had been with Leffingwell and Mikkelsen in 1906–07, and Ole Anderson and Aarnout Castel, men of many years of Arctic experience, for his contemplated trip northward over the ice, and returned to Martin Point late in February.

In the meantime, Stefánsson had sent me to Point Barrow to bring back Jenness, whom he had left at Cape Halkett to study the Eskimo there, and to get the mail. I was unable to return before March 22, the day on which the ice party started. By having a rest of only three hours and starting out at night from Martin Point, I was able to overtake the party out on the sea ice, and I asked Stefánsson to allow me to accompany him as a member of the supporting party. This party consisted of Captain Bernard of the "Mary Sachs," Wilkins, photographer, Johansen, marine biologist, and Ole Anderson. We were to accompany Stefánsson, Storkersen and Castel due north for ten days, carrying extra rations and dog food.

On the second day out however, Captain Bernard fell from a high pressure ridge and had to be taken back to shore, where the wound on his head was sewed up and arrangements were made with Crawford, one of the engineers, to take his place.

On our second attempt, we came to open water the second day. The ice field on the opposite side was moving so rapidly that it was considered impracticable to ferry across with our improvised sled-rafts, so Stefánsson availed himself of this temporary delay to send Wilkins and Castel back to headquarters with some excess baggage, and for the use of the southern party a few seals we had killed. They started at noon. By four o'clock that afternoon, snow had begun to fall heavily and the light southwest wind had increased to about twenty-five miles an hour. Three hours later we were in the grasp of a hurricane that blew at the rate of eighty-three miles an hour. This razed one of our tents and detached from the grounded shore ice the floe on which we were camped. The next day Stefánsson and Storkersen ascertained by observations that we had drifted about forty miles to the eastward and thirty miles out to sea.

This misfortune, which kept Wilkins and Castel on shore, of course reduced our party to only six men, nineteen dogs and three sleds. We encountered frequent obstacles in the form of huge pressure ridges, over which trails had to be cut with picks, and open water on several occasions prevented us from making rapid progress. We continued nevertheless steadily northward.

Two of our sleds were of the light Point Barrow type, and soon became splintered by the rough ice. (All our best sleds were aboard the "Karluk.") The

third sled was of the heavy Nome freighting style and capable of withstanding the hardest usage. The dogs had been gathered from points between Fort Macpherson and Nome, and were in very good condition. Our tents were light in weight and both water and wind proof.

It usually took us an hour to pitch camp, get dinner over and feed the dogs, after which we would immediately roll into our sleeping bags. Each man, before coming into the tent, was expected to brush every particle of snow from his clothing. This invariable rule of Stefánsson's prevented our sleeping gear from getting damp and insured the comfort of every man who obeyed it. Wilkins and I had been chosen to do the cooking, but when he had been left ashore, both Anderson and Stefánsson took turns with me. It was our custom to have breakfast at six thirty in the morning and, as soon as the meal was finished, everyone except the cook would begin breaking camp, loading the sleds, harnessing the dogs and preparing for the start.

Stefánsson would then take the lead, carrying a small ice-pick with which to test the ice and knock off sharp corners in our path, and we would continue in single file until either open water or a pressure ridge would bring us to a halt. The ice on which we traveled was always in motion, so that on some days our actual progress would be slight, even though we had traveled many miles. This was rather discouraging, but no one ever thought of turning back.

Our drift proved to be to the southeast. Storkersen took observations daily and Johansen took soundings at every opportunity. On April 3, Storkersen's observation was as follows: 140° 50′ 22″ W. longitude, 70° 13′ 11″ N. latitude; while his observation on the last day at "Camp Separation", April 7, gave our position as 140° 30′ 7″ W. longitude, 70° 20′ 4″ N. latitude (about sixty-five nautical miles from shore). We had actually lost ground in those four days! Johansen's soundings, which had been heretofore from 17 to 30 fathoms, went abruptly from 34 fathoms to 70, 149 and 180, which proved that we were on the edge of the Continental Shelf.

Here Stefánsson decided to send Crawford, Johansen and myself back to shore with two dog teams and the two worn-out sleds. He took with him Storkersen and Anderson, two of the hardiest and most experienced men in that country, the six best dogs, the best sled and a load of over nine hundred pounds. This included two rifles and four hundred rounds of ammunition. He told us at parting that he would continue northward for fifteen days before turning back. He also left orders for one of the ships to be taken to Banks Land, in case the winds and current might carry the ice on which he was traveling near enough to the island to warrant him making a dash for it. Since then the party has not been seen, although the "Polar Bear" and "Belvedere" searched the west and southwest coasts of Banks Land in summer.

Our journey back to shore was rather uneventful. There were a few tense moments, when on one occasion, three polar bears came up to our tent. At another time the ice on which we were camped broke up into small pieces, leaving our tent within eight feet of the edge on one side and about twelve on the other. Three days after we separated from Stefánsson we were halted temporarily by coming to a lead so wide that the ice field on the opposite side could not be seen. A southwest blizzard however, closed the lead and we crossed while the pressure ridge was forming.

The wind at that time attained a velocity of about seventy miles an hour, although it did not affect the grounded shore ice on which we then were camped. Two days later our progress was made difficult by the enormous pressure ridges we encountered. One of these was from twenty to forty-five feet in height, half a mile wide, and extended east and west as far as the eye could reach. While on the trip out we had on one occasion progressed eighteen miles in ten hours. Now on one day we traveled only five hundred yards in ten hours. But we finally reached shore late in the afternoon of April 16, on Canadian soil, about eighty miles east of our starting point.

Whaling captains report the spring of 1914 one of the earliest they have ever known. Open water appeared in the vicinity of Cape Bathurst in March and there is every reason to believe that the same weather conditions prevailed on the west coast of Banks Land. Therefore if Stefánsson tried to reach the island he was undoubtedly prevented by open water.

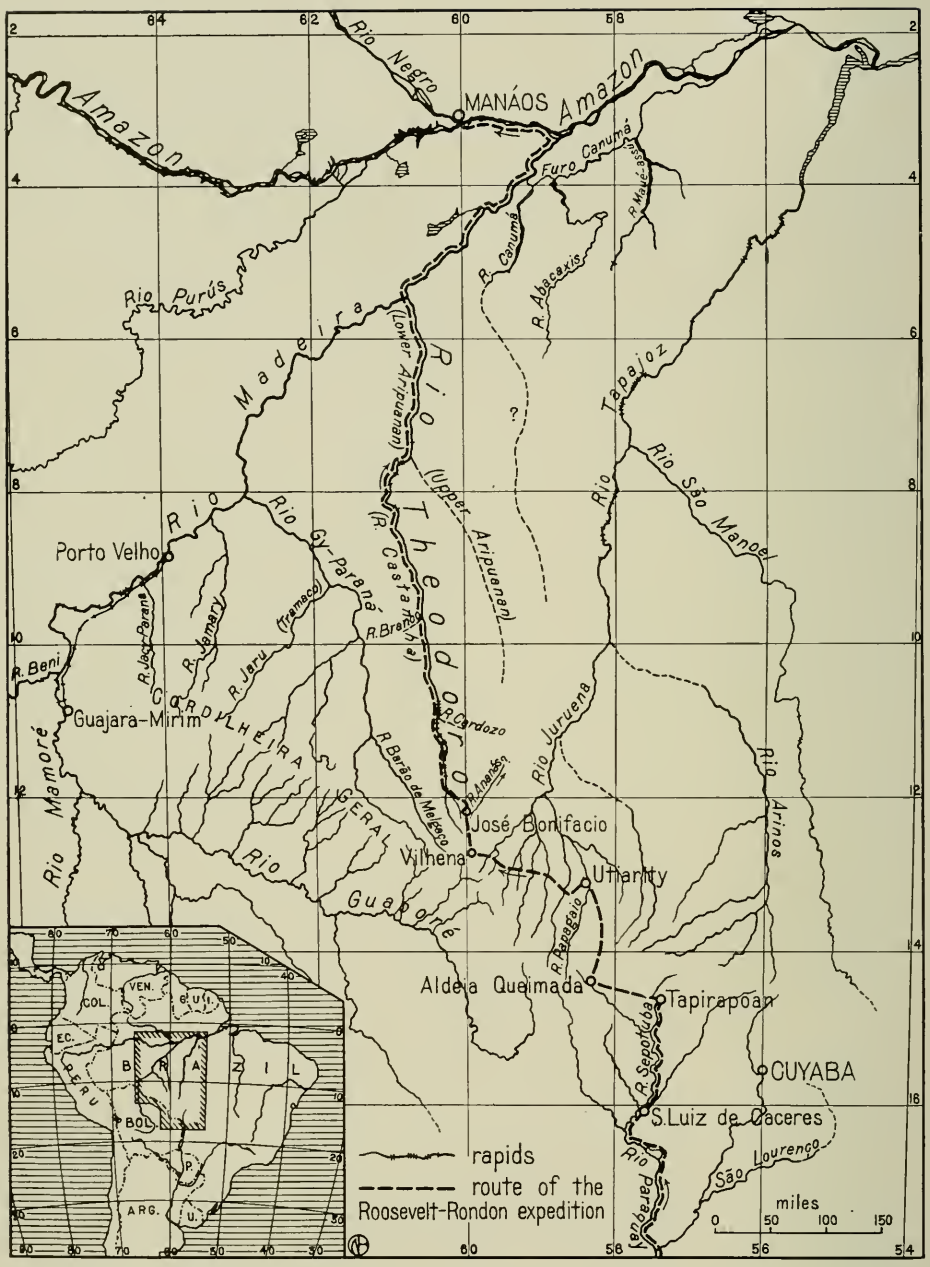
It is possible that he has reached the unknown land he sought and is unable to return because of lack of sufficient food for the journey. But experienced Arctic men agree that the unusually early and rapid westerly drift of the ice must have seriously impeded his progress north and that he is most likely adrift on the ice-pack somewhere in the great open sea between Banks Land and Wrangel Island. Wherever he may be, I firmly believe he is alive and that he could be found by a search expedition.

He and his two companions should have returned to the north coast of the continent in May or June, 1914. When they did not do so — even in July or August, and after two whaling captains had searched the west coast of Banks Land for traces of the party without success, I came out to civilization with the intention of organizing a relief expedition to search for them — and, after I heard that the "Karluk" had sunk, to look also for the eight men who became separated from Captain Bartlett's main party on the retreat over the ice to Wrangel Island.

The plans call for a small power schooner and two to four hydro-aëroplanes with experienced aviators. We would have the machines assembled at Nome and tested before taking them to Wrangel Island. Beginning there and using the ship as a base, we would undertake to search a strip of ice and water one hundred and seventy-five miles long by twenty miles wide daily by having one machine (or better two, one for the relief of the other, if needed) fly at a height of a thousand feet carrying observers equipped with powerful glasses. The machine would proceed one hundred and seventy-five miles in a northwesterly direction, turn at right angles and fly for twenty miles, then turn again and fly back to the ship parallel to its outgoing course. The ship in the meantime would have proceeded twenty miles to the east to meet the incoming machine thus giving the change aviators and the mechanician an opportunity to prepare the second machine for the next day's flight.

Experienced aviators, such as make up the board of governors of the Aëro Club of America, and explorers, including Peary, have approved the plans, and all agree that the work ought to be done.

By such a plan a strip of the Arctic Ocean one hundred and seventy-five miles wide extending from Wrangel Island, Siberia, to Herschel Island, Canada, could be searched in the summer season of 1915 if ordinary weather conditions prevailed.



CENTRAL BRAZIL AND THE NEW RIO THEODORO

Sketch map of the south-central part of the Amazon drainage system, based on the surveys of the Brazilian Telegraphic Commission, showing the course of the Rio Theodoro and the route of the Roosevelt-Rondon expedition. Scale, 175 miles to the inch. The inset shows the location of the main map

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THE GEOGRAPHICAL RESULTS OF THE ROOSEVELT-RONDON EXPEDITION

By W. L. G. Joerg

American Geographical Society

IF we could consult a map — similar to the excellent one of Africa published in the London *Geographical Journal* in 1911 — showing the state of our knowledge, a year ago, of the topography of South America, we would find right in the heart of the continent a blank space as large and as long as Nevada. Across the whole length of this unknown territory lay the route of the Roosevelt-Rondon expedition. Its borders were long well known, although in some cases accurate surveys had not been made until recent years. To the northwest lies the Madeira River, one of the most important highways of the Amazon basin, the authoritative survey of which was carried out in 1878 by an American naval officer, Commander T. O. Selfridge; to the north lies a group of three rivers, the Canumá, Abacaxis and Maué-assú, whose lower courses, which drain into a backwater connecting the Madeira and the Amazon, have been known since Chandless' survey in 1868; to the east flows the Tapajoz, one of the main affluents of the Amazon, long known and in 1895–6 more accurately explored by the French traveler Coudreau; and, finally, to the southwest the unknown area is bounded by the Gy-Paraná, which was properly mapped only in 1907 on one of Colonel Rondon's previous expeditions. These expeditions were undertaken on behalf of the Brazilian government to construct a telegraph line to the rubber settlements on the Madeira and resulted in the exploration of the whole little-known highland region extending from the upper Paraguay to the upper Madeira, together with the drainage systems of both slopes. It was on the occasion of the second of these expeditions, in 1909, that Colonel Rondon came across the headwaters of a river flowing northward. To follow it to its mouth was the object of the 1914 expedition. It might have veered to the left and turned out to be nothing but a source-stream of the Gy-Paraná; or it might have bent eastward and developed into a tributary of the Juruena, one of the sources of the Tapajoz. It did neither. It flowed almost due north and thereby crossed the unknown area from end to end. Therein lies the importance of the discovery.

The new river thus turns out to be the longest known tributary of the Madeira; its length is about 900 miles and it extends over seven degrees of latitude. Its position permits various conjectures as to the hydrography of the region.

To the west, between it and the Gy-Paraná, the interval seems too small to allow a river system of any considerable size to develop; this area is probably drained in opposite directions by their tributaries. A remark in Colonel Roosevelt's book[1] would seem to corroborate this assumption. He tells of hearing of one of the rubber-gatherers who lost his way while working on the Gy-Paraná and, after wandering about for twenty-eight days, finally came out on the Maderainha River, which is a

[1] THROUGH THE BRAZILIAN WILDERNESS. By Theodore Roosevelt. Charles Scribner's Sons, New York, 1914.

small stream joining the new river from the left in about $8\frac{1}{2}°$ S. latitude.

On the other hand, to the east of the new river, between it and the Tapajoz, it is quite possible that larger rivers exist. Indeed, Colonel Roosevelt's narrative makes this very likely. In latitude 7° 34′ the new river was joined from the right by a stream of equal size. That this stream extended up at least as far as 8° 48′ had been established shortly before by the Amazonas Boundary Commission, which ascended to this latitude. It did not even seem unlikely that it might be the lower course of a river, named the Ananás, whose headwaters the expedition had crossed before reaching the new river; in which case it would practically have the same length. This problem, we are told, may be solved soon, as one of Colonel Rondon's subordinates was to attempt the descent of the Ananás this year.

The existence of another large river in this area is made plausible by a further reference in Colonel Roosevelt's book. The year previous, he was told, five Indian rubber-gatherers were working on the Canumá in about 9° S. latitude, thus establishing that it extends at least as far south as this. Chandless' survey did not go above 5° 17′, but the size of the river at this point — in contrast with the Abacaxis to the east, which, in 6° 12′, was a very small stream with the boughs of the trees on its banks joining overhead — made it probable that it rose far to the south. This supposition is expressed on various Brazilian maps, where the Canumá is made to drain the whole region between the Madeira and the Tapajoz and thus, indeed, to usurp the area which, it has developed, is tributary to the new river.

The previous references to the activities of the rubber-gatherers in this region may have called up in the reader's mind the question how the expedition can be portrayed as having traversed unknown territory. It is true that the "unknown" river had been ascended for two-thirds of its length by these men on their search for rubber; the expedition came across the first of them in 10° 24′. Indeed, they had a name for it, calling it the Castanha above the confluence with the river joining it in 7° 34′, and the lower Aripuanan below this point; the right affluent entering here they termed the upper Aripuanan, considering it the main stream. On the upper Aripuanan they had ascended to above 9°. But, to use Colonel Roosevelt's words, "the governmental and scientific authorities, native and foreign, remained in complete ignorance"; no map conveyed an inkling of these facts except the location of the confluence of the Aripuanan with the Madeira. The reason is obvious. Pioneers, although often the first in a new region, generally do not bring back information which can be utilized geographically. In our own West many a miner has been the first white man to go up a mountain, valley or to cross a snowy pass; but the world at large knew nothing of the region until the surveyor had been there.

Whenever a region is newly explored, the geographer's first wish is to see an authentic map of it. In the present case he is doomed to some disappointment. Two of the three maps in Colonel Roosevelt's book represent the new river in some detail. One is a sketch map on the scale of 105 miles to an inch showing the river by itself. While based on the astronomical positions given in the text, a certain stiffness of line and the lack of relation to the surrounding regions betoken an ungeographical hand. The other is a general map of Brazil on the scale of 240 miles to the inch prepared by the Brazilian Telegraphic Commission

and forwarded by Lieutenant Lyra, who had charge of the survey of the river. This is far more satisfactory. On it the drainage of the whole region between the upper Paraguay and the Madeira is represented according to the surveys of Colonel Rondon's expedition of 1909; on it, above all, is the first authentic representation of the new river. Here it has the verisimilitude of nature, but it is unfortunately on too small a scale to show much more than a general outline. What the geographer would like is a map such as that published on the scale of sixteen miles to the inch, of an expedition through similar country from the Xingú to the Tapajoz, by the German zoölogist, Miss Snethlage, whom Colonel Roosevelt met in Belem. But this is almost an ideal case; and it would seem proper to expect the desired information rather from the Brazilian party of the expedition, whose aim was primarily geographical, than from the American party, whose aim was primarily zoölogical. Doubtless a satisfactory map will be, or has been, published in Colonel Rondon's official report, but if it is as inaccessible as are the surveys of his previous expeditions, the present material will long have to satisfy our wants.[1]

In discussing Colonel Rondon's previous explorations, Colonel Roosevelt says that they "received no recognition by the geographical societies of Europe or the United States." This is indeed true — although they did not escape the vigilance of the leading German geographical periodical. Inaccessibility of the official reports, even to the specialist, is the main reason. One of the great merits of Colonel Roosevelt's book lies in the fact that he has made us familiar with the highly important work of the Brazilian Telegraphic Commission. The only original map showing the results of these explorations, which diligent search has revealed, appeared in a Rio de Janeiro newspaper, although it seems very probable that the ultimate source goes back to some official report. This delineation, which was reproduced in the German periodical referred to, is incorporated on the accompanying map for the region between the upper Paraguay and the upper Madeira. To this have been added the new river as represented on the map of the Brazilian Telegraphic Commission accompanying Colonel Roosevelt's book and the various features earlier referred to, in an endeavor to present as correct a picture of the region as possible. Reference to any standard map or atlas will show how greatly it differs.

The difficulties which further beset the conscientious interpreter of this important journey are well illustrated by the question of name. As soon as it developed on the expedition that the new river was a major stream and not simply one of the headwaters of the Gy-Paraná or the Juruena, it was formally christened "Rio Roosevelt" by Colonel Rondon on orders received from the Brazilian government before his departure. Subsequently — because of the difficulty of pronunciation for Brazilians, it is understood — Colonel Roosevelt's Christian name was substituted. On two of the maps accompanying his book this name is given as "Rio Téodoro." This is the Spanish form; in Portuguese the name would be Theodoro. Although it is rather presumptuous to question the accuracy of the name used by an explorer to designate the object of his discovery, the

[1] The authentic map of the river has just come to hand, since the above was written. It accompanies the London *Geographical Journal* for February, 1915. It is on the relatively large scale of 6⅓ miles to the inch and is reduced from a manuscript map supplied by Colonel Roosevelt, which is based on the surveys made by Lieutenants J. S. Lyra and Pyrineos de Sousa under the direction of Colonel Rondon.— W. L. G. J.

latter form is used on the accompanying map, as it seems the more plausible and the Portuguese names throughout the book are not always correctly rendered.

Besides those relating to the discovery of the new river Colonel Roosevelt's book permits various other deductions of geographical interest. The last rapids were encountered in about latitude 7° 30′ S., just below the mouth of the upper Aripuanan. This point is worthy of note, as the last rapids on the southern tributaries of the Amazon indicate the boundary between two of the major physiographic provinces of South America, the Brazilian Highlands and the Amazon Lowlands. This boundary — similar to the "fall line" between our own Atlantic coastal plain and the Appalachian piedmont region — lies increasingly farther upstream as one proceeds from east to west. Thus, on the Xingú it lies in 3° S.; on the Tocantins, in 4°; on the Tapajoz, in $4\frac{1}{2}$°; on the Maué-assú, in 5°; on the Canumá, probably in 6°; and on the Madeira, in $8\frac{3}{5}$° S. Its location in $7\frac{1}{2}$° S. on the Rio Theodoro, between the Canumá and the Madeira, therefore indicates that the even outline of this natural boundary is not here interrupted. The last rapids are also of importance in marking the upper limit of steam navigation — a barrier which, in the case of the Madeira, has been overcome by the construction of a railroad (see map), opened in 1912, which connects with navigable waters on the Mamoré River above.

The contrast between two other natural provinces was very noticeable to the members of the expedition. On the upland plateau of Matto Grosso, which separates the south- and southwest-flowing drainage of the upper Paraguay and the Guaporé from the north- and northeast-flowing drainage of the Madeira and Amazon tributaries, the prevailing type of vegetation is open grassland. To the north lies the jungle of the equatorial forest. The route of the expedition led from the one into the other north of Vilhena in about $12\frac{1}{2}$° S. The former is strikingly pictured in the illustration facing page 174, the latter in the illustrations facing pages 248 and 262 of Colonel Roosevelt's book.

Many other references throughout the book are of geographic interest, such as those on the economic possibilities of the Matto Grosso plateau, on the Parecís and Nhambiquara Indians, and, in the appendices, the pertinent classification of travelers in South America and the comment on the paleogeography of the continent. But above and beyond all this is the record of human achievement. Hardships and dangers there were, even the stern realities of murder and death; but what are these to spirits kindred to that gallant band in the frozen South, over whose grave is so fittingly inscribed, in the words of the grand old rover of the days when the world was young, the eternal longing of the race?

DANIEL GIRAUD ELLIOT

Mammalogist and Ornithologist

Dr. Elliot's personal collection of birds (1869) was the first material of any kind that the American Museum owned, and his purchases and gifts laid the foundation for the great department of mammalogy and ornithology

DANIEL GIRAUD ELLIOT

A BRIEF BIOGRAPHICAL SKETCH ON THE OCCASION OF HIS EIGHTIETH BIRTHDAY TO EMPHASIZE HIS LONG DEVOTION TO SCIENTIFIC WORK AND HIS SERVICES TO THE MUSEUM

THE month of March, 1915, brings the eightieth anniversary of the birth of Daniel Giraud Elliot, the man who with the late Professor Albert S. Bickmore shares the honor of being one of the two scientific founders of the American Museum of Natural History. The original collection of birds belonging to Dr. Elliot was the nucleus of the Museum's later riches and his purchases and gifts laid the foundation of the great department of mammals and birds. Also from the standpoint of knowledge in natural history, he was authority in New York City at the time of the foundation of the Museum, the best-equipped, practically the only man able to give advice in scientific matters relating to the institution. Thus to the trustees of the Museum, men of business who wished to promote science and build up a great educational and scientific institution, Dr. Elliot was an efficient guide. Professor Bickmore conceived the idea of the Museum; he gave his effort to create interest in the plans and to raise funds to carry them out, but he came to Dr. Elliot for advice involving scientific knowledge.

In the winter of 1868–69 when Professor Bickmore had just returned from the Malay Archipelago and the charter for the Museum had lately been given to the body of New York merchants, he especially depended upon Dr. Elliot for advice. He hoped also to obtain Elliot's collection of birds to start the exhibits of the new Museum. The collection consisted of some one thousand specimens, a large number for that early time, covering most of the described species of North America. It had been accumulated during a period of ten to fifteen years, in fact ever since Elliot's early boyhood. This collection at the moment was of considerable concern to Elliot because he was planning to go abroad for an indefinite period of study. No storage building at that time was fireproof and there was also the danger from moths. Therefore when Professor Bickmore suggested that he dispose of the collection to the new Museum, he accepted the plan. This particular collection was the first material of any kind the Museum obtained. It was turned over to J. G. Bell, then the leading taxidermist in New York, and as fast as mounted the birds were put on exhibition in the Arsenal in Central Park, where the Museum had its temporary quarters.

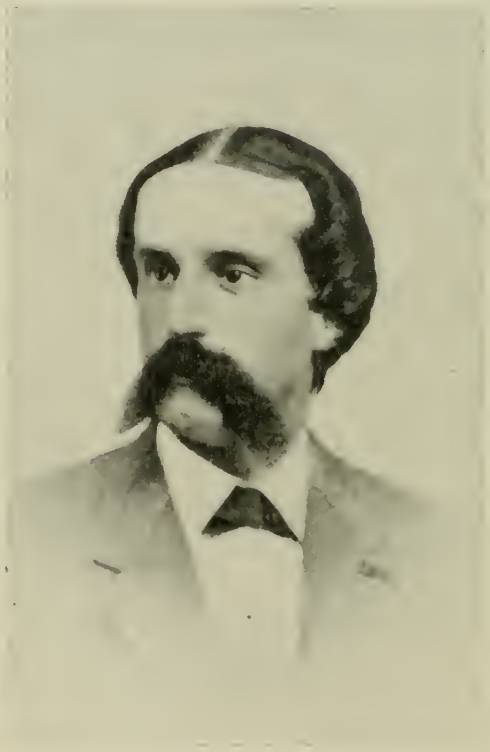
Among the specimens in this collection were five of the Labrador duck.[1]

[1] The following facts were gained from Dr. Elliot regarding the disappearance of the Labrador duck at the time he was a boy:

The cause of the extinction of the Labrador duck is a mystery. The bird was a strong flier and a sea duck, having no special enemies that anyone knew of, and in the earliest part of the last century was a very common bird. Imperceptibly its numbers began to grow less, a fact that at first excited very little comment. When Elliot as a boy in continually adding to his bird collection visited the New York markets, especially Washington and Fulton, he would find many Labrador ducks hanging up for sale, sometimes as many as would make a barrel of them. After a few years, he found however, that the full-plumaged males did not appear, that the birds the markets received were mostly females and young males. Then it began to dawn upon those interested that the bird was gradually becoming extinct, and it seemed from that time on to fade rapidly out of existence. The last bird that Dr. Elliot received, a splendidly full-plumaged male which is in the Museum now, was killed on Long Island.

This bird is now wholly extinct with only forty specimens known in all the collections of the world. The American Museum is highly fortunate therefore. Dr. Elliot's five specimens are exhibited in group form, one of the most valuable of the bird groups in the Museum. At the last sale of this bird one specimen brought five thousand dollars.

At the time of the foundation of the American Museum, New York City was practically destitute of any scientific institutions except the Lyceum of Natural History. This was holding its small meetings presided over by Major Delafield, in a room loaned through the courtesy of the College of Physicians and Surgeons at Fourth Avenue and Fourteenth Street, then the northern boundary of the city. There were few natural history associates therefore with whom Elliot could compare notes. The conditions of the time were vividly stated by Dr. Elliot in his address before the Linnæan Society of New York[1] in March, 1914:



Daniel Giraud Elliot at thirty years of age

I do not suppose my boyhood was different from that of any other lad interested in natural history. I began to make a collection of birds — why I began I have no idea, probably could not help it — and when it verged toward completion I did not know what to do with it, for there was no one of my age anywhere to be found who sympathized with me in my pursuit; I was practically alone.

My cousin, Jacob Giraud, author of the *Birds of Long Island*, had just entered upon the close of his career, and wrote no more. Audubon had entered upon the last years of his life; DeKay had but recently died in Al-

[1] The second annual dinner of the Linnæan Society of New York was held March 24, 1914. Dr. Daniel Giraud Elliot of the American Museum of Natural History, veteran ornithologist and mammalogist, was the principal guest, and there was a notable gathering of scientists from all over the East to do him honor. Many of those present either recounted what they owed him personally or testified to his creative ability when ornithology as a science was still in its infancy in this country. Among those who spoke were Professor Henry Fairfield Osborn, president of the American Museum of Natural History, and Dr. F. A. Lucas, director; Dr. Witmer Stone of the Philadelphia Academy of Sciences; Drs. T. S. Palmer and A. J. Fisher of the Biological Survey at Washington; Messrs. Ernest Thompson Seton and Ernest Ingersoll, the well-known writers on animal life. Other prominent scientists present were Dr. Frank M. Chapman, Mr. W. DeW. Miller, Dr. John H. Sage, Dr. Louis B. Bishop, Dr. William T. Hornaday, director of the New York Zoölogical Park, and Dr. C. H. Townsend, director of the New York Aquarium. At the close of the speech-making the Society presented Dr. Elliot with the Linnæan medal of honor, as a testimony of its appreciation of his preëminent position in ornithology and mammalogy. In reply Dr. Elliot spoke of the science of ornithology as it existed sixty years ago at the beginning of his career; touched upon experiences in the past with many members of the Museum staff who were present that evening, and closed with a few words of advice and encouragement to the younger generation, given with that kindliness of spirit which has endeared him to the hearts of those who attempt to follow in his footsteps.— SECRETARY, LINNÆAN SOCIETY OF NEW YORK.

bany; and in all the cities and within the boundaries of our great state, there was but one working ornithologist, George Newbold Lawrence, a man greatly older than myself, whose sons were my friends and companions, but who had not inherited their father's scientific tastes. Lawrence's collections seemed larger and more wonderful to my youthful eyes than any I have since seen in all the museums of the world.

The condition in New York was pretty much repeated in other parts of the country. In Massachusetts there were no ornithologists. Neither Allen nor Brewster had appeared and their predecessor, Brewer, had hardly been heard from. In Washington the work was represented by Baird, who had just come to the Smithsonian Institution. There was no other naturalist in Washington. Gill as a boy had begun his work on fishes, but the young naturalists, Coues and Ridgway had not yet been heard from

Philadelphia was much better off however. Its ornithology was represented by George Cassin, one of the most erudite and competent ornithologists this country has ever produced and the only one at that time familiar with exotic forms.[1]

The city had its Academy and library donated mainly by Dr. Thomas B. Wilson. Also Leidy was at the height of his career. I used to work a good deal in the old building on the corner of Broad and Sansom streets, my companion often Cope, then starting on his career, his alcoholic snakes and lizards contesting table space with my birds.

In all the length and breadth of the land there was not a periodical devoted to the ways of birds, and it was hard sledging for any young ornithologist. The vast majority of

[1] A few years later through the publication of his Monographs, Elliot was brought into rather intimate relationship with Cassin, owing to the fact that the latter was the head of the firm of Bowen and Company (who served Audubon for so many years).

Dr. Elliot in 1897, when curator of zoölogy at Field Museum, Chicago

EXTINCT LABRADOR DUCK

Four birds from a group in the American Museum consisting of specimens from the original collection of Dr. Elliot which came into the possession of the Museum in 1869. The species has been extinct fifty years and there are only forty known specimens in all the museums of the world. The last specimen sold brought a price of five thousand dollars

the books which are our daily companions now and which we keep always within the reach of our hand, had not even been conceived, much less printed. With the exception of that of Lawrence, there was no private collection of birds of any moment in the whole country — of which the Mississippi was the western boundary. It was but the glimmering of the dawn of that glorious day that was to produce the famous company of some of the greatest naturalists the world has ever seen, most of whom had already crossed the river.

Robert L. Stuart — The trustees of the Museum, through Robert L. Stuart, president, gave large commissions to Dr. Elliot for purchases of material in Europe. It was in this way that the Museum gained such valuable possessions as the Verreaux and Maximilian collections

In the summer of 1869 Dr. Elliot went abroad primarily for study but also with a commission from the trustees through Robert L. Stuart, president of the Museum (who had succeeded John David Wolfe, the first president), to purchase for the Museum any material that he thought advisable. Prince Maximilian of Neuwied had lately died and the family desired to dispose of his collections which he had made on his different journeys through South America and the western part of the United States. Dr. Elliot therefore visited Neuwied soon after arriving in Europe, taking a letter of introduction from the Princess Waldeck to the Prince of Wied.[1] He found the collections valuable because in a state

[1] The following interesting reminiscence is quoted from conversation with Dr. Elliot: "I was very cordially received by the Prince, whom I found to be a young man of perhaps twenty-six or twenty-seven, unmarried, living at the time in the Palace in the wood a few miles from the town, with his mother, the Dowager Princess, and his sister Elizabeth.

My stay in Neuwied, which lasted several days, was very pleasant. I met the Princess Elizabeth, then about eighteen years old, afterward so well known as Carmen Sylva. She showed me in the park the places where they went to hear the stags roar during the hunting season. At that time the present King of Rumania, who was Prince Charles of Hohenzollern, had arrived in Europe from Rumania, and it was generally understood that he was on search for a wife. One afternoon when the Princess was walking with me, she spoke of the matter and wondered whom he would take. A day or so afterward the Prince, a very pleasant,

of excellent preservation, and containing the principal types of both the mammals and birds which the Prince had described. He therefore made the purchase and had the collection sent to the Museum.

Another purchase was selected from the Verreaux Collection in Paris. The Messrs. Verreaux in the Place Royale in Paris had for many years been recognized as the largest dealers in natural history objects then in Europe and their collection of mammals and birds, shells and other material represented specimens from all over the world. Dr. Elliot spent several months studying the collections and as rapidly as he selected birds or mammals, they were mounted by Verreaux and shipped to New York until several thousand specimens had been obtained.

Still a third collection which though very much smaller than the Maximilian or Verreaux, yet afforded some very valuable specimens, was that of Mme. Verdray. From her he got many rare specimens, as the collection was not a general one but consisted more particularly of species which were rare and difficult to procure.

He also obtained valuable specimens from Frank of Amsterdam, a dealer on a considerable scale who obtained material from the Eastern Archipelago, his Dutch connections giving him greater facilities for such enterprise than had any other person in the trade.

It was in the Museum of Messrs. Verreaux in Paris that a group[1] composed of an Arab on a camel attacked by two lions was purchased — not by Dr. Elliot however who preferred to put the 20,000 francs to a purpose more valuable to technical science, but by one of the trustees from New York who was visiting him.

Besides these larger collections Dr. Elliot was able to pick up valuable single specimens from time to time during his stay in Europe. He one day chanced to find in a taxidermist's window in London a specimen of a great auk in winter plumage, which he purchased for one hundred and five pounds.[2]

It was on one of the rare visits that Dr. Elliot made to New York during his stay in Europe that he succeeded in obtaining still further valuable bird material for the Museum. This had belonged to his friend, Dr. A. L. Heerman, had been collected in the western and southwestern portions of the United States, and kept in unusually perfect condition. The collection was bought by Dr. Elliot and presented by him to the Museum. Added to his own one thousand birds which the Museum had gained possession of several years before, it brought the American Museum's collections as regards the birds of North America to a state unsurpassed in numbers and importance by any other collection of the time, unless perhaps by that of the National Museum at Washington.

On his final return in the early eighties

frank personage, arrived in Neuwied, and I with the many others was a guest at the grand dinner given in his honor at the Palace in the wood. It was during that visit that he became engaged to Princess Elizabeth.

[1] The group was done fairly well and had received the gold medal at one of the great expositions. The animals and the man's face too were strikingly well done — for the time. This group stood in the hall of the Arsenal and afterward in less and less conspicuous positions in the new building in Manhattan Square but has considerable value to-day from the historical standpoint. It is now in the possession of the Carnegie Museum, Pittsburg.

[2] This specimen has a prominent place to-day in the bird collection on the second floor of the Museum. The label announces that it is the gift of Robert L. Stuart, which reminds us of the fact that when the great auk shipped by Dr. Elliot arrived in New York, it was paid for by the personal check of Mr. Stuart, then president of the Museum.

after a sojourn abroad of nearly ten years, he brought with him a large collection of humming birds, made during his stay in Europe. At that time it was probably the most complete in the world. He had had the great good fortune to be present when large collections of humming birds, like the Boucier, Mulsant and others, had been broken up and sold, and had therefore fortunately been able to make selections from them all, gaining many rare species and a number of types.

In 1887 when moving from New Brighton, Staten Island, where he had made his home since his return from Europe, he gave this collection to the Museum in the case that he had had made for it. At about the same time the Museum gained Dr. Elliot's books, a very full working library for ornithologists, practically complete for the time with the exception of the serial publications.

Dr. Elliot has traveled in connection with his work more than have most naturalists. He visited the West Indian Islands when scarcely out of boyhood and also the southern portion of the United States, his curiosity and his desire to study and collect specimens greatly excited by the strange birds and mammals that he saw. In 1857 more than ten years before the founding of the American Museum, he went to Rio de Janeiro and did some study and collecting in Brazil. Immediately after, he went to Europe, of course with his interests as ornithologist and sportsman uppermost, passed from Malta to Sicily and on to Egypt, giving a few months to a trip up the Nile, shooting and preparing specimens. He returned to Cairo, formed a party and with camels crossed the long desert to Palestine. On reaching the eastern side of the Sinaitic Peninsula, he journeyed to the land of Moab visiting the ancient city of Petra (capital of Esau's kingdom), also going to Bethlehem and Jerusalem and on into Palestine as far as Damascus, crossing the Lebanon Mountains at an altitude of ten thousand feet, and returning to Europe from Beirut.

Later in life he made two zoölogical trips to Alaska, once as a member of the Harriman Expedition, the researches of which in many volumes are still in the course of publication.

In 1896 he was commissioned by the Field Museum of Natural History in Chicago [he had gone there in 1894 as head of the department of zoölogy] to lead an expedition into Africa to get specimens for the institution. He spent a year in passing through Somaliland and Ogaden and was on his way to the Boran country when he was prevented by illness from carrying on the work. This expedition was highly successful in obtaining specimens of the African species of quadrupeds many of which are on exhibition in the Field Museum to-day. Also somewhat later he led an expedition for the Field Museum into the Olympic Mountains.

He has spent eighteen months in an around-the-world journey since 1906 when he began the preparation of his recently published *Review of the Primates.* He had not progressed very far in the preparation for this work when he realized how impossible it was to do much on the subject in the United States since representatives of the Primates from either the Eastern or Western Hemispheres are very few in American museums. He therefore sailed for Europe in April 1907 and did not return until 1909. During this time he visited place after place, studying the types of lemurs and monkeys both in museums and zoölogical gardens. After working in one after another of the large Euro-

pean museums, he went to Egypt, went up the Nile to the second cataract and then directed his course to India. He studied monkeys of various species there, still other species in Ceylon, and then went over from Calcutta to Rangoon and passed through Burma, going as far north as Mandalay, the old capital on the Irawadi River. Returning to Rangoon he passed over to the Straits Settlements and visited the museums and zoölogical gardens there. He went from Singapore to Java and stopped at Batavia for some time. Returning to Singapore he moved to Hong Kong, passed up the river to Canton, and then returning went to Shanghai. Then he journeyed eight hundred miles up the Yang-tse-kiang River to Hankow, and from there crossed through the heart of China, to Peking, to Tien-tsin, and back by sea to Shanghai. From China he went to Japan, passing through the Inland Sea and landing at Kobe; then to Kioto, where he remained a considerable time because exceedingly interested in the zoölogical gardens and in the wild monkeys which inhabited the forests all around the city. He visited the places in Japan likely to further his researches, and then started for home. On his way to San Francisco he visited a number of the islands of the Honolulu group, among them the one on which is Mauna Loa, the smaller volcano at the foot of Mauna Loa being in action at the time of his visit.

After reaching the United States, Dr. Elliot came at once to the American Museum to devote himself to the research in hand. Somewhat later he went again to Europe — to London, Paris Leiden, Berlin, Dresden, Vienna and Munich, to do certain comparative study still necessary. Comparative data on Primates was difficult to obtain. For more than a century they have been a subject for study by naturalists in many countries and thus the types are to be found in all corners of the earth — wherever scientific research has been done. Since the material is so greatly scattered, it could seldom be brought side by side for comparison of characteristics. Thus the monograph proved to be an immense labor — which was conscientiously accomplished. The work now finished is an elaborate treatment, in three quarto volumes, of the lemurs and monkeys of the Old and New Worlds, as well as of the anthropoid apes. It was published as a monograph [1] of the American Museum.

Dr. Elliot is the author of many volumes [2] besides the recent *Review of*

[1] The series of illustrations in Dr. Elliot's monograph (from photographs by A. E. Anderson) both in fidelity to nature and artistic treatment of half tones, are of an excellence never before reached in works on osteology or craniology. As reviewers have said, ".... by means of more than one hundred photographic plates of skulls, giving lateral, frontal, ventral and dorsal views, the close student of the monkeys has all the world's types, as it were, brought to him. The value of these plates cannot be overestimated, and the work would be a notable one were it merely a portfolio of them."

[2] The following is a list of some of the important publications of Dr. Elliot:

A Monograph of the Tetraoninæ, or Family of the Grouse. 27 pls. col., with descriptive letterpress. fol. New York, 1864–1865.

A Monograph of the Pittidæ, or Family of the Ant Thrushes. 31 pls. col., with descriptive letterpress. fol. New York, 1867. (Second edition, pp. xxiii, 1 tab., 51 pls. col., with descriptive letterpress. London, 1893–95.)

The New and Heretofore Unfigured Species of the Birds of North America. 2 vol. illust. col. fol. New York, 1869.

A Monograph of the Phasianidæ, or Family of the Pheasants. 2 vols. illust. col. fol. New York, 1872.

A Monograph of the Paradiseidæ, or Birds of Paradise. 37 pls. col., with descriptive letterpress. fol. London, 1873.

A Monograph of the Bucerotidae, or Family of the Hornbills. 59 pls. col., with descriptive letterpress. fol. London, 1876–82.

A Classification and Synopsis of the Trochilidæ. pp. xii, 277. text illust. (Smithsonian Contributions to Knowledge) 4°. Washington, 1879.

A Monograph of the Felidæ, or Family of the Cats. 43 pls. col., with descriptive letterpress. fol. London, 1883.

Primates and in addition to hundreds of papers published in scientific journals here and abroad. Some of his books such as *North American Shore Birds* and *The Wild Fowl of the United States and British Possessions* have had some educational influence in bringing about the popular interest in birds that exists in this decade in America. These books are wholly untechnical in character, and were designed largely for sportsmen and bird lovers.

Dr. Elliot stood as an expert adviser for the Museum in its early days. The American Museum would not forget that time or that obligation. In giving him congratulations and heartfelt wishes at this anniversary, we would go back with him to the young days as he recalls the joy of his early collections, the joy of the travel and the work, the joy throughout the years of continued learning and discovery, the joy too of feeling himself a very palpable support to the Museum during the days of its greatest need, before it had even a home of its own. He said at the Linnæan Society dinner two years ago: "As I look around upon this assembly and see so many naturalists gathered here, I am instinctively carried back into the long ago when New York and the Museum and I were young. There is no one here who remembers that time — for I am the sole survivor of those days."

The American Museum of to-day gives him greeting with grateful recognition and appreciation of those days. From all departments the institution extends to Daniel Giraud Elliot the welcome of fellowship in scientific endeavor — whenever to-day he walks through her galleries and laboratories, viewing their present gigantic proportions, seeing also the promised growth of the next few years, and through the eyes of memory living again the institution's early days of which he was so intimately a factor and a guiding influence.

North American Shore Birds: A History of the Snipes, Sandpipers, Plovers and their Allies. pp. xvi, 268. 74 pls. text illust. 8° New York, 1895.

The Gallinaceous Game Birds of North America. pp. 220. 46 pls. and color chart. 8°. London, 1897.

The Wild Fowl of the United States and British Possessions, or the Swans, Geese, Ducks and Mergansers of North America. pp. xxii, 316. 63 pls. 8°. New York, 1898.

Synopsis of the Mammals of North America and the Adjacent Seas. Field Col. Museum Publ. 1901.

The Land and Sea Mammals of Middle America and the West Indies. 2 vols. Field Col. Museum Publ. 1904.

A Check List of the Mammals of the North American Continent, the West Indies and the Neighboring Seas. Field Col. Museum Publ. 1905.

A Catalogue of the Collection of Mammals in the Field Columbian Museum. 1907.

A Review of the Primates. 3 vols. 11 color pls. 32 pls. American Museum of Natural History, 1913.

The Life and Habits of Wild Animals. [In collaboration with J. Wolf]. 4°. 1874.

MUSEUM NOTES

Since the last issue of the Journal the following persons have become members of the Museum:

Associate Founder, Mr. J. P. Morgan;

Associate Benefactor, Mr. Thomas De Witt Cuyler;

Patron, Mr. George F. Baker;

Life Members, Mrs. James M. Lawton, Miss Edith W. Tiemann, Master Henry S. Redmond, and Messrs. Edward W. C. Arnold, Max Wm. Stöhr, James Streat and Frederic Delano Weekes;

Sustaining Member, Mr. J. Kennedy Tod;

Annual Members, Mrs. Fritz Achelis, Mrs. George Percival Coolidge, Mrs. M. E. Dwight, Mrs. M. C. Eschwege, Mrs. Clifford Harmon, Mrs. Charles M. Muchnic, Mrs. Roland Redmond, Mrs. Franklyn B. Sanders, Mrs. C. F. Swan, Mrs. Charles B. Towns, Misses E. H. Davison, Nathalie F. Low, Dr. Adelaide Mills, Dr. W. G. Eckstein, Dr. Bernard Sachs, Master William T. Blodgett, 3d, Master Howard G. Cushing, Jr., Master Ralph Stowell Rounds, Jr., and Messrs. Charles B. Colebrook, C. B. Davison, W. H. Ellis, Sol. Fuld, Thomas Francis Fox, Frederick Frelinghuysen, Richard H. Gosman, Alexander Hamilton, F. J. Huntington, Francis DeMilt Jackson, Edgar A. Levy, Alphons Lewis, Horace R. Moorhead, A. W. Parker, Frederick H. Patterson, Alfred L. Simon, Leo L. Simon, Edwin H. Stern, Moses J. Stroock and Malcolm Herrick Tallman.

A formal word of greeting and appreciation was extended by the trustees and members of the staff of the American Museum to Dr. Daniel Giraud Elliot on the occasion of the eightieth anniversary of his birth, March 7, 1835.

The recent Indian disturbances in eastern Utah and adjoining territory are of interest to the Museum, since the department of anthropology is engaged in an extensive and intensive survey of all the Shoshonean Plateau tribes. In the newspaper accounts the Paiute are made to figure as the trouble-makers. From the geographical data at hand it appears that they are not identical with the tribe so designated by ethnologists, since both the Northern and Southern Paiute, using accepted scientific terminology, live well to the west of the area in question, which does form the home of the Southern Ute. One band of this tribe is called Paiyutsi by the others, and this is apparently the one that has come into conflict with local authorities.

The recent acquisition of a bust of John Burroughs together with a marble pedestal designed to harmonize with the bust was made possible to the Museum through the generosity of Mr. Henry Ford. This interesting piece of sculpture was shown at the last exhibit of the National Academy of Design. The sculptor is Mr. C. S. Pietro.

The annual meeting of the board of trustees of the American Museum of Natural History was held at the residence of President Henry Fairfield Osborn, on Monday evening, February first. The trustees were the guests of President Osborn at dinner.

At the annual meeting of the board of trustees the following trustees were reëlected in the class of 1919: George F. Baker, Henry Fairfield Osborn, Joseph H. Choate, James Douglas and George W. Wickersham. The following officers were also reëlected: president, Henry Fairfield Osborn; first vice-president, Cleveland H. Dodge; second vice-president, J. P. Morgan; treasurer, Charles Lanier; secretary, Adrian Iselin.

The department of education has arranged to extend its courses of lectures for school children by having certain of the lectures which are given at the Museum repeated in three local centers,— namely, the Washington Irving High School, Public School 64 on the lower East side and a school to be selected in the Bronx. This plan will benefit many pupils who cannot afford the necessary carfare to the Museum.

At the annual meeting of the board of trustees the following elections of members were made in recognition of generous contributions and genuine interest in the growth of the Museum: J. P. Morgan, associate founder; Thomas DeWitt Cuyler, associate benefactor; George F. Baker, patron.

Financed by a committee of friends of the Museum interested in the paintings of Mr. E. W. Deming, the work on the series of

murals for the Plains Indian hall will begin at once. The series will include eight panels. Added to his many years spent in study of the Indian and in recording Indian life, Mr. Deming made new studies for the work last summer, especially among the Blackfoot Indians of Glacier National Park. [A portrait of Mr. Deming is shown on page 91.]

As a number of its *Anthropological Series*, the Museum will soon publish a paper by Mr. M. D. C. Crawford on prehistoric Peruvian fabrics. Mr. Crawford's familiarity with all the materials, implements, machinery and processes of present day weaving has enabled him to analyze and describe the processes by which these cloths were made.

The Museum's collections from the ancient graves of Peru contain the cotton and wool in all stages from the raw state to the finished yarns, and contain also looms with cloth in process of manufacture. The fabrics besides being some of the most beautiful ever woven have always excited the wonder and admiration of those who know anything about weaving by their technical qualities. It is difficult to understand how a primitive people, with the simple tools at their command, could have produced cloth technically better than can be made by the wonderful looms of to-day. In some of the fabrics the cotton thread has three times as many turns to the inch as the best cotton thread commonly used in our mills, and the twist is remarkable for its evenness. Some have a warp of forty-two fine cotton threads to the inch, crossed by two hundred and eighty-two ply woolen threads to the inch. This weft had been beaten so compactly that the instrument used in mills to count the number of threads to the inch is useless, and the cloth has to be fastened down firmly and the threads drawn out, one at a time, with a hooked needle point, under a magnifying glass, the counting of an inch taking three and a half hours.

Some twelve hundred specimens of archæological and ethnological material from various parts of the world have been deposited by the Museum at Barnard College, Columbia University, to be used as a study collection by its students of anthropology.

Attention may be called to the fur-seal group just opened to the public in the North American mammal hall, adjoining the recently constructed beaver group. The background, which is remarkable for its illusion of distance, was painted by Mr. Albert Operti. It shows a part of Kitovi rookery at the Pribilof Islands.

From recent cable advices we learn that James Chapin with about one-fourth of the collections of the Congo expedition left Boma on the western coast of Africa January 31. He is expected to arrive in New York the latter part of March.

The exhibits in the Jesup North Pacific Indian hall are being rearranged and the cases repainted to produce a more harmonious color scheme.

The opening lecture of the fifth series of the Museum's "Science Stories" for the children of members was given on Saturday morning, February 20, by Admiral Robert E. Peary. His subject, "Children of Ice and Snow," proved of great charm and he graciously repeated the lecture and showed the Arctic pictures a second time, to the overflow audience of children who waited.

Mrs. William H. Bliss of New York has enriched the Museum's gem collection with a very beautiful blue aquamarine, weighing 144.51 carats. It is a Brazilian stone from Minas Geraes, cut in an oblong brilliant, and easily exceeds in color beauty and size any of the aquamarines previously brought from that locality.

The photograph reproduced in sepia opposite page 102 of this Journal, is a copy of one of two new mural canvases by Mr. Will S. Taylor. It represents Indians of the Tlingit tribe engaged in a shamanistic ceremony for curing the sick, and was recently put in place on the east side of the North Pacific hall. Any reproduction of this picture not in color is unfortunate, since in the color lies a considerable part of its power. The scene is an interior with steps leading down into a room like a pit. Weird figures in dim light sway to the chanting of voices and the beat of a drum, while in the circle of firelight, the shaman in ceremonial dress, his hair adorned with clipped eagle down, dances about the man to be cured. The second new canvas represents Haida Indians in a house-building ceremony. [A portrait of Mr. Taylor is given on page 90.]

THE spring members' course of popular lectures at the Museum was opened on the evening of March 4 by Dr. Wilfred H. Osgood in a presentation of the subject, the "Fur Seals and Other Animals of the Pribilof Islands."

A THIRTY-PAGE pamphlet, the *Report on the Street Trees of New York City* published by the Tree Planting Association of New York City in coöperation with the New York State College of Forestry at Syracuse University may be secured without cost at the sales desk on the first floor of the Museum. This report by Mr. H. R. Francis gives the results of the survey of the trees of the several boroughs of New York City made by him during the summer of 1914, and offers suggestions for an organized system of scientific tree culture especially adapted to New York City.

THERE has recently been installed in the Darwin hall an exhibit of the Galapagos finches of the genus *Geospiza* to illustrate geographical variation as a result of isolation. The Galapagos Islands, made classic through the observations and researches of Darwin, furnish many types of animal life which are not found in other parts of the world, although in most cases they bear resemblance to the corresponding fauna of the mainland of South America. Each island of the archipelago is the home of a species or variety not found elsewhere. While these forms are often distinct from those of neighboring islands, they differ widely from those of the mainland. A map of the islands is shown in the exhibit together with specimens of the various species mounted in such a way as to indicate their geographic distribution on the archipelago. As the degree in which they differ is doubtless correlated with the length of time during which the islands have been separated, a relief map of the archipelago showing the deepening of the channel of the surrounding waters is introduced to further emphasize this correlation.

THE latest addition to the exhibits in the hall of public health is a group showing the enemies of the fly. The setting is a section of a stable with its stable yard, a corn field and orchard showing in the distance. The most important enemies are shown in characteristic activities. A hen is busily engaged in picking up fly larvæ; a toad is waiting under burdock leaves for a fly to appear; swallows are skimming over the yard, catching flies on the wing; wasps are abroad on a similar quest; while in dusty corners of the stable and on the broken window are waiting spiders and centipedes, and waiting bats hang suspended from the beams.

ANOTHER shipment of birdskins, including seven hundred and four specimens collected by Mr. W. B. Richardson in eastern Panama, has been received by the Museum.

MR. FRANK M. BYERLY, who exhibited before the faculty of the Museum in January a long series of autochrome plates in stereopticon views of unusual beauty, will give a lecture to members of the Museum on the evening of March 25.

MR. H. E. ANTHONY has recently been appointed assistant in the department of mammalogy.

DR. DAVID G. STEAD, Commissioner of Fisheries of New South Wales, recently visited the Museum. He is returning to Australia from an investigation of the fisheries of England during the past few months, and expects to visit the United States government fish hatcheries at Woods Hole, Massachusetts, and several other points before sailing for home.

A GENERAL meeting of the New York Academy of Sciences and its Affiliated Societies is to be held at the Museum Monday, March 22. Professor Raymond Dodge of Columbia University will lecture on the "Incidence of the Effect of Moderate Doses of Alcohol on the Nervous System."

THROUGH the courtesy of Dr. Emilie Snethlage the Museum is to receive from time to time collections of birds and mammals from the Museu Goeldi, Pará, Brazil. The first shipment contains six hundred and four birds and fifty mammals and includes several species new to our collections, one of them the wonderful opal-crowned manikin, *Pipra opalizans*, pronounced by Count von Berlepsch to be the "finest bird in the world".

MR. FRANCIS HARPER has been working recently at the Museum, in the preparation of a paper on fish material which he collected on the expedition sent out in 1914 under the Canadian Geological Survey to Great Slave Lake.

The American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

Open free to the public on every day in the year.

The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people. It is dependent upon private subscriptions and the fees from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world. The membership fees are,

Annual Members	$ 10	Patrons	$1,000
Sustaining Members (annually)	25	Associate Benefactors	10,000
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The Technical Publications of the Museum comprise the *Memoirs*, *Bulletin* and *Anthropological Papers*, the *Memoirs* and *Bulletin* edited by J. A. Allen, the *Anthropological Papers* by Clark Wissler. These publications cover the field and laboratory researches of the institution.

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HANDBOOKS

NORTH AMERICAN INDIANS OF THE PLAINS. By Clark Wissler, Ph.D. *Paper*, 25 *cents; cloth*, 50 *cents.*

INDIANS OF THE SOUTHWEST. By Pliny Earle Goddard, Ph.D. *Paper*, 25 *cents; cloth*, 50 *cents.*

ANIMALS OF THE PAST. By Frederic A. Lucas, Sc.D. *Paper*, 35 *cents.*

ILLUSTRATED GUIDE LEAFLETS

GENERAL GUIDE TO THE COLLECTIONS. New edition issued December, 1914. *Price*, 25 *cents.*

THE COLLECTION OF MINERALS. By Louis P. Gratacap, A.M. *Price*, 5 *cents.*

NORTH AMERICAN RUMINANTS. By J. A. Allen, Ph.D. *Price*, 10 *cents.*

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THE ANCESTRY OF THE EDENTATES. By W. D. Matthew, Ph.D. *Price*, 5 *cents.*

The extinct great auk purchased in London by Dr. Elliot and presented to the Museum by Robert L. Stuart. A specimen of this bird would sell for six thousand dollars to-day

THE AMERICAN MUSEUM JOURNAL

HUNTING THE AFRICAN BUFFALO

MAY WOODLANDS IN THE AMERICAN MUSEUM

WILD BIRD GUESTS

JOHN BURROUGHS – AUGUST WEISMANN

The American Museum of Natural History

THE AMERICAN MUSEUM JOURNAL

VOLUME XV APRIL, 1915 NUMBER 4

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MARY CYNTHIA DICKERSON, *Editor*

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JOHN BURROUGHS AND HENRY FORD

[In the first automobile designed and built by Mr. Ford.] The marble bust of Burroughs, recently shown at the exhibit by the National Academy of Design, has been presented to the Museum by Mr. Ford

Photos by A. H. Pratt

John Burroughs and his grandchildren by the well at Riverby. John Burroughs II has just been tossed to his shoulder

John Burroughs and the woodchucks at Woodchuck Lodge. The woodchuck is the only form of wild life on which Mr. Burroughs tries his skill with the rifle

Photo by A. H. Pratt

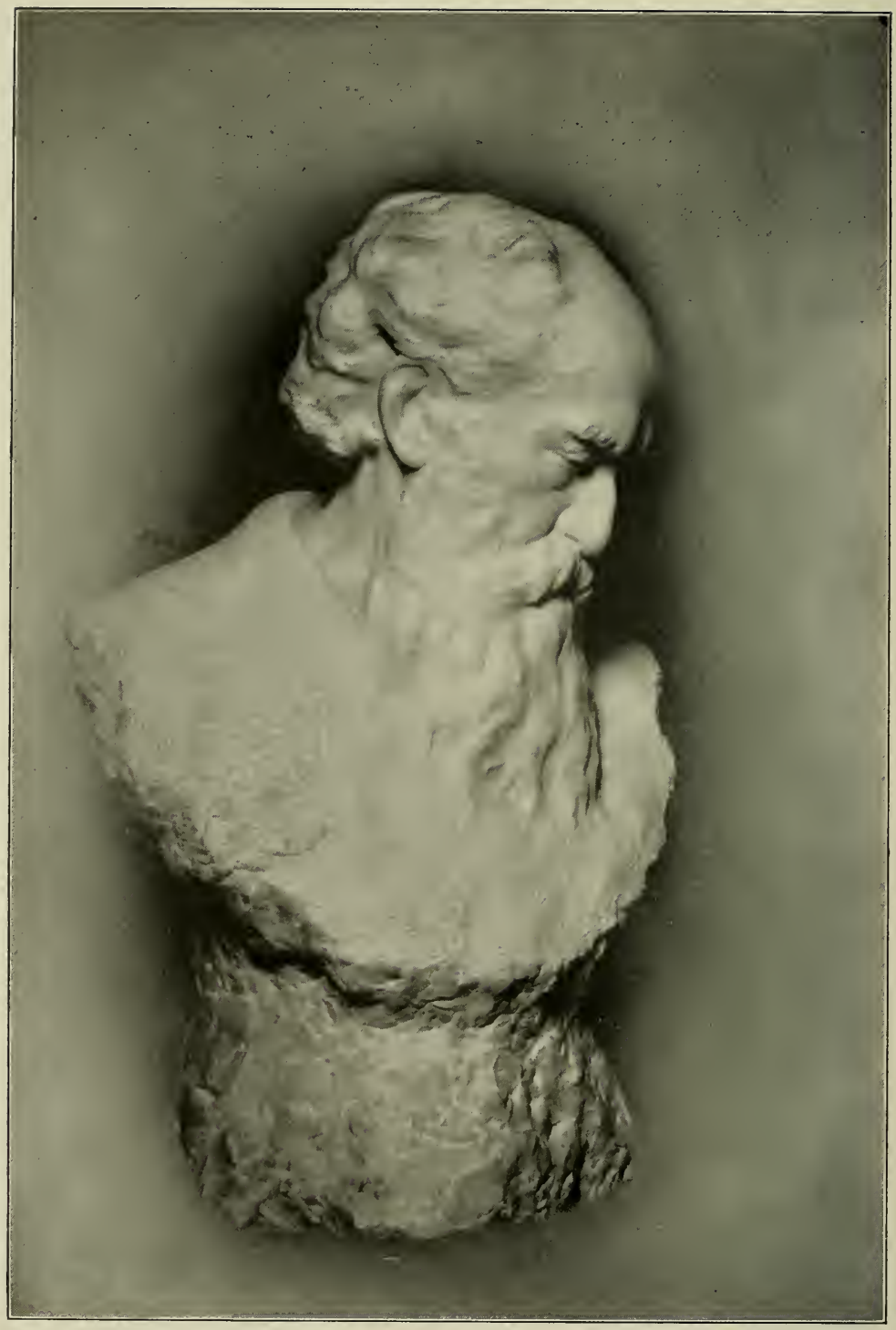
A NATURALIST AT HOME

John Burroughs looking up the Grand Gorge of the upper Pepacton, a stream closely associated with his boyhood and youth

Photo by A. H. Pratt

POSING FOR THE SCULPTOR

On the stone wall across the road from Woodchuck Lodge at Roxbury, New York, while the sculptor, C. S. Pietro, models a statuette. This was the first of the studies of Burroughs that finally resulted in the Museum bust



JOHN BURROUGHS, NATURALIST

This bust of Burroughs by the sculptor C. S. Pietro together with a pedestal in marble to harmonize with the bust, has recently been presented to the Museum by Mr. Henry Ford

— " Note on John Burroughs," page 196

THE AMERICAN MUSEUM JOURNAL

VOLUME XV APRIL, 1915 NUMBER 4

HUNTING THE AFRICAN BUFFALO[1]

ONE OF THE MOST DANGEROUS OF BIG-GAME ANIMALS IN BRITISH EAST AFRICA

By Carl E. Akeley

Illustrations from photographs by the Author

WHEN we first went to British East Africa in 1905, on interviewing the government officials at Mombasa, we learned that our game license would not include buffalo. Buffalo were thought to be nearly exterminated as a result of the rinderpest of the early nineties. There were known to be a few herds however, and finally in view of the fact that the buffalo killed were to be used for scientific purposes, the officials consented to let us have five on payment of a license fee of five pounds each. The arrangement allowed us to hunt at the edge of the reserve at Kijabi where a small herd lived in the bush and forest of the Rift Valley and the escarpment. We were warned that it was very dangerous hunting them there because of the rather dense cover; that they were pugnacious and generally disagreeable creatures to hunt under such conditions.

We arrived at Kijabi and the first afternoon out one of our party came up with a herd and killed a cow — the cow of the buffalo group of Chicago. This was a good beginning and we fully expected to have little difficulty in getting the complete series. Nevertheless at the end of four weeks, having been on their trails nearly every day without securing another specimen, we gave up in despair.

These particular buffalo had been much hunted and had become wary. More than once while carefully tracking a single animal through the bush, we were startled by the sudden stampede of our quarry. The animal having decided to rest perhaps, had turned back to one side of the trail where he had heard us or got our wind. More frequently no doubt, the explanation lay in the eddying currents of air caused by the high and forested escarpment overhanging the low hot valley.

Later on during a month of collecting on the Mau Plateau at an altitude of from 7000 to 8000 feet, we spent some time hunting buffalo in the forests of that region but with no better success. We found only a couple of small herds and single animals, always in dense bush or forest.

Some six months later, when we had met with no further success on the plateau, we gained permission from the government to go across the Tana River into Mount Kenya Province, which up to that time had been a closed district. We were in camp at Nairobi preparing

[1] This story gives some idea of the danger and the hard work connected with shooting six African buffalo for the Field Museum, Chicago, in 1905. These specimens now form a group, recently mounted by Mr. Akeley in the elephant studio at the American Museum and shipped to Chicago for permanent installation there.— THE EDITOR.

AFRICAN BUFFALO IN FIELD MUSEUM, CHICAGO

A group recently mounted by Mr. Akeley for Field Museum, the work being done in the elephant studio at the American Museum of Natural History. The buffalo in the group are as follows, naming from the left: *young bull*, shot by Mr. Akeley at the edge of the great marsh or *tinga-tinga* on the Theba River; *large bull*, shot by Mrs. Akeley on the Tana River; *cow* shot at the edge of the reserve at Kijabi; *calf* and *young herd bull* taken from a large herd on the Tana River. These are a half-dozen buffalo with great scientific value, a series illustrating the development from babyhood to old age

for the journey when one morning a company of the King's African Rifles passed on the Fort Hall road, and we soon learned that trouble had broken out among the natives across the Tana and as a result our trip was postponed.

Some eight weeks later after an elephant hunt on the Abadare Mountains, we arrived at Fort Hall just as the Governor, Sir James Hayes-Saddler, with his suite was about to go across Mount Kenya Province for the purpose of locating the site of the new "Boma" in the newly pacified region. Not only was our permit to hunt in the district renewed but we were invited to accompany the official party as far as our routes paralleled. It had been the Governor's intention to go on a buffalo hunt, when the official work was finished, and it was suggested that we go elephant-hunting on Mount Kenya until the Governor had finished his shooting. To hunt elephant on Mount Kenya was an unexpected privilege; nothing could have pleased us more.

After six weeks we returned from the elephant hunt to the Tana River where we made a base camp, stored the elephant and other skins and proceeded two marches about twenty-five miles down the river. Here we established our "buffalo camp." Buffalo sign was abundant but for many days we came up with none except old outcast bulls, usually two or three together, no one of which seemed desirable specimens. We frequently saw indications of a herd but it was only after many days that we finally found them, and then just at the close of a day so that we were not able to pick out the individuals we wanted. Back to camp we went, ten miles in the dark, through a region that was literally rhino-infested, with the hope that on the following day we could make good with the buffalo. It turned out that we spent a week looking for that herd and never again found it.

One morning however, Cunningham having gone out with some boys to shoot meat for camp, came upon three old buffalo. He sent a runner back to camp with the news and Mrs. Akeley and I started out to join him. Halfway from camp we were obliged to make a wide detour to avoid an old rhino and calf, but soon caught up with Cunningham. He reported however, that the buffalo had passed on into some dense bush. We started to follow, but suddenly came on to two rhinos. We quickly turned to the leeward not to disturb them by giving them our wind, thereby possibly bringing on a general stampede of the game in the neighborhood. This turn brought us to the windward of the old cow and calf that we had first avoided, with the result that she came charging up, followed by the calf close at her heels, snorting like a locomotive. Cunningham helped Mrs. Akeley up a convenient tree. He stood at the base of the tree and I at the foot of another where we poised with our guns ready, watching the old cow go tearing past within twenty feet of us. But the rhino had lost her scent and it was a typical "rhino charge" which means merely a general mad rush up and down in a stupid effort — perhaps to get away from the supposed danger.

We continued on the buffalo trail, but the stampede of the rhino had resulted in alarming the buffalo so that instead of finding them nearby, we were forced to follow them for an hour or more before again coming in sight of them; and again twice more they were stampeded by rhinos that happened to get in our path. At last the buffalo evidently became tired of being chased from place to place, and came to rest on a sloping hillside which we could approach only by crawl-

ing on our hands and knees in the grass for a considerable distance. In this manœuvering it happened that Mrs. Akeley was able to stalk the best bull, and a few minutes later he had been finished off and we were busy photographing, measuring and preparing the skin. Twice during the operation of skinning we had to send our boys to chase off curious rhinos who acted as though they wanted to come in and break up the party. This bull became the big bull of the Chicago group.

Some twenty-five miles to the northwest from the Tana, across the plain on the Theba River, is a marsh, the *tinga-tinga* of the natives, where a herd of nearly a hundred buffalo was known to live, but the Provincial Commissioner had definitely said that we were not to shoot these. We decided finally to ask for the privilege, which was granted but with a warning in the form of an explanation, that he had told us not to shoot there because of the danger involved.

We found the *tinga-tinga* a reed marsh about one by two miles in extent with, at that time, a foot or two of water in the buffalo trails that crisscross in all directions. On arrival, while making camp at one end of the marsh just at dusk, we saw the herd come out on dry land a half-mile away — but they returned to cover before we could approach them. In fact during nearly two weeks that we spent there, we saw them come outside the swamp only twice, each time to return immediately.

We made several attempts to approach them in the marsh but found that while it was quite possible to get up to them, it was out of the question to choose our specimens. Also it would have been impossible to beat a retreat in case of a charge or stampede, so we adopted a campaign of watchful waiting. From the camp at daybreak we would scan the marsh for the snowy cow herons that were always with the buffalo during the daytime. These would fly about above the reeds from one part of the herd to another and at times where the reeds were low they could be seen riding along perched on the backs of the animals. Having thus located the herd and determined the general direction of its movements, we would go to a point at the edge of the marsh where it seemed likely that the animals would come out, or at least come near enough to be visible in the shorter reeds. It was in this way that we secured the specimen that makes the young bull of the group — and two weeks spent at the *tinga-tinga* resulted in securing no other specimen. On this one occasion the buffalo accompanied by the white herons, had come to within about a hundred yards of our position on the shores of the swamp. They were in reeds that practically concealed them, but the young buffalo in question in the act of throwing up his head to dislodge a bird that had irritated him, disclosed a pair of horns that indicated a young bull of the type I wanted. At the same time a heron standing on his withers gave me the clue to his position and aiming some two feet below the bird, I succeeded in killing the bull with a heart shot.

Feeling that it was practically impossible to choose and collect the desired series from this herd, we determined to go back to the bush and plains between the Theba and Tana rivers in an effort to locate a herd that we had seen earlier on the Tana. Knowing that this herd must go daily to water either at the Tana or the Theba, which bounded the two sides of the triangular territory through which we were working, we decided to go down the Theba to its junction with the Tana, then up the Tana to our original buffalo camp. From the swamp down

Part of the expedition crossing the Tana River by the primitive government ferry (1906). At this point near Fort Hall, the government has since erected a pine bridge

Mr. Akeley established his main "buffalo camp" on the Tana River and it was near this camp that the big bull of the Chicago group was shot by Mrs. Akeley. During a second march up the Tana River some months later, the herd of five hundred buffalo was encountered [see photograph on page 159]

The King's African Rifles leaving Nairobi for a scene of trouble in Kenya Province

Family and home of the Wandorobo guide of the Mau Plateau

the Theba to its junction with the Tana occupied three days during which time we saw no fresh sign of buffalo. On the second march up the Tana, as I was traveling ahead of the safari at about midday, looking out through an opening in a strip of thorn bush that bordered the river, I saw in the distance a great black mass on the open plain which on further investigation with the field glasses I was reasonably certain was a herd of buffalo. Sending a note back to Cunningham, who was in charge of the safari, suggesting that he make camp at a hill on the banks of the Tana some two miles ahead of my position and await me there, I started off over the plain with my two gun-boys. Coming up out of a dry stream-bed that I had used to conceal my approach to the herd

I came on to a large herd of eland, and my first fear was that I had mistaken eland for buffalo.

Going farther on the high land however, we saw a herd of about five hundred buffalo lying up in a few scattered thorn trees, some four or five hundred yards away. At first it seemed an almost impossible situation. There was practically no cover and no means of escape in case the herd detected us and saw fit to charge and at that time my respect for the buffalo led me to be extremely cautious. We worked around the herd trying to find some place where a safe approach might be made. Finally seeing a little band of a dozen buffalo off at one side on the bank of a ravine which offered splendid protection, we stalked them but unfortunately not one in the band was desirable as a specimen. Since this was so, I tried them out, giving them my wind, then going up where they could see me better. I found that they were quite indifferent either to the scent or the sight of man. They finally moved off quietly without alarm. I then knew that this herd had had no experience of men or hunters, and that there was perhaps less to fear from them than from the traditional buffalo of the sportsman. So going back to the main herd, I crept up boldly to within a hundred yards of them. They saw me, faced about, closely inspecting me, but with no sign of alarm. It was approaching dusk and in this great black mass it was difficult to pick out a good pair of horns except with

Rhinos in buffalo country. Rhinos may be greatly in the way in buffalo-hunting. Sometimes as many as twenty or thirty were encountered in a single day

the aid of the glasses. I carefully located a fine bull and then shot as I supposed at the one I had located. As I fired, the animals bolted, first away, then back toward me. They wheeled, ran halfway between the dead animal and myself and passing on some hundred yards to the right, wheeled about again and stood watching me, the bulls in the front lined up like soldiers, the calves and cows in the background. On coming up to the dead animal, I found much to my regret that I had shot a cow and not the bull I had picked out through the glasses.

One of our Wandorobo guides while hunting buffalo on the Mau plateau. The bow is protected by a sheath of raw hide wound spirally. This with a quiver of poisoned arrows, and a short sword are his weapons of offense and defense

I returned to camp feeling that now at last from this herd living apparently in the open, we should have relatively little difficulty in completing our series of specimens. On the following morning much to our disappointment, our first glimpse of the herd was just as it disappeared in the thorn bush along the banks of the river. We put in nearly a week of hard work to complete the series.

During those seven days of continual hunting, that herd which had been indifferent and unsuspecting at the beginning became cautious, vigilant and aggressive. For instance, on one occasion near the close of the week, after having spent the day trying to locate the herd, I suddenly came face to face with them just at the edge of the bush at night on my way back to camp. They were tearing along at a good pace, apparently having been alarmed. I stepped to one side and crouched in the low grass while they passed me at twenty-five or thirty yards in a cloud of dust. Even had I been able to pick out desirable specimens at this time I should have been afraid to shoot for fear of getting into difficulties when they had located my position. I turned and followed them rapidly as they sped away over the hard ground until the noise of their stampede suddenly stopped. I then decided that it was best to get to some point of vantage and await further developments. I climbed an acacia tree

Photograph made in 1910, not far from the place on the Tana River where I found the herd of five hundred, four years earlier. Probably a part of the original herd that had been split off

that enabled me to look over the top of the bush. About fifty yards ahead I could see some fifty buffalo lined up in a little open patch looking back on their trail. As I was perched in the tree endeavoring to pick out a desirable animal, I suddenly discovered a lone old bull buffalo coming from the bush almost directly underneath me, sniffing and snuffing this way and that. Very slowly, very cautiously he passed around the tree, then back to the waiting herd, when they all resumed their stampede and made good their escape for the day.

One morning I came in sight of the herd just as it was entering the thorn bush and followed hurriedly on the trail, until just at the edge of the jungle I happened to catch sight of the two black hoofs of an old cow behind the low-hanging foliage. I stopped, expecting a charge. After a few moments I backed slowly away until I reached a tree where I stopped to wait developments. Stooping down I could see the buffalo's nose and black beady eyes as she stood motionless. The rest of the herd had gone on out of hearing and I think she was quite alone in her proposed attack. After a few moments, apparently realizing that her plan had failed, she turned about and followed the herd, moving very quietly at first, then breaking into a gallop.

On the following day we came up again with the herd toward evening in the same region. As we first saw them they were too far away for us to choose and shoot with certainty. We managed to crawl to a fair-sized tree midway between us and the herd, and from the deep branches picked out the young herd bull of the group. When we had shot and he had disappeared into the bush, a calf accompanied by its mother gave us a fleeting glimpse of itself, with the result that we added the calf to our series.

The herd disappeared into the bush and after a few minutes we descended from our perch and inspected the calf, then started off in the direction the wounded bull had taken, and found him lying dead just a few yards away.

This completed the series much to our great joy, for by this time we were thoroughly tired of buffalo-hunting. It had

been a long hard hunt and our safari as well as ourselves were considerably the worse for wear. To shoot a half-dozen buffalo is a very simple matter and ought to be accomplished almost any day in British East Africa or Uganda, but to select a series of a half-dozen that will have the greatest possible scientific value by illustrating the development from babyhood to old age is quite a different matter. To the average sportsman the one would be sport, the other hard labor.

The young bull of the African buffalo group, with one of Mr. Akeley's gun-boys. The photograph shows the character of the marsh vegetation

These buffalo of the Tana country, that we found on the plains and in the bush, apparently rarely or never go into the swamps, a fact not only confirmed by observation but also indicated by the condition of the hoofs. These are horny, round and smooth as a result of traveling on the hard and more or less stony ground of the region. Whereas the *tinga-tinga* buffalo have lived in the swamp for years and spend practically no time on hard ground, hence the hoofs are long, sharp and unworn as a result of walking always in the soft mud and water. All this in spite of the fact that these two herds may actually come in contact at the edge of the swamp. Other herds living in forest country, which come out into the grasslands to feed at night, always go back into the forest at daybreak.

In Uganda where buffalo are recognized as a menace to life and are of no particular value except for food, they are officially treated as vermin and one may shoot as many as he will. Here the herds have increased to an enormous extent and because of the dense jungles and general inaccessibility of the coun-

try, it is rather difficult to hunt them. While elephant-hunting in Uganda we found the buffalo a decided nuisance, frequently coming on to them unexpectedly while hot on an elephant trail, sometimes having difficulty in getting rid of them, not wishing to shoot or stampede them because of the danger of frightening away the elephants, to say nothing of the constant menace of running into a truculent old bull at very close quarters in dense jungle. The buffalo actually mingle with the elephants, each quite indifferent to the other, excepting that on one occasion we found elephant calves charging into a herd of buffalo, evidently only in play. They chased about squealing and stampeding the buffalo, who kept at a safe distance but did not actually take alarm. Occasionally an old cow whose calf was being hard-pressed by the young elephants would turn, apparently with the intention of having it out, but would always bolt before the elephant could actually reach her. In spite of the fact that the record head, fifty-four inches in spread, was shot by Mr. Knowles in Uganda, from our general observation, the heads in Uganda run smaller than those of British East Africa while the animals are perhaps heavier.

Kikuyu porter with buffalo skull

While on our buffalo-hunting we have never had any actually serious encounters, we fully appreciate that the buffalo deserves his reputation as one of the most dangerous of big-game animals. His eyesight is good, he has keen scent and is vigilant and vindictive. While the lion is usually satisfied with giving his victim a knock-out blow or bite, the buffalo when once on the trail of man will not only persist in his efforts to find him but when he has once come up with him, will not leave while there is a vestige of life remaining in the victim. In some cases he will not leave while there is a fragment of the man remaining large enough to form a target for a buffalo's stamping hoofs.

A QUIET CORNER

Three Fowler's toads in the new "Toad Group" at the American Museum of Natural History

THE "TOAD GROUP" IN THE AMERICAN MUSEUM

A WORD AS TO ITS COMPOSITE CONSTRUCTION AND INTEREST

Group designed and construction directed by M. C. Dickerson; panoramic canvas by Hobart Nichols; detailed wax and color technique on the animals of the group by Frederick H. Stoll; group assembled by Ernest W. Smith and Frederick H. Stoll

By Mary Cynthia Dickerson

THE new group, fourth in the reptile and amphibian series, has been made with three important objects in view: first that it should set forth various facts in the ecology and general biology of amphibia; second that it should be more easily read than a book by those who wish to learn these facts; and third that it should be as beautiful as is the original spot lying under the sunshine of May in Rehoboth Township, Massachusetts. There should not be left out however even momentarily, a fourth aim which has controlled the work from first to last. This is that the group, while made up of the most delicate and fragile of constituent parts, should be permanent in construction, capable of lasting unchanged for decades, in fact indefinitely, if not destroyed by fire or earthquake.

In its scientific scope the group aims to set forth certain simple facts many of which are very well known to zoölogists and laymen alike who wander much afield. These include such items as the difference in appearance and in time of breeding (in southern New England) of nine species of common amphibians,[1] and the identification for the ponds of northeastern North America of the amphibian eggs commonly seen. These latter include the eggs of frogs, represented in the group by the freshly laid eggs of the green frog and hatching eggs of the pickerel frog; those of salamanders, in the whole range of which there is more variation than among frogs, but among which the eggs commonly found are those shown in the group, the large gelatinous masses of the spotted salamander; and lastly those typical of toads, represented by eggs of Fowler's toad in the group, the long gelatinous strings in which the eggs are imbedded at intervals. The eggs in the group are accurate reproductions in glass treated with color and wax spray, and are the first attempt by museums to represent them as far as known.

Some of the unusual facts set forth, the results of original investigation in the field, concern such points as the distinction between the two species of toads and difference in their adaptation to low temperature as shown in their different

[1] The group includes specimens of two kinds of tree frogs, the tiny "spring peeper" (*Hyla pickeringii*) whose voice in chorus carries over the countryside a half mile or more in early spring, and the common so-called "tree toad" and "weather prophet" (*Hyla versicolor*); two species of toads, the American (*Bufo americanus*), breeding in the middle of April, and the smaller, grayer, more agile Fowler's toad (*Bufo fowleri*) coming to the pond from its hibernation the first week of May; three frogs, the green frog (*Rana clamitans*) often confused with the larger bullfrog (*Rana catesbiana*) (See bullfrog group), the spotted pickerel frog (*Rana palustris*) confused with the leopard frog (*Rana pipiens*) (See casts in synoptic case), and the little brown wood frog (*Rana sylvatica*) inured to the same low temperatures as are the amblystoma of the region and the peeper, thus appearing in March from its winter sleep in the mud; and finally two salamanders, the big black and yellow spotted salamander (*Amblystoma punctatum*) which is more often seen in damp places on land than in water, and the common small brown newt never seen out of water after it is one year old.

breeding times,[1] the swimming of the two-thirds grown tadpoles of the wood frog in definite schools as do fishes and the possible presence in the ooze at the bottom of the pond of a "nest" of adult amblystomas usually sought for on land only.

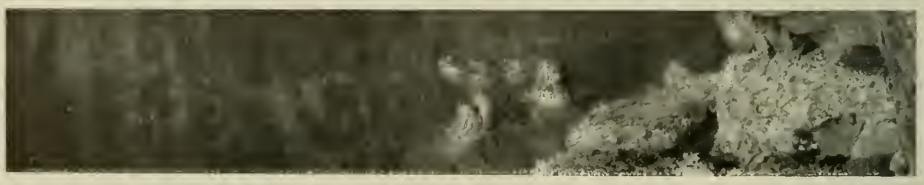
In working out the educational value there was a considerable problem. It was necessary to arrange the some one hundred animals of the group, besides the eggs and tadpoles, in a space a few feet square, with clearness for study. The final arrangement evolved, aims to make a quick appeal to the eye as to a distinct separation of different species, relationship of different stages of development of a given species, truthful position of all in the environment, and this with no sacrifice of scientific accuracy or of the actual probabilities and without crowding or arranging in synoptic form which would have killed the artistic effect.

Artistic effect in reptile and amphibian groups seems of particular importance, a thing to be striven for, for here we must overcome a large measure of more or less active dislike for the subject. The completed group therefore has been made an illustration of the fact, but recently used in museum installation although now recognized as fundamental in all work of an educational character, that beauty is not incompatible with scientific value in an exhibit. On the other hand, it may strengthen the appeal of science.

The following quotation from a letter recently received from Mr. William Henry Fox, director of the Museum of the Brooklyn Institute of Arts and Sciences, touches the matter of art value in natural history exhibits:

> My recent visit to the American Museum impressed me greatly with the artistic beauty of the reptile and amphibian groups. There is no reason why artistic effect as well as scientific truth should not always be taught in this way. I hold that without this essential, groups are of little educational value in a popular museum. The uninformed public must first be "taken into camp" as it were, with a visual impression which gives pleasure. I recognized at once in these groups conscious employment of the elements that the painter uses in making a picture on a flat canvas, such as composition, color harmony, the chromatic gamut and aërial perspective. He employs one medium; here is used another means to the common end — namely, the interpretation of natural phenomena. One of the secrets of the effect is that with all the animal and plant species, introduced with fidelity to natural effect and ecological order,

[1] The plan of construction of the group includes a small pool of water at the left separate from the main pond and intended exclusively for the American toad with its tadpoles (while the specimens of Fowler's toad with freshly laid eggs are in the large pond at the right), so that there can be no possible confusion in the comparison of the two.



nothing has been permitted to obtrude into the picture. As in nature the infinitely varied manifestations of inanimate life and the creatures that abound in the water, on land and in the air are only details in the one universal conception of beauty.

From the artistic standpoint the construction of the toad group, it must be admitted, was also a problem: to create with artificial materials (wood and plaster, wax, glass, papier-mâché, celluloid and oil paints) an illusion so perfect that the observer will be actually deceived as to the realness of the objects; then to arrange these objects in a pleasing composition. There had to be careful handling of the colors, and especially of the lights, and the concrete foreground had to be blended with the panoramic painted background with proper perspective, in order to give illusion as to the naturalness of the scene as a whole.

The main difficulty lay in maintaining the balance, allowing nothing to take on ultra importance scientifically or pictorially, while still making the attitude or action of each of the animals the resultant of the demand of the location in the group (with consequent relations to neighboring animals) and the known habits of the species. It was at this point in the construction that decision was made to leave out or to subordinate in position various large enemies of toads and frogs. The skunk for instance eats toads, first rolling them forcibly under his paws until the poison has been exuded from the skin glands. The muskrat varies his menu in spring by the addition of an occasional frog or toad, and hawks and owls as well as herons and even crows are known to include amphibia in their diet. I have seen a chipmunk hastening to his burrow with a woodfrog in his mouth and the red squirrel is very fond of meat in the spring after his winter on nuts and seeds. The only "enemies" of any size which found their way finally into the group are a red squirrel watching from the stone wall back of the apple tree, a water snake in the act of capturing a Fowler's toad but made inconspicuous by a projecting moss-covered root in the right front of the group, and a spotted turtle deep in the water at the rear and evidently the cause of the lively scurrying of the school of pollywogs.

It will thus be realized that in preserving the balance in the scientific, educational and art values of the group, the position of any animal is truly "strategic," and that its placing was not a simple matter and never a chance matter, but was determined by necessity in the fulfillment of the various demands.

A piece of original, complex, construc-

tive work is always a delight in the doing and the designer will always hope that what has been put into it will be taken out by one or another who stands before it. To create the new group has come as an opportunity to give back in a small measure here in the heart of New York City what was received some years ago from an intimate acquaintance with the New England "wilderness." Naturally no mere words can carry the news of the woods at any season with the vividness of the reality, even though that reality be set in a still picture. Words are weak indeed also to transmit the magnetic attraction nature exerts over man. They fail utterly to convey what will produce the personal reaction of feeling such as is wrought into one who lives out-of-doors and sees continually the most commonplace scene take on meaning and beauty — perhaps under the influence of the mist of dawn, the quietness of dusk or the blackness of storm, perhaps when it is lashed by wind and rain, or afterward transfigured in a radiancy of sunshine.

It is in this last mood that the recent group has been fashioned and in May, the season of new life, with the thought that perhaps this concrete picture would be able to do what words accomplish but inadequately. That in it there would be seen with unusual vividness and attractiveness the natural history facts involved, and that perhaps, in addition, there would be felt — by a child here, a lover of beauty there, the poet everywhere — some part of nature's subtle personal invitation and some reflection of the spiritual response which the original scene might invoke.

Redstart and parula warblers.— May is the month of warblers and the gay-foliaged branches are filled with them, yet they are difficult to locate. (From the Toad Group)

DETAIL OF THE "TOAD GROUP"

The group emphasizes in its fine detailed technique the expert work in wax and glass of the Museum's artists

THE "TOAD GROUP" IN

A New England woodland scene created in permanent form in the American Museum. Everywhere are suggested joyous sound and movement and the exuberance of new life. Birds are just at the moment of flitting; toads and "tree toads" are calling

THE TIME OF MAY

A wild apple tree is in bloom over a tumble-down stone wall. The wild flowers — cowslips, columbines, jack-in-the-pulpits, anemones and trilliums — are so perfectly made that it is difficult to see that they are not real

A COVE WHERE GREEN FROGS LIVE

Detail from the Toad Group in the American Museum of Natural History

AQUARELLES OF OUR COMMON WOODLANDS[1]

By Warren H. Miller

Editor of *Field and Stream*

OUR Museum has many wonderlands of American wild life upon which the hungry city dweller may feast his eyes, but none more beautiful than the collection of scenic cases presenting the amphibian life of the ponds and brooks of our familiar woodlands. It is a veritable fairyland that one enters here, a fairyland in more ways than one, for it is the gateway back to one's own forgotten youth, a fairyland having the power to touch the mystic chords of memory and reawaken the keen pleasures that one experienced, with the tenfold sensitiveness of youth, when going into the woods in the springtime to collect wild flowers, to renew acquaintances with the birds, and to watch the still pools for signs of the activities of the small creatures which give the touch of life to such places.

I presume that these cases are given such prosaic names as the "toad group," and the "bullfrog group," but my soul will have none of it. To me the scene presenting the life of our common toads, is *May;* fresh, bounding May, the eternal New Year of the wilderness: when the new leaves have just unfolded, soft and feathery as fine plumes, the forest floor is carpeted with anemones, dog-tooth violets and jack-in-the-pulpits; and every dell has its wild bird finding melodious breath over the nodding sprays of Solomon's-seal. When I look upon that scenic picture of May in the woods I hardly see the wild life at all, at first. I see, dimly, a Boy of Ten, with a net and an aquarium pail, and dimly recognize in him my own weatherbeaten and battle-scarred self. That boy is — somehow different. He is free, and barelegged, and eager with the devouring eagerness of childhood; keen in his observation of every least detail of the pool beside which he is standing. It is a pool very like the one shown in the scenic case, every feature of the latter recalling similar scenes that were then of poignant interest to the Boy of Ten. Impelled by the hunter's ardor of pursuit and the scientist's eagerness to collect new specimens, the boy is gradually filling his pail with fish, tadpole, froglet and turtle, until after a morning's work he returns home triumphant and adds the spoil to the wild life already inhabiting his large aquarium. I suppose that nearly every boy who lives anywhere within reach of our ordinary woodlands has maintained an aquarium; certainly all the boys in our town did, and therein lies the appeal of the "May" scene to many observers of the male persuasion. To the feminine minds also come memories: of girlhood days in the Maytime woods collecting wild flowers, memories coupled probably with amazement that the abundant pond life of these same woods had been utterly overlooked during the careless days of youth.

Of course in these groups, the wild life of many pools must be concentrated into one, perhaps far beyond the capacity of the normal insect supply to support life. The boy who spent his morning collecting for his aquarium had, I am sure, to visit many such pools to secure even part of the complete series shown here — but there were no doubt many creatures

[1] Photographs for this article and the preceding as well as for the four-page sepia insert, made from the Toad Group by Mr. Julius Kirschner, Museum photographer

that he did not see in hiding in each pool, while here in the group all are brought out into plain view. Moreover, while your memory may tell you that you have seen just such a pool many times in the woods, as a matter of fact you have seen no such pool, for Nature, in her grand, haphazard way, has no place for Art in her small canvases; she shows a detail here and a detail there, but to assemble a complete scene that will lead the eye hither and yon according to the prearranged purposes of the artist, requires a skillful staging of the scene, using only legitimate natural "properties," and this Miss Dickerson has most ably done for us.

Describing the groups more in detail, the May scene, representing specifically the life histories of our various species of toads, frogs and tree frogs, assembles all of them under the banner of early spring. A stray wild apple tree on the right, with its abundant pink-and-white blooms; a tall blueberry in full blossom; various familiar vines and shrubs just coming into leaf; young hornbeam saplings, and a couple of sturdy oaks and red maples, proclaim a water scene in mid-May, and set the stage for the amphibian life that we can expect to see at that time. The eye further notes cowslips, violets, trilliums, jacks, dog-tooths and anemones as the plants in blossom, while the curls of unfurling ferns tell us yet again that spring is here. The hylas or "tree-toads" are out in force; everywhere in the natural places for them one espies them out, while attached to crimson spikes of water-plant down in the still, clear depths of the pool are their clusters of pearl-like eggs, for this is their breeding season. Various kinds of frogs and toads occupy important positions on the right and on the left of the case; down in the water are the egg masses just laid, and hatching

egg masses with tiny tadpoles pendant from the original matrix, and other tadpoles just detached are to be noted clinging to leaves and sticks. Over on the mossy promontory under the jacks are wood frogs just coming out of the water, while in the pool near them are their young tadpoles in a school, proving their communal instinct as they swim hastily away from the approach of a spotted turtle.

We not only see these hylas and toads and frogs as we stand before the case but in memory we hear them too, the blending of melodious trill and bawling call of one and another. They make the springtime vocal. How it is done is suggested for some of the species in the group — that little sac under the chin is blown up by Mr. Lovelorn until full of wind, like Shakespeare's "lover, sighing like a furnace," and, without opening the mouth, the penetrating notes issue forth, made by the vocal chords in the throat and reënforced by this vocal sac. I recall an experiment made by the Boy of Ten to settle a dispute as to whether the hyla or the toad made a certain bawling sound — a sound which comes to me faintly now as I remember and listen. It was on a still night, encamped by a mountain lake, when incessant amphibian calls of one kind or another made the principal night sounds. The boy crept far out onto a great rock, jutting into the lake. All about in the darkness had been the calls. Silence instantly ensued with his coming, but after a five minute's wait, the calls began again. Softly lighting a candle, no fewer than six toads were discovered within the distance of a few feet. Presently one of the toads distended his throat pouch and issued his song. Followed him another, and another — and the dispute was settled for good.

TOADS AT THE POND IN MAY

Four Fowler's toads (in the Toad Group at the American Museum), one swimming, a second just coming up from deep water, and two singing with throat resonating sacs expanded. Fowler's toads resort to the pond about the first of May (in southern New England, some two weeks earlier in New York). The small black eggs enclosed in gelatinous strings are to be seen in the lower part of the photograph

Some of the enemies of toad life are also shown in this group; two ribbon snakes on the left are ready to take toll of the small "spring peepers" which are whistling their high-pitched tones with throat bubbles well expanded, while a big water snake on the right has engulfed one of the toads. Finally the bird life of this time is not omitted for we note in trees and bush many of the warblers, the small flitting birds so typical of May: black and white creeper, Maryland yellowthroat, Blackburnian warbler, redstart and chestnut-sided and yellow warblers — these and others are here for the sharp eye to see.

The scenic case of next appeal to me is the one I call the June case — I suppose it bears the more practical designation of the "bullfrog group" in museum parlance. But to me it is June, late June, no less! A deep, sunny pool in the hot sunshine of mid-day is this. We guessed that the time-o'-day of the May scene was morning, from the dew-drops twinkling on leaf and flower, but here all these have evaporated, and it is high noon in warm mid-summer. The scenic group shows the life of one of our most common frogs in our common lily-padded pools; a scene so familiar to all that its appeal stirs the heart of every one of us. Who has not stood contemplating such a pool; with these clumps of blue-spiked pickerel weed ranging away into the cool backwaters under the shade of giant forest trees, these small turtles scrambling awkwardly up over the flat lily pads in the foreground, that bullfrog diving into the deep water and leaving on the surface a string of bubbles as he expels the air from his lungs; those newts poking their way along the bottom! Every detail of the scene is familiar, and no detail precious to memory has been omitted. There is our old comrade, the water turtle, just diving off a stump (as we generally see him!) while the "bullies" are everywhere and all doing something that illustrates one or another of their life habits. Here is one that has just snatched up a mouthful of young water snakes, a whole squirming mass of them, which he is cramming into his mouth with a very human-like hand. Here is another, looking up expectantly at a wood mouse in a bush, for the bullfrog is omnivorous and will eat anything that he can catch and then swallow down his capacious throat. Here is another that has just snitched in a bumble-bee off a wild white azalea (in full blossom so that we *know* that it is late June or early July), and the way he does it with his extensible tongue is well set forth. At this time of the year, too, frogs peel off the old skin, as shown by that fellow on the right who is just disrobing, and eating the old skin — frugal Frenchman — that nothing be lost! Bullfrog tadpoles are here, too. It takes about two years to get up to frogdom from tadpolehood, and the whole process, including losing one's tail and living just above the water on a tiny snag, is shown here. Here also are some of the enemies of the "bullie." A black snake lurks behind that azalea and his sinister intentions are only too evident. One large bullfrog who has seen him is "playing stone," knowing well that the snake's eyesight for inanimate objects is not over-keen. He has gathered himself into a smooth round wuzzle of green, and the snake sees him not. The latter is so intent on a young bullfrog, which in his turn is so intent upon a chickadee just alighted on a birch branch above him, that a double tragedy seems imminent.

To the left of this scene is the September case, so-called the "giant salamander group." It is a big trout stream with yellow-leaved sycamore and ripening frost grapes hanging over, and blue asters

IN THE WOODLANDS BEYOND THE TOAD POND

Rehoboth Township, Massachusetts

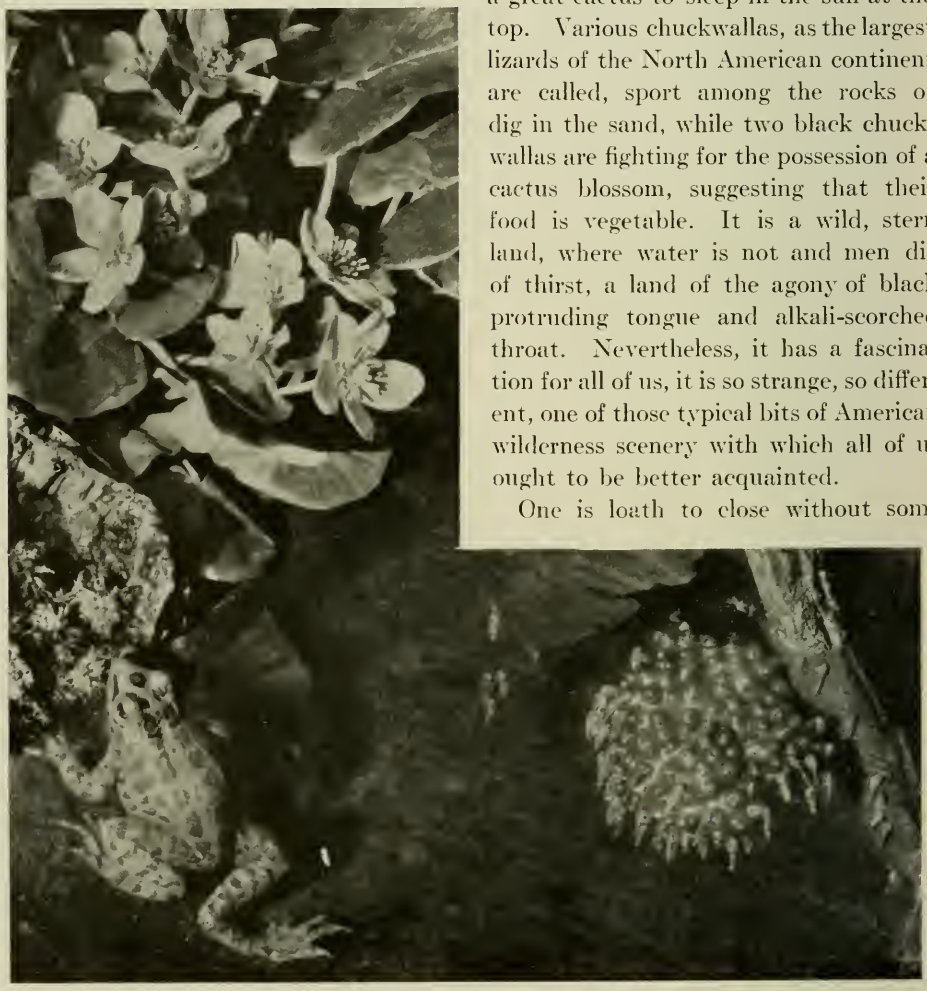
bending low to the water. A kingfisher sits above, and the water flows toward you over many a rocky riffle, streaming the long fronds of brookweed in the current; flowing, flowing endlessly — right into your lap seemingly, a wonderful example of arrested motion by the artistry of the Museum preparators who *will* have Nature presented to us just as she appears in reality. Even the very stones of the brook bottom have that brown, velvety look that comes of settled sediment, and that peculiar slippery covering that brings many a trout fisherman to grief! Herein are depicted the life history and habits of the giant salamander, familiar to those who wade the mountain streams. A greedy voracious beast and a cannibal, with clumsy ways. Here is one that has seized a fish of the school which is swimming upstream, for in spite of his clumsy body, the salamander's protective coloration, blending exactly with the rocks of the brook bed, enables him to lie in wait until a brook fish hovers over him — when he is quick to strike, and his mouth opens the full extent of the width of his head. Here are two big fellows fighting over a string of eggs. The one on guard over the eggs was lying among them under the rock watching, when along came a second salamander and started to bolt the eggs, whereat

About a moss and violet covered root in the water (from the toad group). The common "tree toad" or so-called "weather prophet" (*Hyla versicolor*) is in the pond but a short time and then resorts to the orchard, the garden or edge of the woods. Notice the small clusters of this hyla's pearl-like eggs on the water plants

he has been seized amidships by the angry guard, although how well he is to be finally punished for his misdeed the scene does not tell us. Young salamanders are to be seen foraging along the bottom, and the red, land form of the newt is out on the bank of the river to serve as a standard of size for comparison with the giant species.

Another group, which I have never had the good fortune to observe in the natural state, is that showing some of the reptilian life of the desert. Looking seaward on an island in the Gulf of California, appears to be this scene, the red volcanic rock, the cactus life, saguaro, ocotillo and palo-verde, being prominent in the stage setting. Under a volcanic fissure is the lair of a great rattler of the desert, he is just raising his head from his coils to look over the possibilities of prey outside. Small highly colored desert lizards are there for the catching, and an iguana is climbing up over the spines of a great cactus to sleep in the sun at the top. Various chuckwallas, as the largest lizards of the North American continent are called, sport among the rocks or dig in the sand, while two black chuckwallas are fighting for the possession of a cactus blossom, suggesting that their food is vegetable. It is a wild, stern land, where water is not and men die of thirst, a land of the agony of black protruding tongue and alkali-scorched throat. Nevertheless, it has a fascination for all of us, it is so strange, so different, one of those typical bits of American wilderness scenery with which all of us ought to be better acquainted.

One is loath to close without some



The pickerel frog (*Rana palustris*), with head above the surface of the pond (photograph from the Toad Group), and old egg mass and hatching tadpoles. The portion of decayed stump and sphagnum moss beside it (at the left) are real, the frog, tadpoles and marsh marigolds are wax, the egg mass is blown glass

word as to the inspiration these groups[1] give to go out and see for oneself these scenes put forth so powerfully. The appeal to children is strong; they are the nature lovers of the future, in whom the love of wild life imparted by the great story of the Museum cases will bear fruit in better protection of what wild spots we still have left. We know nothing about immortality, but this we know, that in our children we *do* live, and in them there will be carried forward what character the world once knew as ourselves. The Boy of Ten stands in the flesh before me, myself, yet also so different, my own son, just turned ten years. How do these scenes strike him? Well—there is little that those bright blue eyes overlook; not a tiny detail that passes unnoticed. He is living in the midst of the thing, not viewing it from a distance as we older ones must. Every scrap of pond life refers at once to his own aquarium: here's where you look for this particular kind of tadpole — he did n't know that there were several varieties of tadpoles before; that backwater is the place where those newts grow; never knew before that those peculiar greenish warty bulbs were a frog's egg mass, thought all eggs were in strings like toad's eggs — Oh, these cases were a mine of practical information to him, and we look for a large increase in the population of the aquarium this spring! And, what of that other child, not so fortunate as to have his mind directed from infancy to the world of the great out-of-doors and with no large country-side to roam over, the city waif who comes in here to look — and wonder? Who can tell but that many such receive their first call to go back to the land, here; to forsake the crowded slum where body nor soul has a chance, and to earn their bread in *their* future close to the green soil, with just such a pond right over the dip of the hill!

And what of the older ones, we whose pathways in life are fixed, and may not be changed because here in the city we earn the bread that those dependent upon us must eat? What of the appeal to us? Here is Nature, spread before us; Nature in her most charming mood, with her silver filaments of still waters, her teeming abundance of humble (but not really familiar) pond life. And Nature can be found within an hour's train or trolley ride of the city. Shall we presume that, to the thousands who look upon these scenes there comes no desire to look again at the forgotten brookside? To discover for themselves many things besides flowers and birds, things that were before passed over unheeded, not knowing what to look for, nor realizing what a wealth of interest lay here untouched? Shall we not rather rest assured that thousands have here had reborn in them an inspiration to revisit old scenes, and a resolve not yet to let the home country-side relapse into the limbo of forgotten memories, not yet to let one's love of Nature be deep-buried in the dust of the city's turmoil.

[1] Photographs of the reptile and amphibian groups of the American Museum, other than the Toad Group will be found in previous issues of the JOURNAL as follows: Bullfrog Group, October, 1911; Giant Salamander Group, December, 1912; Lower California Lizard Group, February, 1914.

HAULING A GRANITE BOULDER FOR A BIRD BATH

If we wish to bring the wild birds near us, we must remember that in hot weather and especially in time of drought, there is nothing more attractive to them than cool shallow water in which to bathe

BIRD BATHS AND DRINKING POOLS[1]

By Ernest Harold Baynes

IN hot weather, especially in time of drought, there is nothing more attractive to birds than water. They need it to drink and to bathe in, and when the natural pools and streams are dried up, they will come from far and near to visit a properly constructed bird bath. At the very time this chapter is being written the weather is very hot and dry and birds are coming to the artificial baths in this village, Meriden, New Hampshire, not one at a time, but by scores. Only this morning they gathered at a little cement bath just outside my study window, and gave it the appearance of an avian Manhattan Beach. I saw two bluebirds, a chewink, a white-throated sparrow, a song sparrow, a junco, a chipping sparrow and a myrtle warbler, all bathing at once and at least a score of other birds were hopping about in the grass or perched in the bushes nearby, awaiting their turn. There are similar scenes at nearly all the bird baths in Meriden.

One example will suffice. In the Bird Sanctuary there is a bath made from a granite boulder, or rather half a boulder, for it was split in two, ages ago, probably by the frost. It broke in such a way that one half had a gently-sloping concave surface and we took this half, turned the concave surface uppermost that when filled with water it might form a natural pool for the birds. It was set upon a well-made stone foundation, and a hole was drilled down through to admit a lead pipe which supplies running water. As I approached this bath one evening after sundown, I saw the whole surface of the water dancing as though a shoal of little fish were sporting in it, and spray was flying in every direction. It was simply a flock of birds taking their evening bath. Perhaps because night was coming on they were too impatient to wait their turn, for all seemed to be trying to get in at once, and most of them were successful. Juncos seemed to be most numerous, but there were several bluebirds and myrtle warblers and some sparrows which in their wet plumage and in the uncertain light I could not identify. A little apart a phœbe sat on a twig above the pool, watching for chances to dip down into the water for an instant, after which she would return to the twig to preen her feathers. Birds come to our bird baths every day in summer and fall, in an almost continuous procession, but usually just a few are present at the same moment. They come in large flocks only at exceptional times, usually during severe drought.

Bird baths may be as simple or as elaborate as one likes. A rough earthenware saucer from six inches to twelve inches in diameter and with half an inch of fresh water in it, is a great deal better than nothing and may attract some of the most delightful birds. I have seen robins, catbirds, Baltimore orioles and rose-breasted grosbeaks and many others bathe in an earthenware saucer. But the supplying of water is so very important that most of us will wish to do rather more than put out a saucer. Even from a selfish standpoint it is well to give birds all the water they want. If we do, they will be much less likely to destroy our small fruits which they sometimes eat chiefly for the fluid contained.

[1] This article is from Mr. Baynes's forthcoming book, *Wild Bird Guests and How to Entertain Them.* E. P. Dutton and Company, New York.

In making any bird baths, the first thing to look out for is the depth of the water. Few of the birds which will come to bathe will use water of greater depth than two and a half inches, and even for blue jays and grackles five inches is about the limit. But most birds will not jump off into any such depth, so if we had a pool with a uniform depth of two and a half inches, birds would come and drink, but few if any would bathe. So we must arrange for shallow places where the birds can enter the water; they will go in deeper presently, but they are very cautious. Half an inch is a good depth for the shallows and if the depth grades off to nothing at all, so much the better. A bath which the writer invented some time ago and which has proved very popular with the birds, is made on the principle of a flight of broad steps, each one of which is two feet long and seven inches wide. There are five of these steps, each one-half inch lower than the last, so that when the water is half an inch deep on the top step, it is two and a half inches deep on the bottom one. The birds invariably enter the water at the top step. Their favorite steps are the second and third; they seldom go lower than that. The bottom is covered with clean sand and bright pebbles from a trout brook, and here and there among them are strewn beautifully tinted shells.

Birds will come from far and near to visit a properly constructed bird bath. Mr. Baynes has seen in a simple little cement pool like this of the photograph seven species of birds at one time: bluebirds, a chewink, a white-throated sparrow, a song sparrow, a junco, a chipping sparrow and a myrtle warbler — and at least a dozen other birds awaiting their turn nearby

Close beside the bath is a wooden tray of earth, on which are scattered every morning, birdseed of several kinds, bits of bread, a little suet, ripe raspberries

and a piece of banana perhaps, as additional attractions for the feathered guests. The smallest visitors are the chipping sparrows, gentle, modest little fellows, that come to the food tray quietly as mice, crack a few seeds, and then take a bath on the top step where the water is shallow. Almost burly in comparison, are the purple finches, which come, often two or three at a time, make a full meal in the food tray, and then souse themselves thoroughly in the deeper water, regardless of theories concerning the dangers of bathing too soon after dinner.

Perhaps the most amusing visitor is a catbird, which has a nest in the lilac bush, from whose top, in the early morning, he sings his wonderful song so surprising to those who know him by his cat-call only. He comes boldly to the food tray, hops lightly about, jauntily flirting his long tail, swallows a ripe raspberry, takes a bite or two of banana, and then proceeds to inspect the bath as if he had never seen it before. He cocks his head first on one side and then on the other, hops into the shallow water and begins to peck at the shells and pebbles at the bottom. Perhaps he will take one in his bill and hold it for a moment before dropping it back. Then he goes out into deeper water, and with wings vibrating as though operated by an electric current, takes a thorough bath "all over." When he comes out, he is a sorry-looking object, dripping wet and with tail-feathers stuck together. But apparently he cares nothing for appearances, and proceeds with his toilet forthwith. He shakes himself vigorously, flips his tail from side to side to get rid of the bulk of the water, and then it is surprising how soon, with the aid of his deft bill and a warm sun, he makes himself into a clean fluffy catbird again.

Sometimes, toward evening a bluebird visits the bath, and after washing himself in a very business-like way, flies off to a dead tree to preen and dry his feathers. Occasionally a phœbe comes, but apparently takes a bath more from a sense of duty than from any love of bathing. He seems to dislike cold water about as much as does the average small boy, for instead of getting right into it as most birds do, he flits through it, barely getting his feet wet. Perhaps this habit has been acquired by repeatedly darting after insects, and possibly is common to all flycatchers; at any rate I have seen a kingbird bathe by dashing through the water of a stream time and again, returning after each dip to a snag, from which he made a fresh dive after stopping a moment to preen his feathers — and perhaps to catch his breath.

The song sparrows are perhaps the most numerous visitors to this bird bath; they come earlier and stay later than any of the other birds. They act as if they owned this particular sheet of water, three feet by two, and if any other bird ventures too near while a song sparrow is bathing, the former is promptly driven away. These sparrows seem to love the water, and not only splash in it, but squat right down in it until practically nothing but their heads are sticking out. Sometimes when it is almost dark, and the last red tinge of afterglow is reflected in the tiny pool, a couple of dark spots on the shining surface tell just where two little song sparrows are cooling off for the night.

We have been altogether too busy to keep close watch on this bath but at different times we have observed the following birds using it: flicker, phœbe, Baltimore oriole, purple finch, white-winged crossbill, American goldfinch, vesper sparrow, white-throated sparrow, chipping sparrow, junco, song

sparrow, chewink, cedar waxwing, black-and-white warbler, Nashville warbler, myrtle warbler, chestnut-sided warbler, catbird, brown thrasher, hermit thrush, robin and bluebird. Probably there have been many more which we have not observed.

The arrangement of steps, while interesting, is by no means necessary. A bath about three feet long, two feet wide and three inches deep, with a continuously sloping and roughened bottom, starting at one end half an inch from the top and ending at the other at its lowest point, would probably answer the purpose just as well. Speaking of the roughened bottom, reminds me that almost if not quite as important as the depth of water, is the character of the footing on the bottom. This should never be slippery, for birds lose confidence when they find they cannot keep their feet. A layer of coarse sand or fine pebbles will usually give the desired "footing" in a bird bath, and a slippery pan or dish can be rendered safe by placing in it a freshly-cut sod, having about half an inch of the grass submerged. This makes a wet spot such as many of the small birds are very fond of.

Concrete is very useful for the construction of pools for the comfort of birds; it may be used alone, as in the case of a bird bath in my own garden, or in connection with natural rock cropping out above the earth. The former was made as follows. I scooped out in the lawn an elliptical hollow, four feet by three feet six inches, the sides sloping down in all directions toward the center where the depth was four or five inches. I then took some Portland cement and some coarse sand and mixed the two, in the proportion of one of cement to four of sand, adding just enough water to give the consistency of common mortar. Then with my hand, I plastered the surface of the hollow, putting in enough to make the depth at the center about two and a half inches. I was careful not to make the sides too smooth, although the concrete itself gives an excellent foothold for the birds. We have no running water in this; about once a week we sweep the water out with a stiff broom and put two pails of fresh water into it. It has been a complete success, and being within ten feet of the house we have had great pleasure in watching the birds from the windows and from the piazzas. We have seen six bluebirds — the parents and four young — bathing in it at once, and at other times there have been whole flocks of song sparrows, white-throated sparrows and juncos, in addition to the many birds that come in smaller numbers. With a few shrubs and hardy flowers planted about it, such a bath can be made a beautiful little feature in any garden. And of course there is no reason in the world why it should not be made much larger if one has plenty of room and the time to make it.

Dr. Ernest L. Huse, president of The Meriden Bird Club, has a somewhat similar bath in his garden, but he has carried the idea a little farther. In the center he has sunk a tub, and from the rim, which is perhaps two and a half inches below the surface of the ground, the concrete slants outward and upward in all directions, making shallows in which the birds will drink and bathe. In the tub, pond lilies are planted, and spread their leaves and blossoms over the surface. Round about, shrubs and tall grasses are planted, and here and there among them one catches a glimpse of little food trays, filled with hemp and millet which tend to keep the birds about the spot even when the bath is over. There is hardly a limit to what

Two and a half inches is about the proper depth of water for a bird bath, with five inches the maximum for blue jays and grackles. A successful bath may be provided with an arrangement of steps under water, giving shallow spots for the bird's cautious entrance and deeper places for his later delight

From a hearty meal at the food tray birds may fly directly to the bird bath, entering the shallowest water first, then sousing themselves thoroughly in the deepest part — with no respect for theories regarding a bath too soon after dinner

Such a pool at dusk may emit a flying spray from the wet plumage of bathing bluebirds and song sparrows, while an exclusive phœbe is waiting on a branch above for a chance to cool off for the night by a few dashes through the water. A concrete pool with flowers planted about it, may be made an attractive feature of any garden

shrubs or grass about it, for behind such things a cat will crouch.

I have spoken of a bird bath made of a granite boulder; we have two like this in Meriden, New Hampshire, and they are among the most satisfactory baths we have. The one in the Meriden Bird Club's sanctuary, estimated to weigh five tons, was lying where the glacier left it on a hillside rather more than a mile away. For the benefit of those who may have similar baths in view, I will say that several teams of oxen were required to move it, and that to haul it, set it on a good foundation of stones,

may be done with concrete in this way, especially if it is used in connection with beautiful stones, pebbles, sand and shells.

Of course in the case of bird baths which are not raised well above the ground, great care must be taken that the little bathers are not pounced upon by cats, which would otherwise have the songsters at an unusual disadvantage. In the first place the birds are so engrossed with the joy of the bath that they are less wary than usual, and their feathers being wet they fly slowly and heavily, often close to the ground. If we cannot be sure about cats, we must either have the bath raised well above the ground on some object which a cat cannot climb, or else we must be content with a very plain bath out in the open, without

A bird bath in the Bird Sanctuary at Meriden, New Hampshire, is made in the natural hollow of a split granite boulder. The boulder has been placed upon a stone foundation and fitted with a pipe leading upward through a hole drilled in the boulder to give a continual supply of fresh water

BRONZE BIRD FOUNTAIN

Executed by Mrs. Louis Saint Gaudens for the Bird Sanctuary at Meriden

and drill a hole through it for the water pipe, cost forty dollars. It is a beautiful object, very suitable for its purpose and will last forever. It was presented to the Club by a Boston lady who desired to establish a bird fountain in memory of her friend, Dr. Edward Everett Hale, himself a lover of birds. I often think how much more appropriate as a memorial to a real man or woman is a beautiful thing like this, made by Nature, carved by her mighty forces, and dedicated to the use and enjoyment of the loveliest of her children, than is a shining, ugly and utterly useless polished shaft, whose chief recommendation is that it costs from a hundred to a thousand times as much.

The lovely bronze fountain executed by Mrs. Louis Saint Gaudens, is another of the charming features of the Bird Sanctuary at Meriden, and makes one realize that with the sculptor as an assistant there is no end to the artistic bird baths which may be designed. This particular bath was made in commemoration of the first presentation of Percy MacKaye's Bird Masque, *Sanctuary*, and was presented to the Meriden Bird Club by a New York lady who witnessed the play. It will be seen by the shallowness of the basin at the top that my remarks about the depth of the water apply just as much to a formal work of art as to a granite boulder or an earthenware saucer. The rule about surface also applies, and the sculptoress purposely left the surface of the inside of the basin slightly rough that the feet of the little bathers might not slip. Below the shallow bowl and in bas-relief may be seen in procession the principal characters who took part in the masque. Below these are interesting inscriptions, some of them historical, others consisting of quotations from the masque itself. Of these the one that sends the reader away filled with determination to do something for the cause of bird conservation is the compact proposed by the poet to the converted plume-hunter and the naturalist: —

A compact, then, that when we go
Forth from these gracious trees
Into the world, we go as witnesses
Before the men who make our country's laws,
And by our witness show
In burning words
The meaning of these sylvan mysteries:
Freedom and sanctuary for the birds!

In the country of the Apache Indian

MOTION PICTURE RECORDS OF INDIANS

FILMS THAT SHOW THE COMMON INDUSTRIES OF THE APACHE

By Pliny E. Goddard

THE ethnologist is not primarily concerned with the actual objects displayed in a museum. The true subject matter of ethnology is made up of the habitual movements and activities of a people. An Indian on horseback does not differ in general appearance from a white man in that position, but the fact that an Indian mounts from one side and a white man from the other constitutes an important fact in ethnology. It is one of the small habits which in their combined effect make the difference between a white man and an Indian. Such habits are the most important means of making comparative and historical studies in ethnology, for they are generally learned from one's neighbors or ancestors. Through them, therefore, one may trace the distribution of habits and customs geographically or historically.

In the past, such habits have been studied by observing the daily life of a people and reducing such observations to writing, using drawings and photographs as illustrations. It is tolerably difficult to observe and record every significant movement involved in the work of a single individual engaged in such a simple task as making a flint arrowhead. When several individuals are engaged in the same undertaking, it becomes impossible for a single observer to follow the movements of each worker.

The moving-picture camera furnishes an excellent method of making a permanent record of the movements of one or, if properly localized, of several people. This record can be scrutinized in detail for as long a time as is desired and can be viewed repeatedly. It records many things which otherwise would not be made objective, such as the characteristic nervous coördinations and movements of different people. To make such records of value, great pains must be taken not to arouse self-consciousness in the subjects being photographed. Such unavoidable self-consciousness as

1 — Posture assumed and position of the hands in discharging an arrow

2 — From the film the movement of the hands in basket-making can be observed

3 — Liquid pitch is being applied to a basket to render it water-tight

arises when one first faces a camera disappears as the persons become interested in the work or ceremony.

It would require a very long time to secure a record of the various industries of a tribe if these were all taken as they are actually performed as a matter of yearly routine. In practice, it is necessary to have these duties undertaken for the special purpose of photographing them. When this is done, however, it is usually possible to allow the subjects to assume their own poses and positions even if the result is less attractive in arrangement. The photographer needs only to insist on a proper relation to the source of the light. To take the entire action of a piece of work lasting for several hours, such as the preparation of the pitch and its application to a water basket, involves too great an expense and more film than can be utilized. In such cases it is necessary to have the camera constantly in position, and to operate it only when movements of significance occur. It is seldom necessary to change its position for simple industrial acts.

During a field trip to the San Carlos Apache this year a small daylight loading camera was employed. Films were made of such industries as basket-making, the boiling and applica-

tion of pitch to make a basket water-tight, the gathering of mesquite beans, the grinding of corn, the preparation and cooking of the century-plant stump. Men were photographed flaking arrow-heads, feathering arrows, and putting sinew on a bow. The rather simple process of discharging an arrow from a bow, taken on twenty-five feet of film, illustrates the position of holding the bow and the arrow release practised by the Apache, two points of considerable comparative interest. It was not possible to secure films of religious ceremonies because of the superstitious attitude of the Indians. Films of a gambling game in progress and of two old men taking a sweat bath were secured.

Considering the results obtained, the method is not excessively expensive. It ought to be applied systematically and energetically in North America, while there are Indians still living who have habitually performed these native industrial acts. After the disappearance of primitive life, films of this sort will be invaluable.

1 — Apache women shelling acorns and grinding and shelling corn
2 — Gathering mesquite beans, the pods only of which are edible
[*Still pictures taken in connection with motion films*]

AUGUST WEISMANN, ZOÖLOGIST, 1834–1914

A follower and supporter of Darwin, whose work played an important part in the development of the theory of heredity

AUGUST WEISMANN

Born January 17, 1834, died November 5, 1914

By Frank R. Lillie

Professor of Zoölogy at the University of Chicago

THE life of Professor Weismann spanned the most interesting and important period in the history of biology. In his early childhood Schleiden and Schwann established the cell theory (1838–1839); he was a young man of twenty-five at the time of publication of Darwin's *Origin of Species* (1859). During his active life as zoölogist were discovered those great principles concerning cell-division, the fertilization of the egg and the history of the germ-cells, which he applied with such success to the theory of heredity. He participated in the grand struggle over the evolution theory and the factors of evolution during the latter half of the nineteenth century; he witnessed the rise of experimental zoölogy and in his old age came the period of exact research in genetics, which his own studies had done much to prepare.

The last weeks of his life were saddened by the great war. He had lived a long life full of loving and disinterested labor, crowned by many honors and the universal respect of the scientific world. An immense pathos inheres in his last public act — the relinquishment of the academic honors bestowed on him in England.

Like so many of the zoölogists of his time Weismann studied medicine, but he found opportunity during the short period of its practice to carry out zoölogical investigations on the life history and especially the post-embryonic development and metamorphosis of flies. In 1863 he became attached to the University of Freiburg, and spent the remainder of his life, fifty-one years, in this quiet provincial University, in spite of offers from larger universities. Here he found the leisure and the quiet beautiful surroundings in which he could devote himself heart and soul to investigation and reflection. His objective investigations were limited by serious trouble with his eyes which began in the seventies, and later compelled him to relinquish the microscopical studies for which he had such unbounded enthusiasm. His vision was thus turned more and more inward to constructive thinking; it was no doubt in part due to this physical handicap that we owe his great theoretical generalizations.

Weismann was a true naturalist, who viewed nature with a loving enthusiasm which appears clearly in the objective researches in zoölogy of the first fifty years of his life. His main contributions are classical in their mastery of detail, wealth of observation and broad outlook. His earliest studies were physiological and histological (1858–1862). Then followed a series of papers on the embryonic and post-embryonic development of flies (1862–1866). Studies on the seasonal dimorphism of butterflies next engaged his attention in which he raised questions that led to later fundamental researches by other investigators. In 1875 he began a long series of studies on the natural history and reproductions of Daphnids (continued to 1889) which constitute the foundation of all subsequent study on this group and were especially important for the fundamental problems of parthenogenesis, sex-

determination, and significance of the polar bodies. Between 1880 and 1883 he was engaged in his epoch-making researches on the germ-cells of hydroids which uncovered the fundamental facts on which his theory of the continuity of the germ-plasm was based.

The special papers and memoirs dealing with these and other investigations constitute a great body of knowledge to which zoölogists will constantly refer as the foundation of many important lines of research.

About 1884 he was forced to turn from such investigations, owing to increasing eye troubles. From this time date those contributions to the theory of evolution and heredity for which he is best known to the general educated public, as one of the greatest of Darwin's successors. These were however by no means his first publications on these subjects, for in 1868 he had published a "Justification of the Darwinian Theory," in 1873 a study of the influence of isolation in the origin of species, and a volume of studies on the theory of descent, later translated into English.

His best-known contributions on these subjects began with a series of essays published between 1881 and 1891 on the "Duration of Life" (1881), on "Heredity" (1883), "Life and Death" (1883), "The Continuity of the Germ-plasm as the Foundation of a Theory of Heredity" (1885), "The Significance of Sexual Reproduction in the Theory of Natural Selection" (1886), etc., etc., all of which led up to and culminated in his volume on *The Germ-plasm* (1892). In 1896 his *Germinal Selections* appeared. In 1902 all of his theoretical considerations were brought together in two volumes on, *The Evolution Theory*, translated by Professor and Mrs. J. Arthur Thompson in 1904.

It is impossible to discuss in any fullness the theories of these publications. All centered around his conception of the continuity of the germ-plasm, and of heredity as developmental recapitulation; thus the denial of the prevalent belief in the inheritance of acquired characters was a necessary corollary of this conception of inheritance. Weismann maintained not only that the inheritance of variations and mutilations of somatic origin was theoretically impossible, but he labored to show that it was by no means a necessary support of the evolution theory, as had been generally assumed. He met with greatest skill and keenest logic the many attacks which followed the statement of his position; his controversy with Herbert Spencer on this subject between 1893 and 1895 constituted the most notable of these debates. In the end he completely won over the great majority of naturalists to his way of thinking, and freed the theory of evolution and heredity from an enormous incubus.

In his theory of the continuity of the germ-plasm, Weismann formulated a point of view on which all subsequent genetic research must be based. He recognized with Darwin that a theory of evolution must find its final analysis in the life history of the individual, which contains the key to heredity and variation. Darwin's theory of pangenesis, constructed as a formal hypothesis of heredity and variation, involved unnecessary and untenable conceptions; he had assumed that each cell of the body produced, at all stages of its life, living particles (gemmules) capable of reproducing the parent cells. These particles were cast off from the parent cells and accumulated in the germ-cells, each of which was supposed to contain a complete assortment arranged in a definite fashion. The development from the germ-cell depended on the successive liberation and development of these

particles into cells like those from which they originally arose. The inheritance of acquired characters could thus be explained on the assumption that modified cells produced modified gemmules which reproduced the acquired modification in the succeeding generation.

Weismann rejected the centripetal part of the Darwinian theory, while still retaining certain fundamental conceptions of pangenesis. The theory of the continuity of the germ-plasm however offers a complete antithesis to Darwin's theory in the sense that, whereas Darwin regarded the germ-cells as a secretion of the entire body, Weismann regarded them as genetically distinct from all the remainder of the body or soma — as producing the soma but not produced by it. In the production of the soma not all of the active protoplasm (germ-plasm) of the original germ-cell was used up; but a certain amount of it was retained unmodified and formed the germ-cells of the new generation. Thus the germ cells of any one generation were regarded as a direct unmodified product of the germ-cells of the parents, and so were handed down from generation to generation, essentially uninfluenced by the soma, retaining their original attributes and developmental capacities unchanged. This conception constituted an immense simplification of the Darwinian scheme.

However, Weismann accomplished much more. Darwin's theory had been a purely imaginative construction and was frankly acknowledged by himself to be a formal hypothesis. Weismann's theory on the other hand was based on the newly discovered facts concerning cell division, the fertilization of the egg and the processes involved in the origin of germ-cells. As a theory of heredity it has precisely the same relation to Darwin's theory of pangenesis that the latter's theory of natural selection had borne to preceding evolution theories. It permitted test and verification and involved predictions which have been verified in certain cases, the most crucial test of any theory.

The studies of cell-division carried out by Fleming, Hertwig and others had revealed a precise set of phenomena in nuclear division common to animals and plants, which suggested (Roux) a fundamental rôle of the nuclear elements or chromosomes in the cell life. Similarly the studies of Hertwig, Strasburger, Fol, and Van Beneden on fertilization had shown the predominantly significant part played in the process by the nucleus and its chromosomes; and the beginnings of knowledge, destined soon to be carried very much farther, concerning the maturation phenomena of the germ-cells, had demonstrated a similar predominance of significance of the chromosomes in these processes. Weismann used all of these data first in the identification of the chromosomes as the really significant part of the germ-cells (germ-plasm), and second in the construction of a detailed theory on this basis. He was thus able to predict as a logical necessity, the occurrence at some stage in the life history of a reduction division of the nuclei of the germ-cells which would halve the number of chromosomes instead of maintaining the whole number as in all of the other divisions. This prediction has been universally realized in plants and animals. The phenomenon was later found to parallel exactly the Mendelian laws of inheritance and to furnish their explanation to a considerable extent. There are few instances in the history of science, outside of astronomy, in which prediction has been so adequately and significantly fulfilled.

The fundamental assumption of the theory of continuity of the germ-plasm involved corollaries of the most signifi-

cant kind. If the germ-plasm is at all times distinct from the soma, then definite characters acquired by the individual in the course of its lifetime must perish with the individual. There was no known or conceivable mechanism by which such characters could be transferred to the germ-cells and thus carried over to a succeeding generation. Weismann at once recognized this, and began that attack on the belief in the inheritance of acquired characters which furnished the sharpest post-Darwinian debate of the nineteenth century. Weismann argued in the following ways: (1) Such inheritance is theoretically inconceivable; this argument was developed in so thorough a fashion as to be regarded by many as conclusive in itself. (2) The data usually cited to support the case of the inheritance of acquired characters were shown to be so uncritical as not to bear examination, in some cases as to the facts themselves and in others as to their interpretation. Under the latter head the supposed inheritance of diseased conditions, as inferred at that time, was shown to be equally explicable on the assumption of inheritance of germinal weakness. (3) Weismann carried out detailed critical experiments to investigate the commonly accepted idea of inheritance of mutilations; for many generations he amputated the tails of white mice and found by measurement that the tails came as long at the end as at the beginning. (4) He argued successfully against the contention that inheritance of acquired characters is necessary to explain evolution.

If heritable variations do not arise by use or disuse of parts or by action of incident external forces upon the organism, it is necessary to explain how they come about. Weismann put forward three ideas which contain the germ of our modern working hypotheses, viz. (1) the theory of germinal selection; (2) the results of amphimixis; and (3) direct action of environment on the germ.

The theory of germinal selection involves the postulated architecture of the germ-plasm, which was conceived as composed of a great number of elementary particles (determinants), each the representative of some unit-character of the organism. Weismann reasoned in general that conditions in the germ-plasm must be conceived as variable, and thus more or less favorable for the growth of these elements; favored ones would tend to increase, those in unfavorable positions to decrease. The conception of the struggle for existence was transferred to the germ-plasm and variation-producing modifications of the germ-plasm were attributed thereto. This theory, by which Weismann himself laid great store, has been sterile; it was purely formal and has had no effect on research.

The second hypothesis concerning the effects of amphimixis, or admixture of parental germ-plasms in fertilization, was by no means original with Weismann; but he was the first one adequately to prove its significance and to show how the admixture of different sets of parental characteristics, their shuffling in the filial germ-plasm and redistribution in the half reduction divisions of the filial germ-cells is a constant, and perhaps the greatest, source of heritable variations. However, he did not proceed quite to the extreme of the past president of the British Association for the Advancement of Science, Professor Bateson, and postulate the possibility that evolution has been productive of nothing essentially new from its inception.

The third source of heritable variations postulated by Weismann, viz. the action of incident external forces

upon the germ-plasm directly was never adequately analyzed by him. He alludes to it in his earlier essays, without following the matter farther. It has required the detailed investigations of Tower and MacDougal especially to give this real meaning, and such studies are still in their infancy. However, it is important to recognize Weismann's foresight with reference to this.

It is no part of this review to point out the weaknesses of Weismann's theories, for this is not the place for an adequate critical review. However, we should be open to the charge at least of incompleteness if we failed to point out that Weismann's theories were based on the data of a purely morphological period of genetic research. The experimental studies which followed close on the heels of his fundamental publications swept away, probably irrecoverably, some of the elements of his conceptions. Genetic conceptions are coming to be more and more physiological; and it is a logical necessity that analysis should continue to proceed in this direction. Biologists generally have discarded the Weismannian notion of living independent entities (determiners) in the germ-plasm, representative of entire unit characters, and have replaced it by the conception of differential (chemical) factors located in the germ-plasm and interacting with other factors (or chemical substances) in the cell. But when we effect such a change of conceptions, fundamental as it may be, we still deal to a considerable extent with those phenomena of the chromosomes whose significance Weismann did so much to make plain. Similarly we can no longer deal with the development of the individual in terms of qualitative nuclear analysis as Weismann did, for it has been proved that the cytoplasm has a predominant determining influence in many of the phenomena at least, and it has not been proved that nuclei in general grow qualitatively different. However, it must be realized that Weismann's precise formulation of his theory of individual development furnished the stimulus for some of the fundamental investigations that have made real advances in this difficult field.

I think it is fair to say that Weismann played as important a part in the development of a theory of heredity as Darwin did in the theory of evolution in general; he must, therefore, be regarded as among the greatest of Darwin's followers and supporters. The biological world must forever hold his memory in reverence.

MORGAN'S "HEREDITY AND SEX": A REVIEW

By E. G. Conklin

THIS book is the outgrowth of the Jesup Lectures for 1913 which were given by Professor Morgan at the American Museum of Natural History. It is a very difficult thing to make a book interesting to the general public and at the same time valuable to scientific readers, but this difficult task Dr. Morgan has accomplished in an admirable manner. His book is a work of extraordinary interest to the intelligent layman and at the same time one of great value to professional biologists, and its wide success is attested by the fact that the first edition was exhausted and a new one issued within a year.

The book embodies the results of a large amount of research work by Dr. Morgan and his pupils as well as by many other investigators. The subjects dealt with in the eight chapters are: Evolution and Sex; The Mechanism of Sex Determination; The Mendelian Principles of Heredity and their Bearing on Sex; Secondary Sexual Characters and their Relation to Darwin's Theory of Sexual Selection; The Effects of Castration and Transplantation on the Secondary Sexual Characters; Gynandromorphism, Hermaphroditism, Parthenogenesis and Sex; Fertility, and Special Cases of Sex Inheritance. Each of these general topics is dealt with in a manner which is not only instructive but also illuminating and interesting. As to the "Evolution of Sex" it is shown that we know actually nothing about the manner in which sex has come to be. Sexual reproduction brings about many new combinations of characters but such recombinations do not furnish the materials for evolution as Weismann assumed. However these new combinations of ancestral characters produce a great amount of individual variation and this may be beneficial to a species in helping it to survive. Furthermore if a new character arises in a single individual it may be grafted on, as it were, to the species by sexual reproduction.

There is an interesting discussion of the various types of accessory organs of reproduction which serve to bring the spermatozoa and ova together and of the secondary sexual characters which distinguish males and females such as brilliant colors, instincts and behavior in courtship. "In man courtship may be an involved affair....Nowhere in the animal kingdom do we find such a mighty display; and clothes as ornaments excel the most elaborate developments of secondary sexual characters of creatures lower in the scale."

With remarkable clearness and brevity the author presents the facts of the complicated structure of the germ-cells, their origin, maturation, union in fertilization, the way in which sex is determined and the mechanism of hereditary transmission. He accepts unreservedly the view that sex is determined at the time of fertilization; if the egg is fertilized by one type of spermatozoön a male is produced, if by the other type a female results. He also holds that the evidence is "almost convincing in favor of the view that the chromosomes are the essential bearers of the hereditary qualities." In favor of the chromosomal theory of heredity he presents evidences drawn from cytology, from experiment and from *sex-linked* inheritance. The latter is a type of inheritance, first clearly distinguished by Morgan, in which characters are transmitted to male or female offspring in exactly the way in which certain chromosomes are transmitted. On the other hand in *sex-limited* inheritance "the secondary sexual characters appear in one sex only and are not transferable to the other sex without an operation."

After discussing the principles of inheritance discovered by Mendel the author presents the results of his own work on the inheritance of sex-linked characters in the fruit fly. This is perhaps the most important part of this book, as it is one of the most valuable contributions to the study of heredity which has been made in recent years. The author concludes "that when inheritance factors lie in different chromosomes they freely assort and give the Mendelian expectation; but when they lie in the same chromo-

[1] HEREDITY AND SEX, by Thomas Hunt Morgan, Ph.D. Professor of Experimental Zoölogy in Columbia University, pp. ix + 292 with 121 illustrations in the text. Columbia University Press: New York, 1913. Revised Edition, 1914.

some they may be said to be linked and they give departures from the Mendelian ratios." Inasmuch as factors which usually lie in different chromosomes may sometimes come to lie in the same chromosome, Morgan has suggested that when the maternal and paternal chromosomes pair in the maturation stages of the egg or spermatozoön, the chromosomes of each pair may actually fuse at certain points where they cross each other and thus portions of the chromosomes with their factors exchange places. With this interesting hypothesis as a basis he has been able by means of his breeding experiments with fruit flies to plot the location of particular inheritance factors in individual chromosomes. This work, although in many respects hypothetical, is well supported by evidence and it is probably the most important work ever done on the "architecture of the germ-plasm."

A large number of cases are presented in which the sexes differ in color, form or habit and the inadequacy of Darwin's theory of sexual selection to account for these secondary sexual characters is generally admitted. Similarly it is shown that the selection of continuous variations, or of what might better be called non-inherited variations, is of no evolutionary significance. Even in the case of discontinuous or hereditary variations the author shows that natural selection plays no part in the *formation* of these variations.

The effects on secondary sexual characters of the removal and of the transplantation of ovaries or testes are described in the fifth chapter and the conclusion is reached that "the secondary sexual characters in four great groups, *viz.*, mammals, birds, crustacea and insects are not on the same footing."

Those interesting cases in which both sexes are united in the same individual or in which eggs develop without being fertilized are treated at some length in the sixth chapter, and here as everywhere else Morgan draws to a large extent upon his own researches.

In the chapter on fertility and sterility many scattered and diverse observations are summarized, though the facts cannot at present be satisfactorily generalized or explained. The last chapter deals with special cases of sex-inheritance, such as sex in bees, peculiar forms of sex-linked inheritance in fruit flies, and the sex ratios in birds, frogs and man.

This book was written on the firing lines, as it were, of biological science and it deals with many matters which are not finally settled. It is inevitable that such a book should encounter differences of opinion on the part of other investigators in this field, but the author is peculiarly happy in his manner of presentation. He writes as one who is convinced and yet tolerant and open-minded. His style is brief, keen, attractive, and best of all in a scientific work he shows a thorough, first-hand acquaintance with the phenomena described, and sound judgment and good imagination in dealing with them.

NOTE ON THE CROCKER LAND EXPEDITION SHIP

By George H. Sherwood

Acting Chairman of the Committee in Charge

THE Committee in Charge of the Crocker Land Expedition announces that it has chartered the "George B. Cluett" for the purpose of transporting to New York the members of the expedition party which went north in 1913 on the chartered ship "Diana." The "Cluett" is a three masted auxiliary schooner owned by the Grenfell Association and used by it for carrying hospital and food supplies from St. Johns, Newfoundland, to the various mission stations along the coast of Labrador. The "Cluett" was launched on July 1, 1911, and is one hundred and thirty-five feet over all. She is well built and heavily timbered and is to be "fortified" as a further protection against the ice before starting on her journey northward.

The "Cluett" will leave Battle Harbor about the first week in July, go directly to Etah, there taking on board the members of the expedition party, their collections and equipment, and will return to New York some time during September. Captain George Comer of East Haddam, Connecticut, has been engaged by the Committee to serve as ice

pilot and as a Museum representative on the ship. Captain Comer has had many years' experience in the ice fields of Hudson Bay and the Committee has the utmost confidence in his ability to guide the ship safely through the ice of Baffin Bay, land at Etah and start on the homeward journey before the winter ice begins to form.

The Crocker Land Expedition, as will be remembered, was organized under the auspices of the American Museum of Natural History and the American Geographical Society with the coöperation of the University of Illinois. Its staff, consisting of Donald B. MacMillan, leader and ethnologist; Fitzhugh Green, U. S. N., engineer and physicist; W. Elmer Ekblaw, geologist and botanist; Maurice C. Tanquary, zoölogist; Harrison J. Hunt, surgeon; Jerome Lee Allen, wireless operator; and Jonathan Small, mechanic, has been in the Arctic for nearly two years. The party sailed from the Brooklyn Navy Yard on July 2, 1913, in the "Diana" and stopped at Boston and Sydney, Nova Scotia, for additional supplies. After leaving Sydney, however, much ice was encountered in the Strait of Belle Isle and in a dense fog on the morning of July 17, the ship went fast aground on Barge Point, Labrador. The "Diana" was finally pulled off the rocks and returned to St. Johns where the equipment and supplies were transferred to the "Erik" in which vessel the party safely continued its northward trip. It was found necessary to make the headquarters at Etah, North Greenland, instead of on Ellesmere Land as originally planned and it was there that the party spent the long Arctic nights of the winter of 1913–14.

In November of last year the Museum, through the kindness of Mr. Knud Rasmussen, the Danish explorer, received word that Mr. MacMillan accompanied by Ensign Green had made the one hundred and twenty-five mile dash northwest from Cape Thomas Hubbard across the ice of the Polar Sea in search for Crocker Land but that they had found that Crocker Land did not exist, at least within the range originally ascribed to it.

According to the original plans, the expedition is exploring and mapping the Greenland ice cap this spring and will later return to headquarters at Etah to await the coming of the ship chartered for the return to New York.

The Committee begs to call the attention of the friends of the expedition to the urgent need that exists for additional funds to help defray the cost of sending this relief ship northward. The unfortunate wrecking of the "Diana" with its incident expenses has been a heavy burden and additional subscriptions are earnestly desired.

MUSEUM NOTES

The frontispiece of this issue of the Journal is a photograph of the marble bust of John Burroughs, naturalist and author, made by Mr. C. S. Pietro and presented to the Museum by Mr. Henry Ford. The bust has been put on exhibition at an appropriate season — April, the month of reawakening nature and return of the birds — and in an appropriate part of the Museum, the local bird hall. April 3, the anniversary of the birth of John Burroughs, has been made a national "bird day" in Utah and was celebrated as a bird day for 1915 in New York and various other states.

A bird day bulletin to the New York public schools, decorated with a portrait of the great horned owl in color by Louis Agassiz Fuertes was sent out March 25 from the State Education Department of the University of the State of New York. The bulletin was prepared by the three authors of the State Museum memoir, *Birds of New York*, and is endorsed by Dr. John H. Finley in the following words, "If these suggestions are generally followed, the State will be made richer by many millions and a great source of human happiness will be kept at our doors."

Mr. James P. Chapin of the Museum's Congo Expedition, after a six years' absence in Africa, arrived in New York March 30 by way of England. He brings the details of the wonderful success of the expedition, not only in the work of a scientific survey but also in having lived without mishap for the extended period of six years amidst the dangers of the equatorial forest and among the negro races of Central Africa — a success due in part to the cordial coöperation of the Belgian government. Mr. Chapin brings with him

about one-fourth of the expedition's collections. The balance remains in the hands of Mr. Lang, leader of the expedition, who also will come out of the Congo immediately after the final work of packing and shipment is completed.

The entire collection numbers some 16,000 specimens of vertebrates alone, 6000 of which are birds and 5000 mammals. The specimens are accompanied by some 4000 pages of descriptive matter and 6000 photographs. It includes full material and careful studies for museum groups of the okapi, the giant eland and white rhinoceros, besides many specimens of lions, elephants, giraffes, buffaloes, bongos, situtungas, yellow-backed duikers, black forest pigs, giant manis and chimpanzees.

The ethnological section of the collection is rich in specimens of native art of the Congo including several hundred objects of carved ivory, a revelation as to the capacities of the Congo uneducated negro. There are also seventy plaster casts of native faces from the Logo, Azande, Avungura, Mangbetu, Bangba, Anadi, Abarambo, Mayoho, Mabudu, Medje, Mobali and Pygmy tribes. Each cast is supplemented by a series of photographic studies of the individual.

Mr. Chapin will take up again his zoölogical studies at Columbia University and will retain his connection with the American Museum as assistant in ornithology. In this position he will work up for publication the 6000 Congo birds of the new collection which in point of preservation as well as size and number of specimens new to the American Museum, surpasses any collection that has ever been secured by the institution.

There is on exhibition in the west assembly hall for the month of April a series of photographic transparencies illustrating certain noteworthy features of the work of Professor Percival Lowell and his staff at the Observatory, Flagstaff, Arizona. The series shows, first, the Observatory, the great 24-inch telescope, and following, the spectra of the Moon, Jupiter and other planets. Of special interest are the photographs showing various aspects of Mars, including the much discussed "canal system." These are supplemented by drawings by Professor Lowell which illustrate the vegetation on Mars and the condition of the snow-caps at the north and south poles. Perhaps the most striking of the series is the large photograph of Halley's Comet, which includes not only the comet itself, but the stars drawn into lines on account of following the comet with the camera, the planet Venus, and lastly a meteor which chanced to pass directly across the plate during the exposure.

Photographs of the Moon show the craters and the shadows of the great crater walls which rise almost vertically 10,000 to 15,000 feet. As the transparencies are brilliantly illuminated in a darkened room, it gives the effect of looking at the sky itself.

"Origin and Meaning of some Fundamental Earth Structures" was the subject recently discussed by Professor Charles P. Berkey of Columbia University in the Jesup lectures for 1915. The course consisted of eight lectures and opened with a discussion of the origin and nature of the earth. The nebular and meteoric hypotheses of the origin of the earth were contrasted with the later and now widely accepted view that the earth has been built up by the slow accretion of planetesimals, or fragments of a disrupted sun that was the parent of the whole solar system.

Reasons for the existence of elevated areas and basin-like depressions, namely of the continents and oceans, were discussed; these elevations and depressions and the movements of the earth's crust were all traced back to gravitational forces, which were manifested in earthquakes, volcanic eruptions, mountain-forming uplifts, and submergences, all due eventually to the balancing of continents and oceans against each other (isostasy). The place and work of volcanic activity and the agencies and forces involved in the metamorphosis of rocks were treated, with constant reference to rock structure and to the cycles of transformation from sedimentary to metamorphic and igneous structures and the reverse. All this was finally applied to the interpretation of local geology and to such practical matters as foundation work, tunneling work, water supply and the qualities of structural material.

The Jesup lectures, which are Columbia University lectures given in coöperation with the American Museum, form an important medium for the presentation in concise form of scientific progress. The first course of the series was given by Professor Henry Fairfield Osborn in 1907, his subject being the "Evolution of the Horse." In the second series (1909) Professor Richard C.

Maclaurin presented "Newton's Experiments and Contributions to Optical Theory." In 1911 Professor Frederic S. Lee lectured on "Scientific Features of Modern Medicine," and in 1913, Professor T. H. Morgan summarized recent advances in the study of "Heredity and Sex." The Jesup lectures are being published by the Columbia University Press.

Since the last issue of the Journal the following persons have become members of the Museum:

Annual Members, Mrs. Frederic N. Goddard, Mrs. Everard B. Hopwood, Mrs. C. D. Jackson, Mrs. Samuel W. Weiss, the Misses Leila S. Frissell, Margaret W. Watson, His Excellency, Ira Nelson Morris, Dr. Hermann Fischer and Messrs. Lathrop Brown, G. E. Chapin, J. Warren Cutler, Albert de Roode, Samuel Jackson, Robert E. Nolker, Emil T. Palmenberg, Frank H. Parsons, Willard Scudder and F. B. Wiborg.

"Men of the Old Stone Age" was the topic at the April 12th meeting of the Academy of Sciences. Professor Henry Fairfield Osborn presented some of the chief results of his synthetic work on this subject and made special acknowledgments of the coöperation of the following archæologists, anatomists and geologists: Messieurs l'Abbé Breuil, Cartailhac, Obermaier, MacCurdy, Nelson, MacGregor, Starr, Penck, Reeds. He exhibited a chart illustrating the successive advances and retreats of the glacial ice in Europe and the corresponding succession of mammalian faunas and races of man. Illustrations of the skeletal remains of the pakæolithic races were then passed in review.

Professor J. Howard MacGregor then exhibited his remarkably lifelike and accurate series of busts of prehistoric men. He explained the methods adopted in building up corrected models of the skulls, from casts of the imperfect original specimens, and in restoring the flesh, from data secured by dissection of recent types. Dr. A. Hrdlička, formerly of this Museum and now of the National Museum, was present and took part in the discussion.

Admiral Peary's Arctic ship, the "Roosevelt," has been sold and after it has been fitted with oil-burning machinery and other improvements, will be used by the Bureau of Fisheries in the Department of Commerce and Labor in connection with the fisheries service in Alaskan waters. The "Roosevelt" was the ship used by Admiral Peary on the expeditions in which he reached the "farthest north" record in 1906 and the North Pole in 1909, and was built expressly for the purpose in the spring of 1905. It is to be remembered that April 6 marks the sixth anniversary of the discovery of the North Pole.

A life-size model of the beautiful Portuguese man-of-war (*Physalia arethusa*), a remarkable product of the glass-blower's and colorist's skill, has recently been installed in the Darwin hall. The Portuguese man-of-war is not a single animal as might be supposed from its appearance, but a colony of animals in which the phenomenon of division of labor is most strikingly exemplified. One of the individuals in the colony is specialized to act as a float. The other individuals are attached to it, pendant from the lower surface. Some of them have mouths and feed for the entire colony; others are sensory in function and have no mouths; still others are armed with rows of stinging cells and form the offensive and defensive members of the colony; and still others can neither feed nor fight but are the reproductive individuals. The colony as a whole, the "Portuguese man-of-war," floats on the surface of the sea, especially in warmer regions, but is often brought north upon the Gulf Stream and drifts in upon the New England coast. Certain of the individuals making up the colony, those armed with the most powerful stinging cells, extend as long retractile streamers into the depths of the sea, at times to a length of forty feet. These also act as a drag anchor and keep the head of the float to windward. The coloration of the animal is strikingly beautiful, varying from deep cerulean blue through deepest purple to brilliant carmine. In the West Indies it is often seen floating in large squadrons on the sea.

Apropos of the ever-widening scope of the lecture work which is being carried on by the Museum's department of education, it is interesting to note that a course similar to the Museum's Saturday morning stories for the children of members was inaugurated this year in Cleveland, Ohio. Mr. George H. Sherwood gave the introductory lecture of the series which included lectures by Mr. R. W. Miner, Mr. R. C. Andrews, Mr. Ernest Harold Baynes and Mr. Albert H. Pratt.

MODEL OF THE PORTUGUESE MAN-OF-WAR

An animal, or more exactly speaking, a colony of animals, that floats at the surface of warm seas. The transparent "float," blue, purple and crimson tinted, sails before the wind, trailing long retractile filaments. Preparation of model by Mr. H. Müller, glass blower, and Mr. S. Shimotori, colorist, of the American Museum

Model on exhibition in the Darwin hall

THE Hopi Indian group in the Southwest Indian hall has been completed and is now open to the public for inspection. This group aims to present a unified complete picture of pueblo life as illustrated in the home and industrial life of the Hopi Indians. The foreground is the roof of a Hopi dwelling, which is the center of daily life for the Hopi home. Here are shown life-size characteristic figures of Hopi men and women at their respective occupations: the men spinning and weaving, the women making baskets and pottery. In the background is the village of Walpi, on the end of the first Hopi mesa, with the village of Sichumovi in the distance. The group was designed and executed by Howard McCormick, an artist already distinguished for his paintings of scenes of the Southwest, and the figures were modeled by Mahonri M. Young, who coöperated with Mr. McCormick in the planning of the group. It is the first anthropological group constructed by the Museum at all comparable to the bird groups for which the institution has become famous, and marks the turning point in the development of the anthropological exhibits.

An opening view of the Hopi group was given to friends of the Museum on April 8 and was preceded by an exhibit of motion pictures taken by Mr. McCormick illustrating many phases of Hopi life which are represented in the group.

WORD has been received from Mr. H. E. Anthony, who is making a collection of birds and mammals for the Museum in Panama, that on February 21, he reached the base of Mount Tacarcuna in eastern Panama where he is favorably situated for the projected explorations to Mount Tacarcuna.

EARLY in the spring of 1914 Lord William Percy of Northumberland, England, under the auspices of the American Museum, joined the revenue cutter "Bear" on an expedition to the coasts of Alaska and Siberia for the purpose of securing water birds and especially Fisher's eiderduck. While Lord Percy was still in Alaska the "Bear" chanced to take by wireless a message which gave the news of the war. Lord Percy, who is a reserve member of the Grenadier Guards, left the ship immediately, made arrangements for transportation to Seattle and arrived in New York about a month afterward, and from there sailed immediately to join his regiment at the front. Since that time occasional letters with personal facts of the war have come to New York. He was in France for four months. At one time the English troops were stationed only one hundred yards from those of the Germans and as he expressed it, "For us the war consists of shelling and shooting at the Germans all day and all night and of being shot at and shelled by them. It is not a very attractive form of warfare." A short time ago Lord Percy's friends in the Museum learned that he had been wounded and had lain for several hours in a shell-hole before he received medical attention. We are glad to learn that his wound, although serious, will probably admit of an early recovery.

MODELS have recently been installed in the hall of public health illustrating how the mosquitoes which transmit diseases are controlled upon the Isthmus of Panama. One model is a street scene which shows a disinfecting squad at work destroying yellow fever in the houses where the disease has occurred. A second model illustrates the burning of grass and the oiling of ditches to destroy malaria mosquitoes in open country.

MR. LEO E. MILLER writes from South America that he has completed his work in Antioquia and on March 30 sailed from Barranquilla to Colon en route to Bolivia, where it is proposed to inaugurate a zoölogical survey similar to that which the Museum has conducted in Colombia for the past five years. Mr. Miller's collections amounting to two thousand birds and mammals have been received and make an exceedingly important addition to the Museum's Colombian collections.

THE Librarian would be glad to receive back numbers of the JOURNAL, even those of quite recent date, as they are frequently asked for by libraries and other institutions desiring to complete volumes.

THE government of Porto Rico has made the second annual appropriation of five thousand dollars for the continuance of the scientific survey of the island under the auspices of the New York Academy of Sciences in coöperation with the American Museum and other institutions. Several members of the Museum staff will be engaged in this work during the coming months.

The American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

Open free to the public on every day in the year.

The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people. It is dependent upon private subscriptions and the fees from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world The membership fees are,

Annual Members	$ 10	Patrons	$1,000
Sustaining Members (annually)	25	Associate Benefactors	10,000
Life Members	100	Associate Founders	25,000
Fellows	500	Benefactors	50,000

Guides for Study of Exhibits are provided on request to members and teachers by the department of public education. Teachers wishing to bring classes should write or telephone the department for an appointment, specifying the collection to be studied. Lectures to classes may also be arranged for. In all cases the best results are obtained with small groups of children.

The Museum Library contains more than 60,000 volumes with a good working collection of publications issued by scientific institutions and societies in this country and abroad. The library is open to the public for reference daily — Sundays and holidays excepted — from 9 A. M. to 5 P. M.

The Technical Publications of the Museum comprise the *Memoirs*, *Bulletin* and *Anthropological Papers*, the *Memoirs* and *Bulletin* edited by J. A. Allen, the *Anthropological Papers* by Clark Wissler. These publications cover the field and laboratory researches of the institution.

The Popular Publications of the Museum comprise the JOURNAL, edited by Mary Cynthia Dickerson, the *Handbooks*, *Leaflets* and *General Guide*. The following list gives some of the popular publications; complete lists, of both technical and popular publications, may be obtained from the Librarian.

POPULAR PUBLICATIONS

HANDBOOKS

NORTH AMERICAN INDIANS OF THE PLAINS. By Clark Wissler, Ph.D. *Paper*, 25 *cents; cloth*, 50 *cents*.

INDIANS OF THE SOUTHWEST. By Pliny Earle Goddard, Ph.D. *Paper*, 25 *cents; cloth*, 50 *cents*.

ANIMALS OF THE PAST. By Frederic A. Lucas, Sc.D. *Paper*, 35 *cents*.

ILLUSTRATED GUIDE LEAFLETS

GENERAL GUIDE TO THE COLLECTIONS. New edition issued December, 1914. *Price*, 25 *cents*.

THE COLLECTION OF MINERALS. By Louis P. Gratacap, A.M. *Price*, 5 *cents*.

NORTH AMERICAN RUMINANTS. By J. A. Allen, Ph.D. *Price*, 10 *cents*.

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH. By George H. Pepper. *Price*, 10 *cents*.

PRIMITIVE ART. *Price*, 15 *cents*.

THE BIRDS OF THE VICINITY OF NEW YORK CITY. By Frank M. Chapman, Sc.D. *Price*, 15 *cents*.

PERUVIAN MUMMIES. By Charles W. Mead. *Price*, 10 *cents*.

THE METEORITES IN THE FOYER OF THE AMERICAN MUSEUM OF NATURAL HISTORY. By Edmund Otis Hovey, Ph.D. *Price*, 10 *cents*.

THE HABITAT GROUPS OF NORTH AMERICAN BIRDS. By Frank M. Chapman, Sc.D. *Price*, 15 *cents*.

THE INDIANS OF MANHATTAN ISLAND AND VICINITY. By Alanson Skinner. *In preparation*.

THE STOKES PAINTINGS REPRESENTING GREENLAND ESKIMO. *Price*, 5 *cents*.

BRIEF HISTORY OF ANTARCTIC EXPLORATION. *Price*, 10 *cents*.

TREES AND FORESTRY. By Mary Cynthia Dickerson, B.S. *A new edition in course of preparation*.

THE PROTECTION OF RIVER AND HARBOR WATERS FROM MUNICIPAL WASTES. By Charles-Edward Amory Winslow, M.S. *Price*, 10 *cents*.

PLANT FORMS IN WAX. By E. C. B. Fassett. *Price*, 10 *cents*.

THE EVOLUTION OF THE HORSE. By W. D. Matthew, Ph.D. *Price*, 20 *cents*.

REPRINTS

THE GROUND SLOTH GROUP. By W. D. Matthew, Ph.D. *Price*, 5 *cents*.

METHODS AND RESULTS IN HERPETOLOGY. By Mary Cynthia Dickerson, B.S. *Price*, 5 *cents*.

THE WHARF PILE GROUP. By Roy W. Miner, A.B. *Price*, 5 *cents*.

THE SEA WORM GROUP. By Roy W. Miner, A.B. *Price*, 10 *cents*.

THE ANCESTRY OF THE EDENTATES. By W. D. Matthew, Ph.D. *Price*, 5 *cents*.

A red squirrel eagerly watching the toads from the stone wall behind the wild apple tree. He is fond of a taste of meat in the spring after his winter on nuts and seeds. (From the Toad Group in the American Museum)

THE AMERICAN MUSEUM JOURNAL

PHOTOGRAPHS OF STARS AND PLANETS

EUROPEAN CAVES AND EARLY MAN

A GREAT PORTRAIT PAINTER OF BIRDS

"JOHNNY" PENGUINS

FISHES THAT LIVE MILES UNDER SEA

The American Museum of Natural History

The American Museum Journal

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Mary Cynthia Dickerson, *Editor*

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The Journal is sent free to all members of the Museum.

WILLIAM T. HORNADAY

The Director of the Zoölogical Park of the New York Zoölogical Society has no doubt inaugurated and carried to success more movements for the protection of wild animal life than has any other man in America. We owe to him the Wichita and Montana national bison herds, Elk River Game Preserve of British Columbia, and Snow Creek Game Preserve of Montana. He drafted the Bayne Law which since 1912 has prevented the sale of native wild game, as well as the law which since 1913 has prevented all importation of wild birds' plumage for milliners' use. His name is connected also with saving the fur-seal industry. As to his effort to put such protective work on a permanent financial basis for the future, see further mention on page 260

HERBERT LANG

Mr Lang, as leader for the past six years of the American Museum's expedition to the Belgian Congo, has traveled some three thousand miles under an equatorial sun, and for the most part with heavily loaded caravans, to accomplish the remarkable success achieved in the collection of zoölogical specimens and study of Congo native tribes. Mr. Lang still remains in Africa to attend to the final packing and shipment of specimens

[This photograph of Mr. Lang was made before he sailed for Africa six years ago]

JAMES P. CHAPIN

Mr. Chapin has returned to New York after six years of tramping through African jungles as a member of the Congo expedition of the American Museum, during which time he secured the largest and most valuable collection of Congo birds ever brought together

[Mr. Chapin will contribute to the next number of the JOURNAL an article on his experiences in collecting birds in Africa]

LOUIS AGASSIZ FUERTES

A portrait painter of wild birds who bases his work on an intimate sympathetic study of the subject in nature and succeeds in portraying the character of the bird in addition to its external appearance. He is an illustrator of technical and popular books as well as a painter of decorative canvases of considerable size

JOHNNY PENGUINS CLIMBING TO THE ROOKERY

The Johnnies make their homes on the summits of the windy shelterless ridges and trudge gravely back and forth to the sea where they get their food. Broad beaten thoroughfares show the effect of the pattering of little leathery feet through many generations

—"The Penguins of South Georgia," page 225

THE AMERICAN MUSEUM JOURNAL

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OXYGEN AND WATER ON MARS

By Percival Lowell

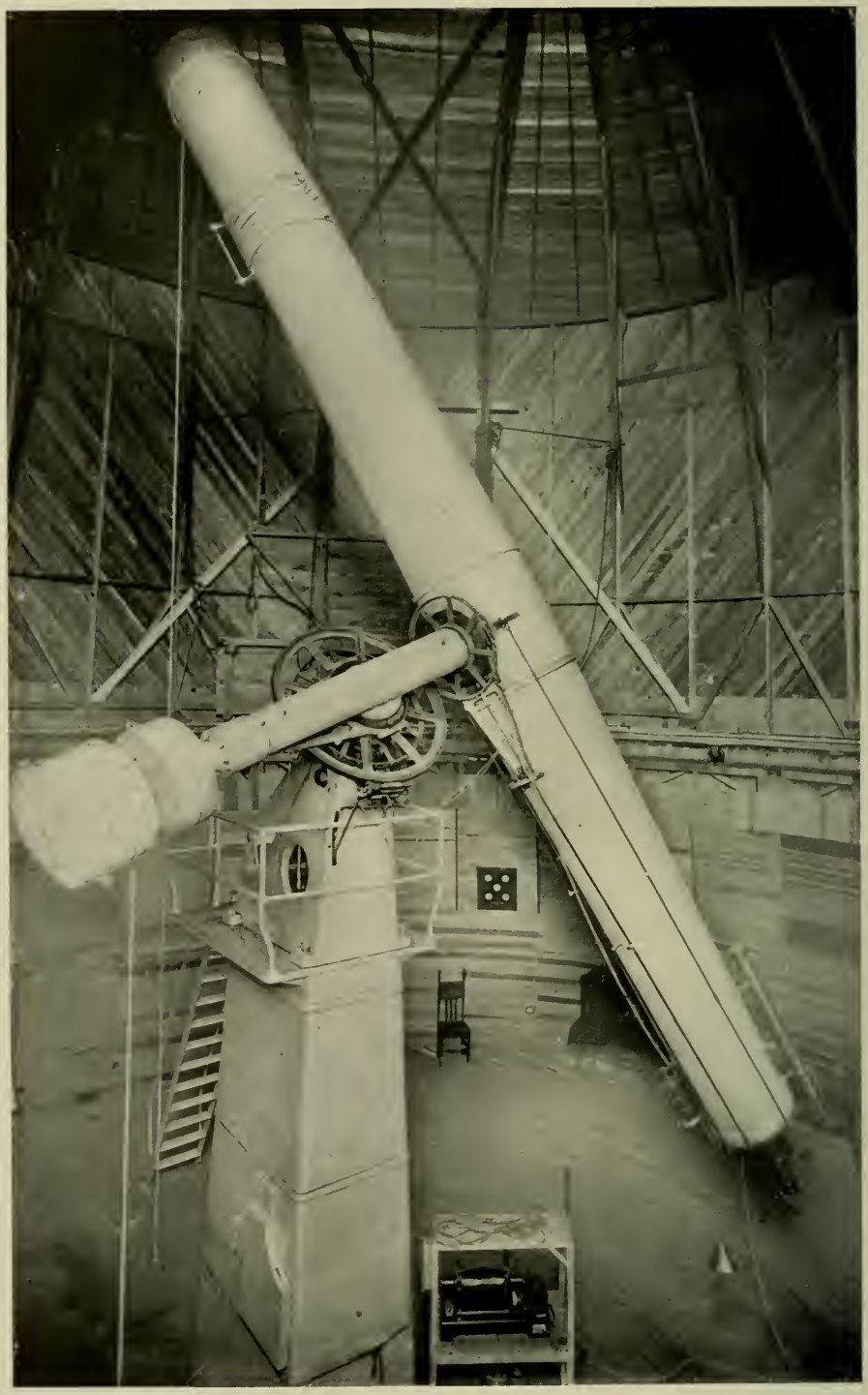
Director of the Lowell Observatory, Flagstaff, Arizona

NEXT to the photographs of the canals of Mars, perhaps the most vitally interesting photograph in the recent work of the Lowell Observatory is a spectrogram of Mars by Dr. V. M. Slipher, disclosing to the average observer merely a darkening of one of the spectral lines (*a*) to the red end of this spectrum over the same line in the collateral spectrum of the moon. But to scientific insight this bit of glass is otherwise transparent. For the slight difference in tone between these identically positioned lines in the two photographs means all the difference between life and death. It reveals the fact that water-vapor is present in the atmosphere of Mars. The moon, an almost absolutely airless body, delivers us the sun's rays unaffectedly and the absorption line in question in its spectrum is caused by water-vapor in our own air. Indeed the spectrum of the moon is simply the spectrum of the sun plus that of the earth, the moon acting only the self-effacing part of a mirror. But in the Martian spectrum the sun's rays have passed in addition through that planet's air and in so doing reveal of what it stands composed. The emphasis it lays upon this line indicates that water, without which all life, vegetal or animal, is impossible, exists upon our neighbor, even as it does here.

Nor is this all that this spectrogram discloses. In the able hands of Professor F. W. Very, measurements of the intensity of another line (*B*) have revealed the presence of oxygen too, in that other world. Here then we have demonstration that both of the chief substances necessary to life are present on Mars.

This evidence was obtained several years ago at a most propitious time, because at the time and place when the earth's air happened to be particularly dry, thus permitting of accentuated contrast. In addition to this however, spectrograms taken by Dr. Slipher more recently, have added to it in an unlooked-for way. Our air, on this latter occasion, was unavoidably more moisture-laden and little was hoped for from the spectrograms beyond a faint corroboration of previous results. When behold, not only did measurement of intensities disclose both water-vapor and oxygen on Mars as before, but these intensities were such as fitted the changed terrestrial conditions, thus adding to qualitative proof, quantitative proof as well. And both fitted in with the Martian meteorology which visual study of that planet has shown us must exist.

Even this is not the limit of the information conveyed by these communicative lines. In Dr. Slipher's latest results, four plates were taken so varied that in two the air above the equatorial regions of Mars was examined, in two



THE GREAT REFRACTINC TELESCOPE, LOWELL OBSERVATORY

This is well known because of the perfection of its great lens and because of the important discoveries made through its use, concerning Mars, Saturn, Jupiter, Uranus and other planets, the stars, comets and nebulæ. Constructed by Alvan Clark and Sons, Cambridgeport, Massachusetts

others the polar atmosphere. The polar snow-cap was then in process of melting and the plates showed that the band in the Martian spectrum, denoting water-vapor, had been intensified seventy per cent in the planet's polar regions and but sixteen per cent in the equatorial over what the band showed in our own. Furthermore, Professor Very remarks about one of the polar plates "there is a brighter streak of continuous spectrum, corresponding to a region of melting snow or of clouds, which gives a larger intensification of *a* (the water-vapor band) than the associated dark streak, when these are measured separately. The diversity of intensification appertains to *a* exclusively — *a* has changed by nearly fifty per cent and this change is certainly Martian." He concludes by saying with regard to oxygen that with the higher altitude of Mars in the later results, the oxygen interposed by the earth's atmosphere being less by one-half an atmosphere, he found the fifteen per cent due to Mars in his earlier measures increased to twenty-four per cent in his later ones, "proving again that this apparent intensification is also real, and is truly Martian, and indicating that the actual amount of oxygen in the Martian atmosphere is about half as great as upon the earth."

Surprising as have been the disclosures due to spectroscopy, perhaps none is greater than that that instrument should inform us of the possibility of life upon another world, a possibility, which, combined with facts that visual observation has revealed (size, mass, temperature and lastly details of the canal-oasis system), amounts, viewed in the light of the doctrine of probabilities, to practical certainty of its existence there.

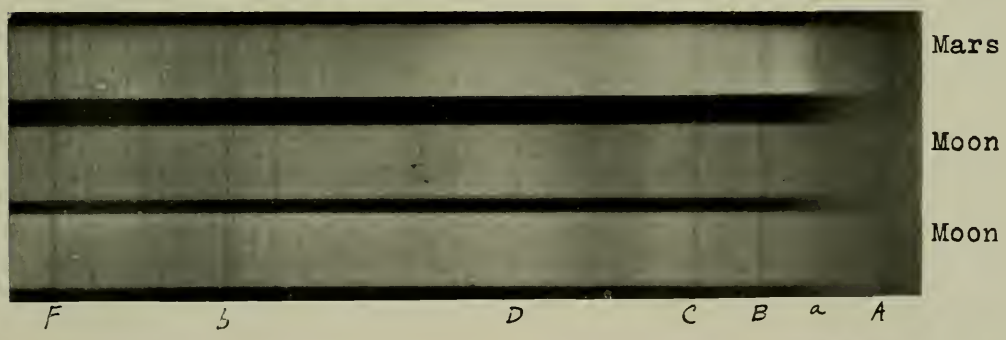


Photo by Dr. V. M. Slipher

Spectra of Mars and the moon. The band marked *a*, well on the right of the spectra, is the band of water-vapor. In the case of the moon the light has traveled only through our own atmosphere, and in that of Mars through the Martian and our own. The difference in darkness shows that water-vapor exists in the atmosphere of Mars. This spectrogram shows also that oxygen exists on Mars, by comparing the line *B*, oxygen, with *C*, hydrogen, in the sun for relative intensities. Its presence was found by very careful measurements by Professor Very with his devised comparator, at the time he evaluated the amount of water-vapor in the Martian air

THE DOME OF THE 24-INCH REFRACTING TELESCOPE

Lowell Observatory, Flagstaff, Arizona, is in longitude 111° 41′.1 W. and latitude, 35° 12′.5 N. It is located at an altitude of 7250 feet, one thousand feet higher than the top of Mt. Washington. This location has helped to make possible many exceptional discoveries

Saturn, photographed by Dr. Lowell, March 12, 1915, showing the ring open to its widest extent

THE PHOTOGRAPH IN ASTRONOMY

By E. C. Slipher [1]

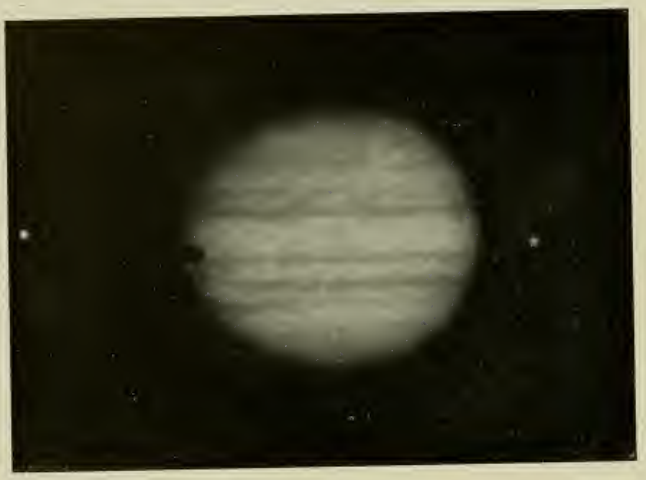
Lowell Observatory, Flagstaff, Arizona

DURING the last two decades the application of photography to researches in astronomy and in other sciences as well, has been fraught with numerous important advances. Through its use in astronomy we have learned many new facts which have confirmed or refuted the old theories and created new scientific belief; and furthermore photography furnishes permanent pictorial record of the evidence, accurate and incontestable, that all may see and believe. No argument carries a conviction equal to that gained by seeing the thing oneself.

Excellent photographs of the great planet Jupiter have been made through the 24-inch refracting telescope of the Lowell Observatory, Flagstaff, Arizona. They show at a glance the conspicuous belted appearance of the visible surface—probably the zoned formation of the various gases of a very dense atmosphere beneath which we seldom if ever see — and innumerable, finer, wisplike markings interlacing the belts. Photographs of the planet showing different longitudes present a varied aspect of these belts, and the photographs taken in different years indicate many evident chaotic changes there.

Across the ball of the planet Saturn there will be noted in the photographs quite similar although less pronounced beltlike markings paralleling the equator; this indicates a like condition of the atmospheres of Jupiter and Saturn. The unique rings about Saturn are remarkably well shown in photographs, with Cassini's division distinctly visible all the way around, separating the two brighter rings. The third and inner ring — the filmy crêpe ring — is too faint to show except where it crosses the ball, without an overexposure, although much of the original definition is lost in the enlarged reproductions due to the separation of the silver grains of the emulsion. It will be seen that the ball of Saturn shines through the outer ring where it crosses the planet on the lower side; this tells how very thin the rings are and evinces their meteoric constitution. The definition of these planetary

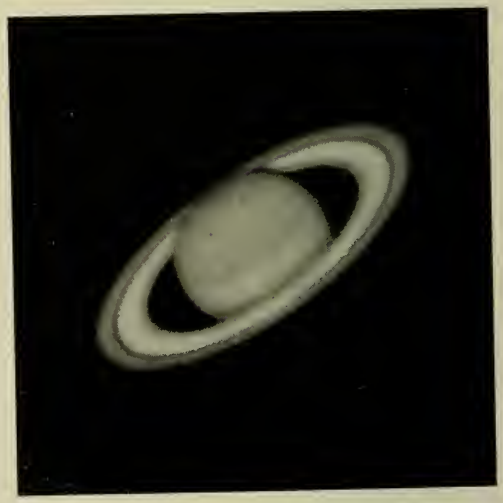
[1] Mr. E. C. Slipher has been directly associated with Dr. Lowell in his work on Mars at the Flagstaff Observatory for many years. He has gone also on various expeditions, among them one to Allanza, Chile, in 1907, to observe Mars.



Jupiter, September 23, 1914. To the left of the planet is seen a small round bright spot against the sky. This is Satellite III. It has just crossed the face of the planet. On the extreme right of this face (the left of the photograph) is its shadow just entering on the disk. It denotes an eclipse of the sun taking place for Jupiter at that point. Some distance to the right of the planet is shown another round bright spot. This is Satellite I, soon to transit the disk and cause another solar eclipse. This plate, securing both planet and satellites on such a scale and definition, is, as far as known, unique

photographs where exposures of as much as thirty seconds were required, attest to the exceptional atmospheric conditions existing at Flagstaff.

Although less picturesque than the direct photographs, the spectrographic observations are just as replete with revelations. After the light from a celestial object has passed through the prism of a spectrograph, many important facts are disclosed concerning it which would be impossible to learn by other means. It is from spectrum analysis that we obtain much of our knowledge of the density and constitution of planetary atmospheres; of the motions, constituents and the states of stars, comets and nebulæ. The spectrogram of the Saturnian system shows the lines in the ball spectrum and those of the rings to be oppositely inclined showing that the rate of revolution differs for each part of the rings, thus presenting a direct demonstration of the fact first found mathematically, that the ring system is composed of disjoined particles. In the spectrum of the planet Venus the absence of inclination of the lines shows its diurnal rotation to be exceedingly slow, which confirms the early observations of Schiaparelli and Dr. Lowell who found its day and year to be equal. This causes Venus to present always the same face to the sun. The day of Uranus was unknown, due to the absence of any marked surface



Saturn, December 23, 1912. It is as seen in a telescope magnifying about 1400 times, thus covering an area approximately 200 times that of the moon to the naked eye. Cassini's division is the dark gap separating the two bright rings. The inner or crêpe-ring is visible where seen against the ball of the planet. Saturn's belts are a counterpart of Jupiter's; both planets are in a "youthful chaotic state, swathed in cloud"

detail from which it could be deduced, until photographs of its spectrum made at Flagstaff in 1910 and 1911 revealed for it a retrograde rotation which it accomplishes in a day of about ten and three-fourths hours.

It is from a similar analysis of their light that the motions of stars and nebulæ are found. The incandescent condition of these bodies makes it possible to ascertain the identity of the substances of which they consist; and by a comparison of their spectra with that of our sun, some knowledge is obtained of their state of evolution. Many startling discoveries result from these investigations, especially in case of some of the nebulæ whose velocities of approach or recession are so great as almost to defy belief, reaching in several instances, one thousand kilometers per second.

In one case at least, that of the nebula in Virgo, Dr. V. M. Slipher has detected the rotation of this great mass by the inclined lines of its spectrum. Another interesting and unique spectrographic discovery is that the wisplike nebula in the Pleiades in all probability shines by reflected light received from relatively near by stars. This is the only known example of a nebula that shines by any but its own light.

Direct photographs of the great Halley's Comet and Comet *a* 1910 show remarkable structural details and the great length of their tails which stretch from thirty to fifty degrees or more across the sky. The cloudlike streamers in the tails of these comets indicate something of the rapid flow away from the head of the mingled meteoric and gaseous material, and

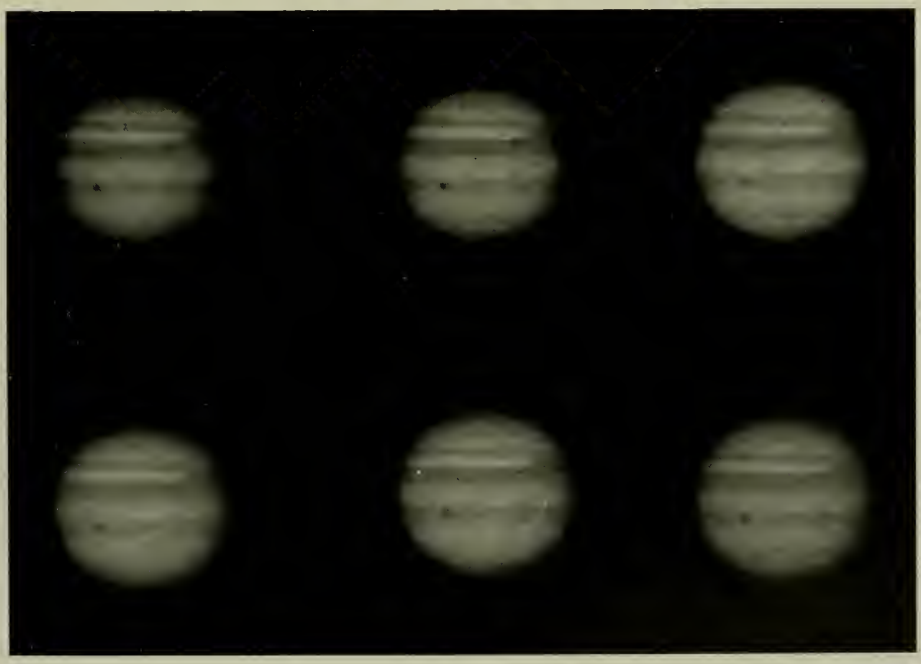


Photo by C. O. Lampland

Jupiter, August 11, 1913. In order to secure the best images of a planet photographically, it is advisable, since our air is never at its best for long, to make many exposures consecutively, moving the plate first laterally and then up and down. We thus get a chance at a good photograph and furthermore one photograph corroborates another

particularly in case of Comet *a* 1910 the curved, fanlike form of the matter in the tail gives evidence of solar forces repelling them.

The dark-line nebula in the constellation Virgo. Photographed with the 40-inch reflector, April 18, 1911. An object of unusual interest on account of its rapid motion — 600 miles per second in the line of sight — and also because it is the first nebula for which rotation about an axis and proper-motion have been observed

The "dumb-bell" nebula in the constellation Vulpecula. Photographed with the 40-inch reflector of the Lowell Observatory

Both slit and slitless prismatic photographs of Halley's, Gale's, Brook's and other comets of recent years, segregate and make known the various constituents. In this analysis the prism differentiates the constitution of the head and tail, and even the substances composing different streamers in the tail can be identified. In general, comet spectra are quite similar; they show the existence, usually, of cyanogen, sodium and hydrocarbons in the head while carbon monoxide and solid sunlit particles produce mainly comet tails.

The spectrograph serves also as a barometer which enables one to read many of the existing conditions of planetary atmospheres. It tells us that Jupiter, Saturn, Uranus and Neptune are surrounded by very dense atmospheres and that the densities of these increase with the distances of the planets from the sun. It was by this means that evidence has been secured at the Lowell

Photo by C. O. Lampland

COMET *a* 1910

One of a series of direct photographs taken at Lowell Observatory

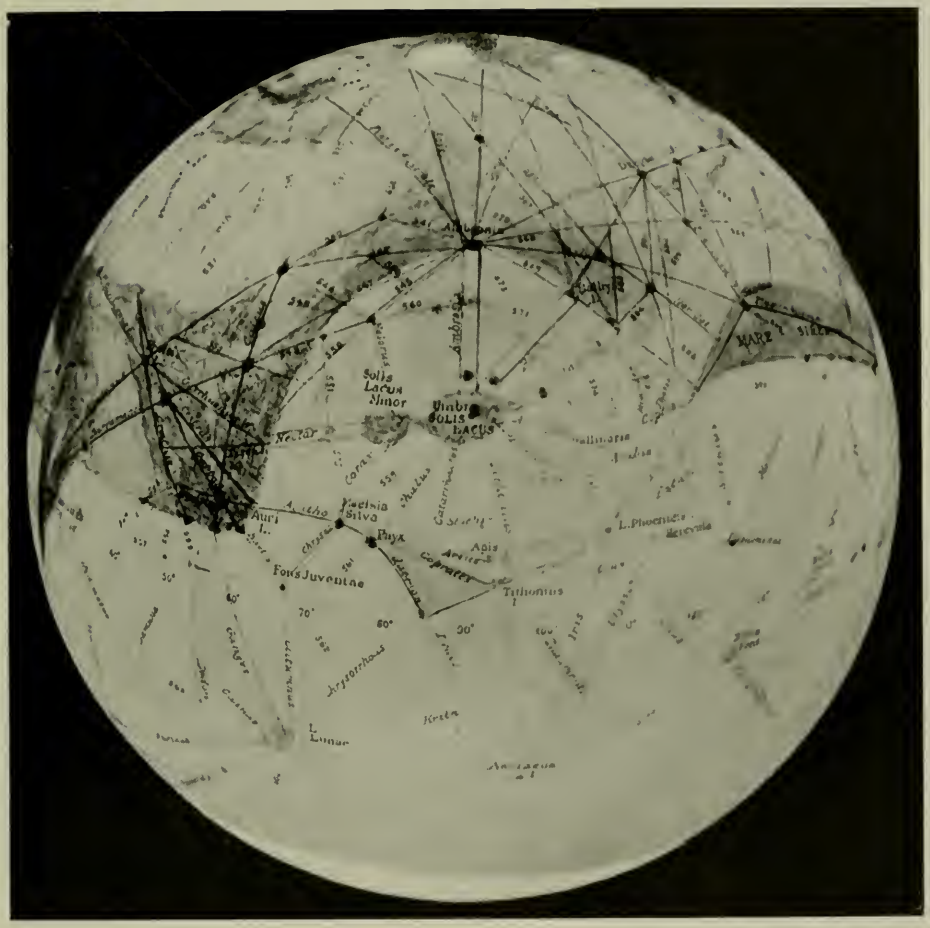
From drawing by Percival Lowell

Globe of Mars, longitude 270°, 1909. Dr. Lowell has discovered that the canals of Mars wax and wane, have what appears to be a "live" and a "dead" season. They are thought to be strips and oases of vegetation sustained by the waters of melting solar snow-caps, distributed through canals constructed by intelligent beings

Observatory, that not only does Mars have an atmosphere, although less dense than the earth's, but that it contains the essential life-supporting substances, oxygen and water-vapor.

Photographs by Mr. C. O. Lampland taken with the great reflecting telescope of forty inches aperture, at the Lowell Observatory, show star clusters containing almost countless suns similar to our own, but so distant that their light travels hundreds of years to reach us; as well as examples of the different classes of nebulæ presenting unique and interesting forms. Also, photographs of our moon show clearly the great craters many times larger than any on the earth, and mountains which rise to a height of ten thousand feet or more.

What has created most interest, however, are the non-pareil photographs of the Martian canals — the possible ingenious handiwork of intelligent beings. These peculiar markings characteristic of Mars only, were first detected in 1877, by the eminent Italian astronomer, Schiaparelli. Because of similarity of



From drawing by Percival Lowell

Mars, longitude 90°, 1909. These drawings agree with the photographs taken of the planet although made independently without any knowledge of what the photographs would show, some of the latter having been taken indeed at a station in Chile seven thousand miles away

color and of their connection with the large dark green regions, which were then generally supposed to be lakes and seas, Schiaparelli was led to believe them to be rivers or channels dividing the continents, and thus they received from him the name *canale*. In 1892 the same linear markings were found to invade also the "seas" of Mars, and it was found too that the positions of these canals remained permanent. This disproved the existence of the supposed seas. Then it was soon discovered by Dr. Lowell that the canals waxed and waned, that they had a "live" and "dead" season and thus he announced, in 1894, the theory that the canals and lakes of Mars were not water but strips and oases of vegetation sustained by the waters of the melting polar snow-caps, and distributed over the arid planet by an artificial canal system constructed by intelligent beings.

As time passes and our knowledge of Mars increases, this theory becomes more and more probable. It satisfies all the facts brought out by observation and accounts for the remarkable changes

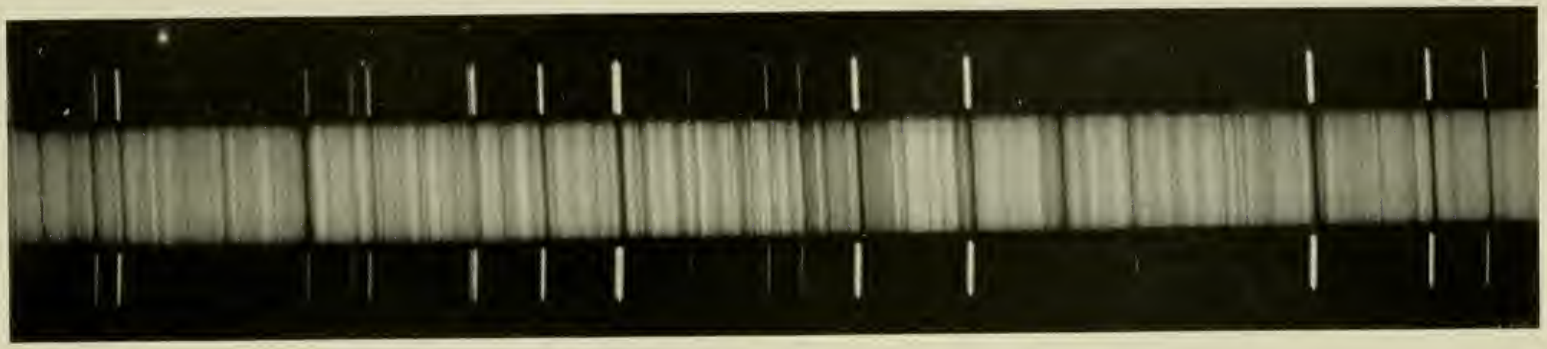


Photo by V. M Stipher

SPECTROGRAM OF JUPITER

Light from a celestial body passing through the prism of a spectrograph gives revelations learned in no other way. These concern the constitution of the atmospheres of planets, and the motions and constituents of stars, nebulæ and comets.

From the spectrogram of Jupiter, we learn that this planet has a very dense atmosphere. The bright lines at the upper and lower edges of the Jupiter spectrum are of the comparison spectrum. The dark lines in the Jupiter spectrum lean to the left at the top edge, in consequence of the rapid rotation of Jupiter. By measuring this slant of the lines the length of Jupiter's day can be accurately determined

occurring in the peculiar network of markings which geometrically thread the planet's surface. Critical and serial observations embracing years of study of the planet by the keen eye of Dr. Lowell have revealed a close connection between the melting of the polar snows and the intensification of the canal system. This development of the marks of vegetation follows the passing of the sun from one hemisphere of the planet over the other and is most intense during the Martian spring and summer seasons. Mars is in a more advanced stage of planetary evolution than the earth and it has but a meager supply remaining of either air or water. Dr. Lowell believes that the numerous linelike markings seen there are those of vegetation growing by an enforcedly constructed irrigation system. Two significant facts found by observation support his theory: first, the marked geometric directness of the lines — no natural causes can account for them; second, the characteristic manner in which they develop with the seasons and the melting of the snow-caps.

That the canals and oases do change markedly in intensity from time to time, is evidenced, directly and indirectly, by the observations of a number of astronomers. The photographs of the planet also prove this. As far back as 1877 Schiaparelli observed their disappearance and subsequent reappearance which he attributed to the presence of Martian clouds but it is now known that clouds never occur on Mars sufficient to obscure such surface details. In fact clouds are very rarely indeed observed there and when they do appear, they are seen only as dust storms along the planet's terminator. It is clear therefore that the changes he saw in the intensity of the canals were not apparent and due to clouds as he thought, but real and due to seasonal variations in the vegetation.

Ever since Schiaparelli discovered the canals a spirit of skepticism, although not general, has existed regarding their reality and the observations of those who have seen them have met with considerable criticism. Various theories have been advanced to explain them as illusions, but these theories suffered sure and sudden destruction when in 1905 Mr. Lampland with camera and methods of his own design first succeeded in photographing them. Subsequent improvements of the method brought better results and during the succeeding oppositions of the planet a majority of the canals and oases have left their imprint on the photographic plate. However it is to be remembered that seeing with the eye is almost instantaneous, while with the photographic emulsion frequently a time exposure is required. Because of this, and the fact that even in the most tranquil air the telescopic image remains quiet but for a very short period of time, the photographic image stands at a great disadvantage, being a poor average picture of the planet at that moment.

The importance of these Martian discoveries has been indicated and emphasized by the denunciation they have called forth. It is the old story over again of the reception of an advanced idea, the same intellectual inquisition which scouted the discovery by Roemer of the velocity of light, and refused publication to Mayer's and then Helmholtz's detection of the law of the conservation of energy. Every new idea in science, Huxley said, starts as a myth to end as a superstition. The very same cast of mind that rejected the conservation of energy for publication in the best physical magazine of Berlin because of its supposed absurdity, when it was young, is proclaiming it, now that it is old, the greatest scientific advance of the nineteenth century.

Courtesy of D. Appleton and Company

SOME OWL PORTRAITS

Fuertes' bird portraits, like those of a great painter of men, depict character and individuality

LOUIS AGASSIZ FUERTES — PAINTER OF BIRD PORTRAITS

By Frank M. Chapman

LOVE of birds as "the most eloquent expression of nature's beauty, joy and freedom" is the rightful heritage of everyone who in one way or another hears the call of the outdoor world. But that inexplicable fascination for birds which awakens an instinctive uncontrollable response to the sight of their forms or the sound of their voices, which arouses a passionate desire to become familiar with them in their haunts and obtain an intimate insight into their ways, and which overcomes every obstacle until, at least in a measure, this desire is gratified, is the gift of the gods which marks the true ornithologist. In him the universal, if not always developed, love of birds is supplemented by the naturalist's longing to discover the secrets of nature. Your true bird student, therefore, is a curious, and sometimes contradictory combination of poet and scientist.

Men in whom this taste and ambition combine to make birds the most significant forms of the animal world, are not numerous; but a great painter of birds must be primarily a man of this type. When therefore one considers how small is the chance that the essential attributes which make on the one hand an ornithologist, on the other an artist, will be found in one individual, it is small wonder that the world has known so few real bird portrait painters.

Artists who introduce into their canvases birds as impossibly feathered as conventional angels, artists who paint birds with more or less accuracy of color and form and, more rarely, pose, have not been few in number; but the artists who paint bird portraits based on an intimate, sympathetic, loving study of their subject in nature, and who have the ability to express what they see and feel, can be counted on one's fingers, and the name of Louis Agassiz Fuertes would be included before the second hand was reached.

Fuertes in possession of a freshly captured specimen of some bird which was before unknown to him is, for the time, wholly beyond the reach of all sensations other than those occasioned by the specimen before him. His concentration annihilates his surroundings. Color, pattern, form, contour, minute details of structure, all are absorbed and assimilated so completely that they become part of himself, and they can be reproduced at any future time with amazing accuracy. Less consciously, but no less thoroughly and effectively, does he store impressions of the bird's appearance in life, its pose, mannerisms, characteristic gestures of wings, tail or crest, its facial expression — all are recorded with surprising fidelity.

This indeed is the keynote of Fuertes' genius — for genius it is. His mind appears to be a delicately sensitized plate designed especially to catch and fix images of bird life; and of such images he has filed, and has at his finger tips for use, a countless number; for his opportunities for field study have been greater than those of any other painter of birds. It has been my good fortune to be with Fuertes on many occasions when for the first time we met with some particularly interesting bird in nature. At such times there was perhaps no very marked difference in the extent of our enthusiasm or the manner in which it was expressed;

but all the time, subconsciously, Fuertes' mental photographic processes were making record after record. At the moment not a line would be drawn or a note written, but so indelibly and distinctly was what he had seen, etched on his memory that it could later be visualized as clearly and faithfully as though the original were before him.

Fuertes' bird portraits, like those of a great portrait painter of men, depict not only those externals which can be seen by any observant person, but they reveal character. Examine, for instance, the drawings of owls' faces, or the sketches of toucans which are reproduced in this connection, and note how much individuality is expressed in each drawing. These pictures are instinct with life and differ from the work of the inexperienced or unsympathetic artist as a living bird differs from a stuffed one.

Fuertes was born at Ithaca, where he now lives, in 1874. In 1897 he was graduated from Cornell, of which his father was director of the College of Civil Engineering. Drawing birds was with him as natural an outward evidence of an inward condition, as with most children spinning tops is an expression of an inherent love of play. Before his graduation he had made the illustrations for Florence Merriam Bailey's *Birding on a Bronco,* and Mabel Osgood Wright's and Elliot Coues' *Citizen Bird.*

It was the encouragement he received from Coues that led him definitely to decide to become a painter of birds, and the immediate recognition his work received permitted him to give rein to the naturalist's longing to see the birds of other lands.

In 1898 therefore he went with Abbott H. Thayer, under whom he was studying, Gerald Thayer and Charles R. Knight, to Florida. The following year, as a member of the Harriman Expedition to Bering Sea, he had exceptional opportunities to meet in life many boreal birds which had been studied by few, if any, bird artists. The reports of this expedition contain some of the studies made on this trip. In 1901 he accompanied a party of the Biological Survey into western Texas. In 1903 he studied in California and Nevada; in 1904 in Jamaica; and in 1909 in the Gulf of St. Lawrence.

In 1902, 1907, 1908–11 and 1913, Fuertes acted as artist to the American Museum's expeditions, which during these years made field studies and gathered material for habitat groups in the Museum from the Bahamas, Florida, Saskatchewan and Alberta, Yucatan, Mexico and Colombia.

On these expeditions he has collected about thirty-five hundred specimens which are beautifully prepared and fully labeled with data of special value to the artist, when necessary. These data are in the shape of color sketches of bill, feet, eyes, or other unfeathered areas, the colors of which disappear after death. Such studies can be obtained only from the living or freshly captured bird, and Fuertes' collection of them is unique.

As the artist of Museum expeditions, Fuertes has not only made sketches of the birds secured, but oil studies of the landscape selected as the panoramic background for the habitat group in which the birds were later to appear. In each instance these are accompanied by detailed color sketches of leaves and blossoms for the guidance of the preparator of the vegetation modeled for the group. Where birds appear in the background of the completed group, they are painted there by Fuertes himself; and the landscapist who realizes his limitations gladly avails himself of this expert coöperation. Thus we have in these groups (notably the flamingo

STUDIES OF SOUTH AMERICAN TOUCANS

Fuertes' opportunities for field study have been greater than those of any other painter of birds. For just his work on the bird groups in the American Museum he has studied in the Bahamas, Florida, Saskatchewan and Alberta, Yucatan, Mexico and Colombia

group), paintings by this artist which to bird lovers of later generations will have all the interest a panoramic painting by Audubon of, for example, a flight of wild pigeons would have for us to-day.

Because of the accuracy of his work, Fuertes is ever in demand as the illustrator of technical and popular books and articles on ornithology. His contributions to publications of this nature amount to thousands of drawings; many of them have been adequately produced in color and through their wide circulation, they have exercised an educational influence of the highest importance. Such for example are the illustrations in Eaton's great work on the *Birds of New York*, published by the State; those in the *National Geographic Magazine*, and the series appearing in *Bird-Lore*.

In all of these illustrations everything is made subservient to the bird itself, which usually claims as large a share of the picture as it does of Fuertes' attention. But in a series of twenty-four large panels in oils, done for the library of Mr. Frederick F. Brewster of New Haven, the birds, chiefly water-fowl and shore birds, take their proper place in a series of strongly handled landscapes which reveal Fuertes' art in a new aspect. With no sacrifice of his skill and insight as a painter of bird portraits, he has here placed his subjects in a setting which adds immeasurably to their beauty and to the appeal they make to the imagination. These pictures, in the writer's opinion, are Fuertes' greatest achievement and point the way for the development of his exceptional gifts.

Property of F. F. Brewster

Peregrine falcon with bufflehead. From painting by Fuertes.

Property of the Artist

BARRED OWL

The "hoot owl" is still a fairly common bird in all of the wooded parts of eastern North America. Like most birds of prey, it is misunderstood and is persecuted on sight, although its food consists almost exclusively of small destructive mammals, birds forming no regular part of its fare

Property of Truman E. Fassett

GOLDEN EAGLE AND PTARMIGAN IN THE ROCKY MOUNTAINS

Property of F. F. Brewster

WILD TURKEY

Formerly inhabiting the entire forested parts of North America from Hudson Bay to the Gulf of Mexico and west to the Great Basin, the turkey is now extinct north of Pennsylvania and common only in a few greatly restricted regions. It is America's finest contribution to domesticated poultry

Courtesy of "Bird-Lore"

TROGONS FROM COLOMBIA

The trogons are tropical birds of superlative beauty, being of the richest iridescent greens, violets and blues above, with underparts of blood red or purest yellow. The most gorgeous of all, the sacred Quetzal of the Aztecs, is related to the larger bird figured

Property of F. F. Brewster

CANVASBACKS

Property of F. F. Brewster

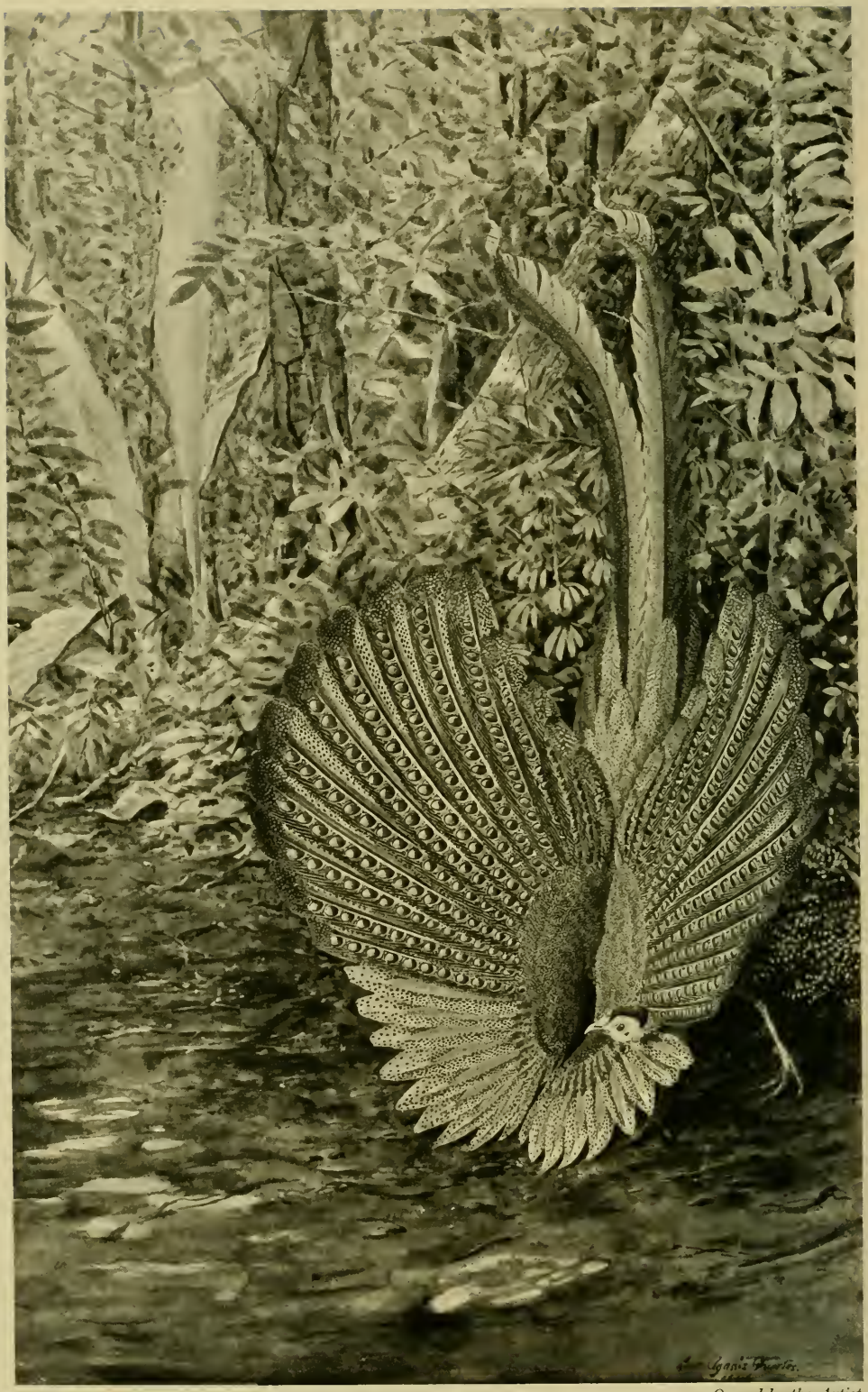
OLD SQUAWS

Old squaws breed closer to the pole than any other bird except the knot sandpiper. They are wonderful divers and are frequently caught in the Great Lakes in whitefish nets set in fifty fathoms

Property of F. F. Brewster

SNOWY OWL

Nesting mainly within the Arctic circle, this owl comes well within the United States in winter, being always more abundant along the sea-coast. Its food is largely fish, caught from the edge of the ice or gleaned from the beaches at low tide



Owned by the Artist

ARGUS PHEASANT, DISPLAYING

Little is known of the habits of the argus pheasant of Malay Peninsula, Java and Borneo, as it is nocturnal and dwells in humid forests

Deserted by his fellows, this young Johnny has his "heart in his throat"

THE PENGUINS OF SOUTH GEORGIA

"JOHNNIES" AND "KINGS" ON A DESOLATE SUBANTARCTIC ISLAND[1]

By Robert Cushman Murphy

Illustrations from photographs by the Author

THE territory of the "Little People of the Antarctic" has lately been subjected to so many friendly invasions that we are beginning to feel fairly well acquainted with a number of their tribes. First in entertaining word pictures, then in photographs, and finally in the beauty and realism of the cinematograph film, we have been shown something of the life histories of the jolly little Adélie penguin, the stately emperor and several others.

Owing to the recent interest in exploration and discovery upon the south polar continent itself, the penguins[2] inhabiting those uttermost shores have been studied somewhat to the exclusion of species equally interesting, and longer known to man, which dwell outside the Antarctic Circle and make their homes upon the chain of desolate Subantarctic islands. During the American Museum's recent expedition to South Georgia, which lies within the ice-fields of the South Atlantic, two species of penguins were intimately encountered —

[1] Article and photographs copyrighted, February, 1915, by Robert Cushman Murphy.

[2] A study of the habits of penguins is particularly valuable at this time when public interest has recently been given to Sir Douglas Mawson's wonderful moving pictures of penguins, taken on the Australasian Antarctic Expedition and exhibited daily at Weber's Theatre in New York City during one of the spring months.

It is to be noted that none of the species pictured by Sir Douglas Mawson (the Adélie, emperor, gentoo, Victoria, king and royal) nor those described by Mr. Murphy have ever been kept in zoölogical gardens, although a few unsuccessful attempts have been made with the king penguin in Europe. One can study in the New York Zoölogical Park at the present time several specimens of the blackfooted penguin (*Speniscus demersus*) from South Africa [purchased through German dealers].— THE EDITOR.

the magnificent king penguin (*Aptenodytes patachonica*) and the companionable little Johnny penguin (*Pygoscelis papua*). The former are dignified, imposing birds, standing a yard high, contented with their own society, and indifferent toward other creatures. As a badge of aristocracy they wear around their necks gleaming gold collars. The Johnny penguins, on the other hand, are roly-poly and plebeian, interested in everybody, and quite remind one of small boys. The two species live on the same territory and follow the same vocation of deep-sea fishers, yet their society is inviolably distinct.

We first met the Johnny penguins on the southward voyage in latitude 43° S., on November 15, 1912. Cold westerly winds had raised a heavy swell on this day, and just before nightfall penguins began to pass the ship in couples or small groups. They remained below the water most of the time, but their braying calls frequently attracted attention to sleek heads and upright tails, the only visible parts of birds at the surface.

Some of the Johnny penguin rookeries at South Georgia were on low ground near the sea, but the largest rookery that we discovered, comprising between four and five thousand birds, was distributed over knolls and ridges behind a great moraine-beach at the Bay of Isles. The site is bounded by two glaciers so that it can be reached only from the bay. In 1912–13 the penguin settlements, beginning half a mile from the water front, extended inland and up the hills to a height of about six hundred feet. As long as young penguins were on this nesting ground, processions of adults might at all times be seen coming and going between the high land and the sea. The birds met and passed each other without a visible sign of recognition, each trundling gravely along on its own business. A broad thoroughfare had been stamped across the moraine, worn down doubtless through generations of the pattering of little leathery feet, while deeply grooved, sinuous avenues extended up the long snowbank to the highest portions of the colony.

This type of rookery is common at South Georgia wherever high land is at all accessible. No matter how much available territory there may be near the water, no matter how wearisome the scramble up the hillsides, a certain proportion of the members of each colony selects as home the summits of the windy, shelterless ridges. Why should marine birds which lack altogether the power of flight, and which are at best indifferent walkers, prefer to make the period of propagation difficult for themselves by retreating as far as possible from their only source of food?

A consideration of the history of South Georgia may help in an interpretation of the strange instinct which drives the Johnny penguins to nest among the hills. The island is small, but its glaciers are as mighty as those of Spitzbergen, and there is ample evidence that it was formerly completely buried by an ice-cap. The interior, which rises to an altitude of more than six thousand feet, is no longer ice-clad, excepting on the peaks, but is covered with an everlasting névé of the Alpine type. This consolidates at the sources of all the valleys to form tongues of ice, most of which extend into the sea, ending in abrupt walls. Since most of the fiords have been carved out by former extensions of the valley glaciers, the coast is almost beachless, the few areas of low, flat land being terminal moraines or beds of moribund or extinct glaciers. Even

now, with the fluctuating seasons, the glaciers sometimes advance their fronts and flanks over considerable ground once abandoned, but in general glaciation is on the wane, and an appreciable decline has taken place even within a century. From such a condition it may be assumed that for a long period following the last ice-cap very little territory suitable for breeding purposes was exposed. Whatever bare earth existed must have been found along the ridges which separated the ice-filled valleys. During such a period these small penguins may have developed the trait which still leads them to seek lofty places for their nests. The fact that South Georgia was formerly the home of a far more abundant fauna than at present would have tended to fix the "mountaineering" instinct, for animals obtaining their sustenance only in the sea would have a tendency to increase more rapidly than the proportionate area of the beaches, and through sheer overflow of population many birds would be forced to content themselves with the less accessible ground, leaving the shores to great herds of summering seals, and the adjacent nesting-sites to powerful rivals such as the king penguins.

The faith which the Johnny penguins hold in the protectiveness of high land is strangely shown by their habit of running *away* from the water whenever danger threatens. Their terrible marine enemy, the sea-leopard, a large carnivorous seal, has fixed within the Johnnies an instinct which urges them to seek safety only on *terra firma*. Consequently they do not govern their acts according to their perceptions. Time and again I have seen a group of them standing at the water's edge when a fox terrier, brought ashore from the vessel, started toward them at a run. If the penguins deigned to show any fear at the approach of the barking dog they invariably responded not by taking to the water, where they would have been rid immediately of the tormentor, but by deliberately running *up* the beach, heading for the nearest bank or hillside. Even after the dog had seized a penguin by its bristly tail and had swung it round and round merely for the fun of

At a rookery of Johnnies

teasing, the poor dazed victim would still persist in scampering away from the water. I often found that the surest way to keep penguins ashore was to try to drive them into the sea.

The antiquity of the hill-climbing instinct among the Johnny penguins is finally attested by a strange and romantic phenomenon, namely that the penguins go back to the seclusion of the heights to die. In a hollow at the summit of the coast range south of the Bay of Isles lies a clear lake on a bed of ice-cracked stones. This transparent pool, formed entirely of snow-water, with a maximum depth of twelve or fifteen feet, is a penguin graveyard. In January, 1913, I found its bottom thickly strewn with the bodies of penguins which had outlived the perils of the sea and had apparently accomplished the rare feat among wild animals of dying a natural death. They lay by scores all over the stony bed of the pool, mostly on their backs, with pinions outstretched, their breasts reflecting gleams of white from the deeper water. Safe from their two enemies, the sea-leopard in the ocean and the skua gull ashore, they took their last rest. For months, perhaps years, they would undergo no bodily change in their frigid graves.

Nesting Johnnies are generally timid, scampering off at the approach of a man, but never retreating more than a few paces. A small proportion of them stand their ground on the nests and show fight, employing as weapons both bill and wings. With the latter they can strike rapid and forceful blows. On one occasion a bird which I had roused from sleep attacked me and beat such a furious tattoo upon my leather leggings that its own pinions were soon bleeding. When a brooding penguin is driven away from young nestlings it lingers near by,

An adult Johnny with the first chick. Three or four days usually intervene between the hatching of the two eggs. Note the penguin's long tail pointing stiffly upward, and the white fillet which crosses the head

trumpeting loudly until the disturbance is over; then it examines its offspring very minutely, stooping down near-sightedly, and scrutinizing one and the other over and over again. When satisfied that all is well it settles down contentedly. The incubating birds turn about in their nests so as to keep their bills pointed toward the skua gulls, which walk about the rookeries with evil purpose and wait patiently hour after hour for a chance to steal an egg. Eternal vigilance is the price of safety for the penguins. The sitters hiss sharply whenever a skua draws near, and the free penguins make angry but vain rushes at the common enemy.

Besides the hiss of wrath the Johnny penguins have a variety of louder calls. The ordinary trumpeting note sounds like the noise of a tin horn or the braying of an ass; the sound is double, being produced by both expiration and inspiration, and is accompanied by a rising and falling of the lower throat. The voice is pitched in a much lower key than that of the king penguin. Usually the head is pointed upward while the penguin trumpets. The mouth is held wide open, with the spiny tongue showing, and the expelled breath condenses into clouds of vapor. The trumpetings are often repeated many times without interruption, and under excitement the bird's whole bodily energy seems to be put into the call. Another note is a short, single "caw," which the penguins are apt to utter as soon as they emerge from the sea. This call sounds like a hail from one man to another, and the human suggestion is enhanced by the penguins' habit of waving their flippers

A proud parent with two healthy, pot-bellied youngsters. The near young one is trumpeting

as if beckoning. The weak trumpetings of nestling Johnnies have a peevish, scolding quality, even hysterical at times. The youngsters have a soft, peeping note also, indicative of well-fed contentment.

By the middle of January the young penguins were mostly two-thirds grown, and their incessant chattering could be heard a long way from the rookeries. The older youngsters walked about in an uncertain, wobbly fashion, tagging after their fathers and mothers and trumpeting nervously when left too far behind. When I walked among the nests, all but the youngest chicks left them and herded together. The brooding adults too, rushed away, but a few squeaks from the abandoned little ones usually brought them back, scampering hither and thither and swinging their wings frantically. If the youngsters happened to be old enough to walk, the parents coaxed them along by giving small tastes of food, with promises of more, but in hysterical fashion they would soon forget to wait for their feeble babies, and would have to be called back repeatedly.

By the end of January all but a very few of the young penguins, still clad in the softest of gray and white "fur," had permanently deserted the nests and had congregated by themselves, but always under the guard of adult nurses. In fine weather they might be seen sunning themselves on the snowbanks, and at other times crouching from the wind in sheltered hollows. Some of them were as large as the adults, but they were still dependent for their food, and they had not yet been to the seashore. I often saw them pleading to be fed when the old birds evidently did not wish to gratify them. Such begging youngsters ran about after the adults, following every dodge and turn, continually bumping into them and stepping

The Johnny on the left has fallen and soiled his clothes. The white spot on the heads of these youngsters is the signal of the approaching molt

on their tails until the harassed adults gave up in despair. The young ones would then press closely against the provider, open their little bills expectantly, and lose nothing of the regurgitated meal.

About the first of February most of the young Johnnies begin molting their down, thus exposing the adult plumage feathers which have developed underneath the down. The down is shed in sheets and patches; the process resembles the peeling of the velvet from a deer's horn. By the middle of February, or toward the close of the molting period, clinging tufts, collars, or top-knots of down give the otherwise smooth young penguins the appearance of clowns and pierrots.

The molt of the nestling Johnny penguins is succeeded closely by the annual molt of the adults. Toward the end of February the feathers of the latter, already much faded and frayed, begin to drop out, still further to litter the ground of the rookeries. The molting season of the adults seems to endure all through the Antarctic summer. On March 12 I observed that a few of the adults had not yet begun to doff their old coats, which were brown, rough and threadbare. Many more, the majority of the birds in fact, were in the throes of the process and were exceedingly ragged, the new plumage showing in spots. Still others had completed the molt of the old body feathers, but still retained their long tails, while the most advanced birds had lost all their feathers including the tail, a temporary loss which gave them a more dumpy outline than ever; for appearance sake a Johnny can ill afford to be without its luxuriant caudal bristles.

The Johnny penguin has not in any degree the fearless and courageous disposition of its Antarctic cousin, the Adélie penguin. Bands of Johnnies along the beaches are prone to take alarm if a man appears suddenly among them. The most successful course of action is to approach them slowly, halting at a discreet distance and so inviting the penguins to take the initiative. They have a large bump of curiosity and will presently push the acquaintance, their familiarity increasing in direct proportion to the quietness and seeming indifference of the observer. A description taken from my notes of December 23, 1912, is characteristic. On the afternoon of this day I walked to a glacial pond on the far side of which stood a group of Johnny penguins. As soon as they saw me one of their number swam across under water and walked toward me. I remained motionless until it came up quite to my feet and stood there. When I moved quietly, it followed, and when I stopped, it did likewise. Then, one by one, it was joined by the other penguins from across the pond. It was whimsical to see this troop of mimicking small brothers with no other wish than to keep me company. I finally broke the spell by stooping to pat one on the head, when they all wiggled their tails, hurried back into the pond, and swam across like porpoises.

On March 12 I rowed ashore during a brisk snowstorm and found a whole army of penguins near the rookery at Possession Bay. They were standing by hundreds in a long double row along the beach. These rows marched forward to meet and surround me, and their numbers were continually augmented by new arrivals which kept popping out of the surf, and came running up the shingle as if much astonished to find me there.

The Johnnies walk in a deliberate manner, raising their feet high at each step, carrying their tails well above the

Off to sea! Relieved sitters setting their balancers and starting on the long walk to the water

ground, thrusting their wings behind them as balances, and poking the head forward into the accustomed nearsighted attitude. Their nearsightedness is probably no less real than apparent, because of the specialization of their eyes for vision through a medium of water.

In crossing the stony or hummocky beaches that separate various arms of the bays, or that lead from the sea to the snow-water ponds in which the penguins delight to play, they follow regular, well-tramped avenues. When bent on a definite journey across the land they trudge along very steadily and unconcernedly, and for the time seem to take no notice of their fellows. When in great haste they fall upon the belly and run on all fours. By this well-known mode of progression, called "tobogganing," they can lead a man a very creditable chase. Their most curious attitude is assumed when they walk down an incline, such as a snowbank or a steep beach. The head is then thrust so far forward that the straight neck and the spine form a right angle; the wings are held stiffly back as far as possible, and the round belly projects as the bird proceeds with gingerly steps. Their fat bodies seem to be made to stand hard knocks, for not only do they tumble over frequently wherever the walking is rough on shore, but they also suffer fearful batterings on the shingle when they come out of the surf, some-

A group of Johnnies — downy young "nurses."

times being bowled over by four or five successive breakers before they can scramble out of the undertow.

When wading into the water the Johnny penguins invariably round their shoulders, bend down their heads almost to their feet, and scoop beneath the surface as soon as there is depth enough to float them. Once under way, all their terrestrial awkwardness vanishes. They swim with well-nigh incredible speed, remaining below the surface except when they leap out porpoise-like, giving an audible gasp for air — to be gone again within the twinkling of an eye.

One evening I stood knee-deep in the water of the Bay of Isles and watched at close quarters four Johnny penguins swimming. The sea was fairly calm, the water clear and brilliant in the sunset light. The quartet of penguins darted hither and thither all about me, now and again almost brushing my legs. Frequently they rolled their backs above the surface, and more rarely they leapt out. I distinctly observed that the strokes of their flippers were sometimes made alternately and sometimes in unison. Probably they were feeding, although I could not see their prey. Whether for sport or a more serious purpose they occasionally swam in the ridge of an advancing swell, going so far up the beach that they were left stranded for a moment. Presently three of them walked out of the sea, shook the water from their tails and became so

and molters. One is in the ecstatic attitude of trumpeting

immensely interested in watching me, that they pursued me for a while when I left the spot.

On another occasion I witnessed an extraordinary diversion of the penguins in the graveyard pool already mentioned. This pond, lying in a hollow of the hills, was bordered on three sides with a perpendicular bank of hard snow, the remaining shore being a stony slope. On the afternoon of my visit penguins were swimming in it, for pure enjoyment of course, for there was no food, no living thing, not even a visible alga, in the transparent snow water. How alert and reptilian the penguins seemed in their own element! How unlike the inelegant, ridiculous creatures they are ashore! They dashed straightaway under water the length of the pool and back again, with a velocity which I had then an opportunity to compute as about thirty feet a second. They chased each other round and round, flashing into the air twice or thrice during their bursts of speed, every action plainly revealed through the clear, quiet water, with the white dead birds down below them. When the swimmers rested at the surface, only the white-filleted head and up-pointed, ridged tail showed, as a rule, but sometimes they would float higher, like grebes. Several of them tried to leap out onto the bank of frozen snow which rose a yard above the water. Strangely enough they misjudged their distance repeatedly; they jumped too soon, and were on the downward segment of their arc before they had cleared the edge. I saw one individual try a dozen times and fail; it always leapt a few lengths too soon and whacked its shiny breast against the wall of ice. A group of birds, which had been sunning on a snow bank, entered the water as if by mutual agreement. Some of them walked to the rocky slope and waded, arching their necks and tucking their heads under water before they made the plunge. Others flopped off the edge of the ice. I say flopped because they did not make graceful standing dives, such as I had expected; on the contrary they entered with flagrant, splashing "belly-whoppers." The great discrepancy between the Johnny penguin and the Adélie penguin in jumping and diving ability is at first sight rather surprising. Through the medium of the films taken during the Australasian Antarctic Expedition I have seen the prodigious, salmon-like leaps of the plucky little Adélies, while the photographs of Scott's Expedition well illustrate the graceful dives of these denizens of polar shores. It must be borne in mind, however, that the Johnny, with a Subantarctic range, breeds on no land which has an ice-shelved coast. The ability to gain the land by a catapultic spring has doubtless vanished with the disappearance of the necessity for such a method.

The Johnny penguins often feed far at sea, but during the long breeding season they apparently all return to the land for the night. In late afternoon we usually saw long troops of them "porpoising" into the fiords from sea. This habit is so well known that sealers, overtaken in their boats by an impenetrable South Georgian fog, rely upon the home-coming penguins for the direction of the flat beaches.

Considering the fact that most marine birds swim as soon as they emerge from the shell, the tardiness of young penguins in taking to the water has been pointed out as a remarkable phenomenon. The explanation of this, however, is doubtless that the speed and stamina required in capturing living pelagic food, in escaping from the dreaded sea-leopard, and in swimming through breaking surf, cannot be developed early in life by birds which

use the *wings* instead of the feet as propelling organs. Certainly the pinions of nestling penguins seem extraordinarily underdeveloped. The little birds begin to exercise them soon after birth by flapping them, weakly at first but vigorously later on — a trait that suggests ancestral aspirations for flight. On many occasions I put nestlings of various ages, as well as fully grown, molting young, into the fresh water ponds, where they proved themselves almost as helpless as human beings unfamiliar with swimming. They instinctively put their heads under water and tried to swim below the surface in the approved fashion, but it was a feat quite impossible for them. They beat the wings simultaneously, and bobbed up and down without making much progress. Such a scene always attracts a band of skua gulls to the spot, as if these ogres realized the helpless misery of a young penguin in the water. The skuas do not strike while their prospective victim is swimming, but pace along the shore waiting to intercept its landing. Once a half-grown youngster, with which I had been experimenting, crawled out of the graveyard pool into the very jaws of seven skuas which attacked it *en masse*. The little penguin struck with its feeble wings and cried out piteously. Insignificant as it was, not one of the skuas dared seize it outright, but they made quick rushes from all sides, striking the penguin on the head with closed bills, and then retreating. I hurried to the rescue and restored the little bird to its nest where I afterward saw it resting characteristically with its head hidden between its mother's warm feathered thighs.

[Story of King Penguins in next issue of JOURNAL]

A group of king penguins. Above is Lucas Glacier named by Mr. Murphy in honor of the director of the American Museum of Natural History

After Max Begouen in "L'Anthropologie"

BISON IN CLAY, TUC D' AUDOUBERT CAVE

Representations in clay of male and female bison, found at the inner extremity of the Tuc d'Audoubert cave, on the estate of Count Begouen, near Saint-Girons (Ariège), France. The figures are each about two feet long and are the only known examples of clay-modeling dating from palæolithic times. Except for the cracks due to drying of the clay, the broken tail of the cow and the horns of the bull, the figures are in perfect state of preservation

EUROPEAN CAVES AND EARLY MAN

By N. C. Nelson

Introductory Note: The American Museum is one of several institutions in the New World to maintain an active interest in palæolithic archæology as developed in Europe. At the present time, for example, a comprehensive display indicative of this earliest of art and industry is open to the public. With the addition of a much-needed somatological series the exhibit would give the visitor a surprisingly complete ocular demonstration of man's origin and of the various steps in his physical and mental history.

In order to make clearer to the general public the binding nature of modern conclusions regarding early human developments it was decided some time ago to construct a model of a palæolithic cave station. The station selected as most instructive for this purpose was the Castillo grotto, in northern Spain, there being preserved here in forty-five feet of distinctly stratified deposits the whole industrial history of man almost from the earliest beginnings down to the introduction of metal. In connection with this project, which was inspired largely by the interest of Henry Fairfield Osborn, president of the Museum, the writer had opportunity a little over a year ago to examine a large number of the palæolithic stations in western Europe and the following general remarks are based on observations then made.[1] — N. C. N.

THERE are recorded at the present time for the southern two-thirds of Europe, including Mediterranean Asia and Africa, no less than four hundred palæolithic stations, that is, places where remains of one kind or another have been left behind by early man. This man was primarily a hunter and his chief center of activity appears to have been what is now southwestern France and northeastern Spain although Germany, Austria, Italy, Belgium, England, and to a lesser degree other countries, came within his range. This apparent distribution may be deceptive however. Many of the stations are out in the open, as for example on the valley terraces of the Thames and the Somme; but the majority of the sites, especially those of later times, are sheltered in some way. The shelter may consist merely of an overhanging cliff, it may be a grotto yawning on the mountain side and it may be the far interior of a cave. This latter type of site it is relatively easy to find by making a deliberate search while the location of an ancient camp or workshop in the open country is the result only of chance. It is conceivable of course, that these roaming migratory hunters returned seasonally to the natural shelters, but on the other hand, it is possible that many of them built huts — some of the geometric cave paintings suggest that they did — and unless these huts stood in very close proximity to

[1] The geographical distribution of important caves and shelters, the cave art and the palæolithic industrial remains were considered in the Journal issues of December, 1912 and October, 1914.

some sheltering cliff, all traces of the spot and its relics would be lost. Hence, we may properly take for granted that hundreds of archæological stations will remain undiscovered, in consequence of which our notion of the actual strength of the population at any given place during these early millenniums of human existence must continue imperfect, if not inadequate.

As need hardly be stated the presence of natural habitations depends ordinarily on a high relief or a more or less mountainous topography. Caves are most abundant in volcanic regions as in the western United States or in limestone areas such as Kentucky and adjacent commonwealths. Shelters are notable features of steep-walled valleys or box-cañons and our own cliff-dweller region affords the best example of them and their utilization. In Europe the most famous cave groups are located in the lower French Pyrenees and their Cantabrian extension in northern Spain, while the equally famous shelter region includes short sections of the Vézère and Beune Valleys at Les Eyzies, in the French department of Dordogne. Both regions are wonderfully picturesque and impressive and barring some alterations in the flora they have not changed much in general appearance since the arrival of palæolithic man. These caves and shelters are all in limestone formations and are the results chiefly of mechanical erosion. Some of the caves, especially those of the lower altitudes, are still in process of making, while others, well up on the mountain sides, are very ancient — in fact, were in their old age when man first entered them.

Roughly speaking, the shelters proper, that is the overhanging cliffs and the wide open grottos, were the homes of palæolithic man and therefore naturally furnish us with important data concerning his physical make-up, his practical

The Vézère River, its floodplain and cliff wall as seen from the entrance to the Gorge d'Enfer, above Les Eyzies, France. The station of La Micoque is on the extreme right, Laugerie Haute at the foot of the distant cliff and Laugerie Basse nearer by off the first bend in the stream

ability, and the general nature of his everyday life. The caves, on the other hand, served him mainly as galleries for a remarkable series of paintings, engravings and carvings, which in a measure reveal to us his mental attitude toward life. The caves, it must be understood, were exceedingly dark and damp, ordinarily unfit for habitation, except possibly as temporary retreats during the hard winters, and contrariwise, the shelter walls, having been exposed for thousands of years to the weathering elements, could not have preserved for us either paintings or delicate engravings that may have been made upon them. There are several somewhat qualifying exceptions to these sweeping statements however. For instance, the Gargas Cavern near Montréjeau, France, and likewise the Altamira Cave, near Santander, Spain, appear to have been occupied for protracted periods although in both cases only very close to the entrance. On the other hand, some of the shelters such as Cap Blanc, near Les Eyzies, France, have preserved, mainly through accident, a fine series of high relief sculptures. But as a general thing the camp-sites are in large half-open shelters, usually facing the sun, while the entrances to the painted caves face in any direction and for the most part are very small and inconspicuous. At Castillo only there is the perfect combination — a large sunny grotto which was occupied periodically throughout most of palæolithic times and which

Entrance to the cavern of Tuc d'Audoubert near Saint-Girons, France. A stream still issues from this cave, which is the most beautiful and in a way the most interesting of all the known Pyrenean haunts of the ancient artist who has left here not only mural engravings but also models in clay and even his footprints

served besides as the vestibule to a considerable cave, famous for its mural art.

An examination of the various Dordogne shelters coupled with a study of the changing types of objects found in them is most instructive. Nearly all of the stations here are at the base of the high cliffs that hedge the narrow valleys on one or both sides; but in a few instances the relic-bearing débris lies on an eroded ledge some distance up the face of the protecting wall. Almost within earshot of Les Eyzies are a series of stations which taken together furnish data on human history practically from Acheulian times to the present day. These stations begin with the old obscured shelter of La Micoque, include the partially-ruined shelters of Upper and Lower Laugerie; another ledge-shelter that served old-time brigands as a rendezvous and also as a fortress to defy the English in 1410; still another ledge marked by ruins of what looks like some old baronial château; and end up finally with the more or less well-kept houses of the modern peasant. These houses often stand on several meters of ancient relic-bearing débris and seem to cling in an infantile sort of way to the overhanging cliff in spite of its cold damp nature. Some distance up the Vézère, at the Rock of St. Cristopher, where the last houses have been removed, there are over four meters of débris dating from neolithic to present time and the adjacent cliff is marked by several series of parallel holes, cut for the insertion of ceiling beams, precisely as we find them in our own Southwest. Some of these holes are high up the cliff but others are below the surface of the accumulated débris which is itself below the high-water mark of the river.

Anniversary occasion (July 20) of the discovery of the Tuc d'Audoubert cavern. The amiable Count Begouen is seated in the center while behind him and on the extreme left are his three enthusiastic sons who made the discovery of the famous modeled bison. Professor Emile Cartailhac is seen to the left of the Count and on the right are two French zoölogists, students of the cave fauna

Laugerie Haute, showing present-day dwellings built against the cliff. Beyond the houses a tremendous overhang which once sheltered Aurignacian and Solutréan people has dropped down, burying possibly some of the ancient inhabitants

The ideal shelter, Grotte d'Enfer, was probably not occupied as long as might be supposed as it was subject to floods

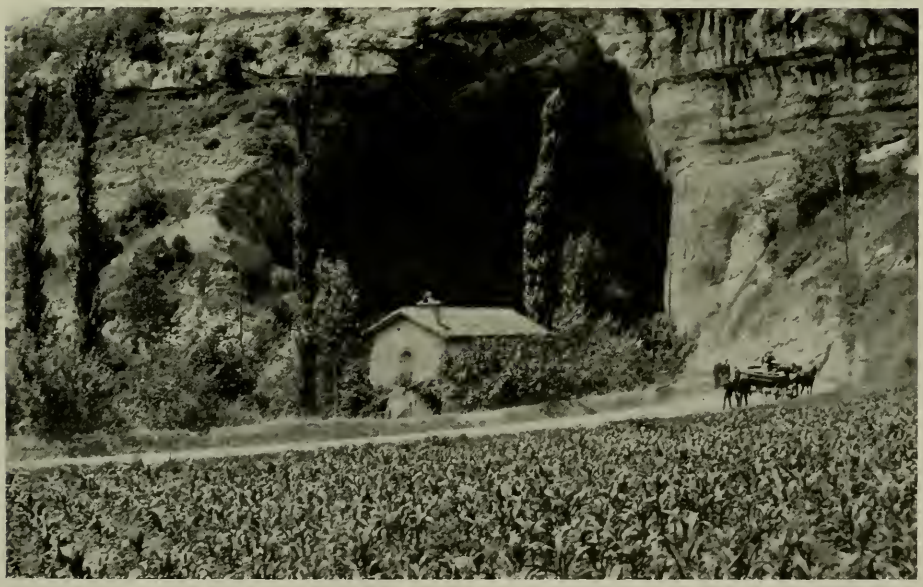
With all this evidence suggestive of continuous occupation, it is not to be wondered at that some students profess to see among the local inhabitants a number of individuals that resemble the physical type of palæolithic man.

A visit to the painted caves is the experience of a lifetime; but while it is an adventure bound to excite more enthusiasm than the examination of the shelters, it is less instructive and certainly less convincing. It is also an undertaking fraught with some difficulty and disappointment, except perhaps in such cases as Altamira, Niaux and Font-de-Gaume. The painted and incised representations on the cave walls are seldom so plain and striking as one might infer from the superb reproductions in the published reports, and to make them out the visitor must take time. In this effort to decipher, he is most ably assisted by Professor Emile Cartailhac of Toulouse, who has given a good part of his life to the study of palæolithic art and who at present guards nearly all the Pyrenean caverns. In Spain and in the Dordogne country, however, local guides must be taken and as these are not always competent, the student who would profit by his opportunity must prepare himself beforehand in regard to what is to be seen and then insist on being shown, or he may not see much.

The last cave to be discovered and also the most beautiful is the Tuc d'Audoubert, located on the estate of Count Begouen near Saint-Girons, France. This is perhaps the most difficult cavern to explore. But to risk passage in the improvised boat that the visitor must sail in order to reach the interior, and to crawl on his stomach along muddy passages that are really too small for a full-grown man, and finally to receive innumerable bumps on his head from pending stalactites is not too much to

Valley of the Rio Pas at Puente Viesgo, Spain. Over half way up the farther side of the prominent peak on the left is the cave of La Pasiega and a little lower down on the side facing the river (within view) is the famous Castillo cave and Grotto where man lived periodically almost from the earliest stone age down close to historic times

Outlook from the Hornos de la Peña cave. Not a human habitation is in sight and the rugged semi-forested country is still the home of the wolf, the bear and the wild boar



Upper entrance to the Mas d'Azil cavern, near Foix, France. The Arize River has here tunneled a high rock formation about one-fourth of a mile thick and which now accommodates the public road. Within the 200 foot-square entrance, on the left bank, is the ledge which was occupied in Magdalenian and Azilian times. In the interior are immense galleries also rich in archæological material, but now the home only of thousands of screaming bats

Entrance to the Pindal cave, north coast of Spain not far from Colombres. The people are standing on the fallen roof of a long sea passage in the rock which when the entrance was choked permitted the cave behind it to silt up and become an art gallery of considerable note. Professor Henri Breuil is on the left and the second from him is his colleague, Professor Hugo Obermaier.

The upper photograph shows the view seen from the entrance of the cave. Stratified limestone stands nearly on end and the waves have cut out long passages in the softer strata

pay for the privilege — which, as it happened, was accorded the Museum's representative as the first American — to see the wonders inside. Ordinarily, the natural wonders of the caverns are more or less discolored with mud, but here is gallery after gallery of bewildering forests of pillars and pendants and posts — all a pure white and glittering as if studded with myriads of diamonds. Here and there the stalactites hang in large sheets like folded draperies and by placing a light behind them the translucent substance flashes up into colors of green and rose too beautiful to be described. No fairy palace was ever more adorned! You are led along devious passages, stepping again and again in lakelets of invisibly clear water and when on dry footing you are warned to move circumspectly for fear of obliterating some ancient human footprints that are faintly visible under the thin coat of stalagmite which covers the clay floor. Bones and skulls of the giant cave bear and other animals lie all about, cemented in place. Finally, near the extreme inner end of the cavern comes the real object of the laborious journey, viz., the representations of two bison (male and female) modeled in clay. The figures which are about two feet in length, are propped against the sloping side of a rock which rises from the floor, and in front of the animals on the floor there are some tracings as if the artist had here sketched and improvised before beginning his real work. About twenty-five feet away in a low side chamber is to be seen the place where the modeler scraped together the clay off the floor and kneaded it. Two or three worked rolls of his material still lie there. The whole thing looks as if done a week ago and yet the bison has been absent from the locality probably for thousands of years.

The last suggestion of skepticism is in keeping with the general impression that the visitor retains from the painted caves. It is a most baffling experience. When the investigation is confined to the stratified deposits everything is beautifully simple. Art objects have a definitely ascertainable place in the series and go back to Aurignacian times. The cave art proper is of the same general style as that of the stratified refuse and must of course be of the same date; moreover, the animals represented are in nearly all cases either extinct or absent from the region. And yet almost all the mural

The Schweizersbild station near Schaffhausen, Switzerland. This limestone excrescence rises abruptly from a meadow-like spot, and in its shelter — facing approximately west — people lived in Magdalenian times. Dr. Jakob Nuesch, who gave three years to the investigation of the site, stands on the right

figures in the caves are within reach of the hand. In other words, the caves have undergone no particular changes since the artist did his work. Not a few of the paintings, and especially the finer engravings seem as fresh as if done yesterday. In the Pindal cave is the representation of a fish incised on the wall and the visitor who examines it closely would swear that he could make a line exactly like it with a lead pencil, but with Professors Breuil and Obermaier standing behind him he says nothing. And how did palæolithic man manage to get about in these caves? It is unsafe to move ten steps in them without a light. It is true that a very few stone basins have been found that may have served purposes similar to the Eskimo lamp, or the artist's right-hand man may have carried a torch; but there are no signs of such torches or of carbonization on the walls in the vicinity of the paintings, although smoke spots made by modern lamps and candles held too close are abundant enough. The conviction that this cave art is not so old as some would have us believe seems irresistible.

A weathered indentation in the limestone cliff such as served to shelter early man. Looking down the Vézère Valley from the point of its junction with the Beune Valley, at Les Eyzies, France. Several caves are to be found in the distant cliff and on one of its high sheltered terraces there is the interesting ruin of a church dating from the early Christian era

There are other difficult problems relating to palæolithic culture though none so seemingly baffling as those pertaining to the cave art, but these cannot be dealt with at present. Meanwhile the skeptic may take some consolation in the fact that Professor Cartailhac and his French colleagues were themselves doubters for over twenty years.

Section of relic-bearing débris recently exposed at Le Moustier shelter near Les Eyzies, France. In the face of the natural matrix may be counted hundreds of worked and unworked reject flint flakes

SOME DEEP-SEA FISHES

Some characteristic types of fishes found in the profound depths of the sea, half a mile or more from the surface, photographed from a group recently installed in the hall of fishes in the American Museum. The illumination of the group is so adjusted that the fishes are seen first for a few seconds in full light, and then in darkness as they are supposed to appear in the sea, lit up only by their own phosphorescent organs

The specimens are models, mostly enlarged several times the natural size. The fishes were prepared by Mr. F. F. Horter of the Museum's department of taxidermy, under the direction of Dr. L. Hussakof

FISHES OF THE DEEP-SEA

By L. Hussakof

UP TO the time of the "Challenger" expedition, very little was known regarding the fish life of the abyssal depths of the sea. Only about thirty species were known. But the wonderful collections brought back by the "Challenger" from her four-year cruise (1873–1876) made known the vast diversity, the strangeness and even weirdness of this fish fauna. Several hundred kinds of deep-sea fishes had been collected — some of them dredged from a depth of more than a mile — and it required a huge quarto[1] to describe and picture them. From this volume dates our real knowledge of the fishes of the abyssal deep. The "Challenger" expedition was, indeed, a "Columbus voyage" in ichthyology; it opened a new chapter in the history of the science.

Since that time many deep-sea exploring expeditions have been sent out by the various nations, and hosts of other fishes have been brought up from the oceans in all parts of the world. More than a thousand species are now known, and we can appreciate at its full value the richness and strangeness of this fauna. Moreover, not only do we know the fishes themselves, but as a result of the scientific investigations carried on by the various expeditions, we now know a good deal of the physical conditions under which they live, so that we can, in a measure at least, explain the why and wherefore of their extraordinary characteristics.

When we think of life in the deep-sea, there comes to mind, first of all, the enormous pressure which these creatures must withstand. This pressure becomes the greater the deeper we go down, and in the profoundest depths it equals thousands of pounds to the square inch. The result of this pressure is that the tissues of these fishes are tender and loosely knitted together. When they are brought up out of the dark depths, and the great pressure under which they live is removed, the explosion of the gases within them bulges out the eyes, and often blows out the viscera through the mouth, while the muscles collapse, leaving them soft and flabby like moist rags. Most deep-sea fishes are very small also, usually only a few inches in length, and it is probable that this reduction in size has come about to some extent at least, from the great pressure under which they live.

Another important condition is the dimness of light, or even darkness in the profound depths of the sea. If we imagine ourselves descending into the deep ocean, we see the light grow dimmer and dimmer as we go down, until finally a level is reached beyond which no light penetrates at all. The entire vast depth below it, is in eternal darkness. Now the fishes living in this dim light, or in total darkness, have been profoundly modified by it. In some forms the eyes have become very small, and in some cases have entirely disappeared. There are even fishes in which the skin and scales of the body have grown over the place where the eyes should be, so that these fishes are, as has been aptly said, "blind beyond redemption." Other forms, on the other hand, have been affected in an entirely different way. The eyes, instead of growing smaller, have grown larger, as if in an attempt to catch every fleeting ray of light. In

[1] *Challenger Reports*, Vol. XXII, 1887.

some fishes this has been carried so far that the eyes have become like enormous goggles.

Most deep-sea fishes have luminous organs of one kind or another, so that they carry their own light about with them. In some the entire body glimmers, the coating of slime which exudes from the pores and lateral canals, emitting a soft silvery glow. In others, rows of minute, luminous organs run along the sides of the body, or there are flashing light-spots on the head or face. What a wonderful sight would be to us a small black fish flitting through the silence and darkness of the deep with its headlights and row of pores gleaming through the darkness like some small ship passing through the night with its portholes all aglow! Some deep-sea fishes have a luminous organ at the end of a feeler on the head. This is waved to and fro to act as a lure to attract the prey.

A pertinent question may be asked: How do we know these fishes glow and glimmer, since no human eye has ever beheld them in their abyssal home? We know this partly from analogy and partly from actual observation. When one is in a boat in the tropics, on one of those sultry nights when everything is a dead calm, and the black clouds hang so low that sky and sea form one continuous blackness, then one may see the glimmering fishes darting out of the path of the boat, their forms, silvery and ghostlike, outlined for one moment against the blackness of the sea. This effect is chiefly due to the oxidizing of the slimy secretion covering their bodies. Why shall we not believe, then, that in deep-sea fishes a similar phenomenon takes place, particularly as in many of them, the slime pores and canals are greatly developed and must exude large quantities of slime? Then too, on deep-sea expeditions, on favorable occasions, as for instance, a dark calm night, fishes that have been brought to the surface and placed in water were seen to flash light from the ends of the tentacles or the phosphorescent pores, precisely as we should have expected from a study of these organs. Major Alcock, in his interesting volume, *A Naturalist in Indian Seas*, mentions a specimen brought up from a profound depth which "glimmered like a ghost as it lay dead at the bottom of the pail of turbid sea-water." So that by inference, as well as by actual observation, we must believe that what we call luminous organs in deep-sea fishes, emit light into the darkness about them. In the case of fishes totally blind, the absence of light is compensated for by the development of enormous antennæ-like feelers, modified from fin rays, so that these fishes can feel their way, as it were, through the darkness.

The absence of light however entails another important consequence. As is well known, no plant life can exist in darkness. There is, therefore, no vegetation of any kind in the profound depths of the sea. The deep-sea fishes are, in consequence, all carnivorous, the more powerful ones seizing and devouring the weaker ones. It is a cold black world where might reigns supreme. Many have enormous mouths, and formidable teeth to insure holding the prey. In some forms the teeth are so large that the mouth cannot be shut! Moreover, since meals are perforce far between, they must be as large as possible; hence many forms have extraordinarily capacious stomachs. Specimens have been dredged from the deep which were enormously distended through having swallowed fishes larger than themselves.

The temperature of the water in the profound depths of the sea, is always low

and near the freezing point. This is true everywhere, even at the equator. Undoubtedly this has an effect upon the fishes, although it is not yet known what it is. The amount of oxygen dissolved in the water also, is much less than in water nearer the surface. The breathing apparatus of the deep-sea fishes is modified to suit these peculiar conditions. The gill filaments have become much reduced in size, and in a number of instances some of the gill-arches bear no gill filaments at all. The fishes are apparently adapted to a much smaller oxygen supply than those living in rivers or in the shallow sea.

When we think of the vast diversity among these fishes, the question arises: Are they all representatives of a single family, or group that has become specially adapted to life in the deep sea; or do they belong to different families or groups? One need hardly be an ichthyologist to answer this question. Even a cursory examination of the plates in a work on deep-sea fishes will show that different types are represented. In fact, a great many families are included in the deep-sea fauna. There are sharks and rays; salmonoids, herrings, perches, eels, and representatives of many other families. We can explain this heterogeneity among them in this way. We may imagine that fishes of many different kinds in their search, so to speak, for the unoccupied corners of the sea, found a haven in these deeper waters where they were free from pursuit by their enemies. In the course of time they migrated farther and farther into the deep, a change in habits taking place *pari passu* with the changes in structure. Having started out with different organizations, and possessing different degrees of variability, they became differentiated in diverse directions, so that while some developed enormous mouths, powerful teeth, or phosphorescent organs, others became bottom-living and partly or completely lost their eyes. Still others developed long feelers for groping their way through the darkness. Now and again however, fishes of separate groups developed similar structures, so that there are many striking cases among deep-sea fishes of what the biologist calls "convergence," or parallelism.

The Museum has recently prepared for exhibition a number of typical deep-sea fishes arranged in the form of a group. The preparation of this exhibit involved many technical difficulties, such as the modeling of the fishes in transparent or translucent media, to represent them as glimmering or shining with lit-up "portholes." Considerable experimenting was necessary to accomplish this group, but all the difficulties were overcome, thanks to the ingenuity and perseverance of Mr. F. F. Horter of the Museum's taxidermist staff. The group, as it is now installed, represents ten types of deep-sea fishes. It is not, of course, a group in the sense of the habitat groups displayed in the Museum; it is not a section, so to speak, taken from nature and transplanted to the Museum. In nature so many deep-sea fishes are not to be found in so small a space. What the group represents is a number of fishes which are in nature scattered over a vast area and through a great height of water, here brought together for museum purposes into a few square feet of space. Each fish is reproduced accurately with its phosphorescent pores and tentacles as these are known to exist. With one or two exceptions they are enlarged several times, as the fishes themselves are very small. And since it is known that the phosphorescent organs do not glow with a steady light, the illumination of the

A small, silvery, eel-like fish which has been found in all the oceans at depths ranging from a little less than a mile to two and one-half miles. It has a row of luminous pores running the length of the body; and in the blackness of the profound depths it must appear like a miniature long dark boat with gleaming portholes. Its greenish, glittering eyes are perched on the ends of slender, hornlike tentacles — a feature which has suggested its scientific name, *Stylophthalmus paradoxus*

group has been arranged so as to have these luminous organs flash intermittently. Furthermore, the installation is arranged so that one may view the fishes for a few seconds in full light, as if in a synoptic exhibit, and then see them, when the light goes out, as they are supposed to appear in the darkness of the profound depths, lit up only by their own phosphorescent organs.

Near the top of the group is seen a fish which lives on the border line between the region of dimness and total darkness. Many of the fishes living in this region are not of a uniform sombre hue, but are brilliantly colored. *Neoscopelus* is one of these. The body is "one dazzling sheen of purple and silver and burnished gold, amid which is a sparkling constellation of luminous organs" (Alcock).

The glowing fish in the center is *Barathronus diaphanus*, a small fish known from a single specimen, which

In this deep-sea fish the head glows with a soft pale light, while the body is quite dark, being covered with large opaque scales. The species (*Opisthoproctus soleatus*), is known by only two examples dredged from a depth of two and a half miles; one off the northern, and the other off the western coast of Africa [This specimen is not shown in the general photograph of the group, having been cut out for convenience in reproduction. It is situated in the group below the bottom fish on the right hand side]

was dredged in the Indian Ocean at a depth of a little over four-fifths of a mile. The model of it is one and one-half times the natural size. The phosphorescent fish with the curious long tail (at the right) is *Gigantura chuni*. It, also, is known by only a single specimen. This was brought up from a depth of four-fifths of a mile in the Gulf of Guinea, on the west coast of Africa. The model is twice the natural size.

The two dark fishes with enormous gaping mouths (near the top, at the right) are *Gastrostomus bairdi*. This species is commoner than some of the others, a number of specimens being in several museums. The models of it in the group are copied life-size from a specimen in the Museum. The species occurs in the Atlantic Ocean, near the American coast, in the path of ocean liners. Specimens have been dredged from a depth of nearly three miles.

Near the bottom of the group at the left-hand side, is seen an eel-like fish with a line of lit-up pores. This is an enlarged model of *Stylophthalmus paradoxus*, a small silvery fish widely distributed in all the oceans, whose young also are known. The generic name it bears was given it in allusion to the fact that the eyes are perched on long slender tentacles. The species ranges from a depth of a little less than a mile to two and one-half miles. Another form with tentacles is *Gigantactis vanhœffeni*, a species typical of many deep-sea fishes which have a tentacle, terminating in a luminous organ, attached to the head. This tentacle serves as a lure for attracting prey. The present species is known by only two specimens which were found in the Indian Ocean at a mile and a mile and a half from the surface. The creature is a very small fish, the model being enlarged six times.

This strange deep-sea fish (*Gigantura chuni*) is known by only a single specimen dredged from a depth of four-fifths of a mile, in the Gulf of Guinea on the west coast of Africa. The body of the fish is a shimmering glow of iridescence, while the protruding eyes shine like automobile headlights. The formidable teeth mark it as a ferocious carnivore

VOLCANOES OF THE LESSER ANTILLES

OBSERVATIONS ON THE PRESENT CONDITION OF THE ACTIVE VOLCANOES OF MARTINIQUE, ST. VINCENT AND GUADELOUPE[1]

By Edmund Otis Hovey

MT. PELÉ and the ruined city of St. Pierre at its base hold chief interest on the island of Martinique. The old summit plateau of the volcano is 4050 feet above the sea. This formerly bore the pool of fresh water known as "Lac des Palmistes," but there is no trace now of the old lake basin under the coating of ten to fifty feet of new ash that covers the plateau. The new cone, which stands as the enduring monument of the great eruption of 1902–3, nearly fills the old crater adjoining the plateau and rises some five hundred feet above it. The famous spine, or obelisk, which rose more than six hundred feet farther into the air, disappeared nearly ten years ago through disintegration, and the cone as viewed from the sea, presents a flat top, whose apparent smoothness does not prepare a visitor for the actual ruggedness of surface which he finds on climbing the mountain.

In 1908 when I last visited Martinique the new cone was seamed with fissures which discharged great volumes of steam and gave temperatures as high as 500 degrees C. (932 degrees F.). Considerable steam is still issuing from these vents, but there are no temperatures exceeding 100 degrees C. (212 degrees F.). The fumarole area and the plateau on the west side of the mountain, between the rivers Blanche and Claire midway between sea and summit, which comprised vents giving temperatures of nearly 500 degrees C. in 1908 have likewise greatly diminished in activity, although vents were found which even now give a temperature of 128.5 degrees C. (265 degrees F.). On the whole however it is evident that the activity of the volcano has greatly and continually diminished since the outbursts of 1902–1903, and apparently there is no present danger of recrudescence.

On the east or windward side of the volcano, the vegetation has reëstablished itself to the summit of the mountain, and even the forest is beginning to reassert itself. The whole aspect of this side of the volcano is verdant and peaceful, and gives no indication of the devastation of thirteen years ago; even the rocks of the new cone are more or less thickly coated with moss, while the side and top of the old cone are covered with grass, ferns and bushes, in addition to moss and lichens. On the summit plateau we found an abundance of red raspberry bushes bearing flowers and green and ripe fruit.

Sugar plantations on the west side of Mt. Pelé have been reinstated as far as the Roxelane River, within the border of the original zone of annihilation, while the ruined city of St. Pierre now contains about thirty new buildings of durable construction and a resident population of possibly two hundred people.

The southwest side of the volcano lying between the Seche and Blanche rivers, which

[1] Dr. Edmund Otis Hovey, curator of geology and invertebrate palæontology in the American Museum, has returned from the first expedition undertaken with the assistance of the Heilprin Exploration Fund. This fund was established in 1914 by relatives of the noted explorer and geographer, the late Angelo Heilprin, for the purpose of aiding geographical work under the auspices of the American Museum. On account of Professor Heilprin's well-known work on the 1902–1903 eruptions of Mt. Pelé, Martinique, it was considered particularly appropriate that the first work under the fund should concern the active volcanoes of the Lesser Antilles in continuation of the work already done by the American Museum in 1902, 1903 and 1908. The object of the visit was to make a comparison of conditions past and present, in connection with assembling for publication all previous observations on the eruptions.

The first stop was made at Guadeloupe where sixteen days were spent, three of which were passed on the summit of the Soufrière. On Martinique eleven days were spent in camp on the old summit plateau of Mt. Pelé, while on St. Vincent more than three weeks were given to the study, twelve days of the time being spent in camp on the volcano. Many specimens were brought back to New York to illustrate the changes that have taken place in the rocks during the past seven years, and scores of photographs were taken to add to the extensive collections already in the possession of the Museum as a result of former expeditions.

was the route traversed by hundreds or perhaps thousands of destructive eruption clouds, still lies drear and desolate, because the soil was completely swept away by the blasts, and the material left behind as well as that added by the eruption is too porous for the retention of the water necessary to restore it to fertility. Furthermore, the rainfall of the west side of the island is much less than on the east side, and the region is dried by the rays of the afternoon sun.

The vicinity of the Soufrière on the island of St. Vincent also shows evidences of recovery from the previous activity. Here as in Martinique, the vegetation has reëstablished itself more thoroughly on the windward than on the leeward side of the mountain. Considerable portions of the Soufrière received immense deposits of gravelly ash from the recent eruptions, and these are largely barren at the present time. Other areas received a finely comminuted ash which retains water better than the coarse material, and suffers more rapid decomposition. This fine ash is now coated more or less thickly with moss and lichens, and often bears, in addition, bushes, trees and tree ferns. The outer limits of the original zone of annihilation show merely a destruction of the vegetation then coating the mountain slopes, and did not suffer destruction or deep burying of the soil.

Palms and tree ferns have regained their pristine development and beauty in this region, and forest trees are growing. On the east side of the mountain the sugar-cane plantations which flourished before the eruptions are now largely restored to cultivation and present a heavier growth of cane than before, while on the west side peasant proprietors are already taking up "provision ground" on the slopes of the volcano itself.

The great crater of the Soufrière is beautiful enough to repay the lover of scenery for making a special trip to the island. It is about nine-tenths of a mile across from east to west, and three-quarters of a mile from north to south, and a lake approximately half a mile in diameter now occupies its lower portions, as its predecessor did in the days before the eruptions which changed the whole appearance of the mountain. In 1902–3 there was a little pool of muddy water in the bottom of the bowl through which disturbing columns or puffs of steam were continually rising. In 1908 the pool was much larger, was yellowish green in color and was not disturbed by any eruptive discharges, but it did not fill the bottom of the crater. In 1915 the lake is apparently some hundreds of feet deeper than it was in 1908 and occupies the entire bottom of the crater, rising well up on the vertical walls in most places. Careful measurements with the theodolite established the surface of the lake as being 760 feet below the point where the trail from the western side of the island reaches the rim of the crater, or approximately 2140 feet above the level of the sea.

The interior walls of the crater are coated with moss and tufts of grass wherever there are slopes of volcanic ash, and tree ferns and bushes are reëstablishing themselves in the ravines cut by the rains, while the vertical faces of the old lava beds making up a large part of the mountain add tones of reddish and yellowish gray to the color effect.

The volcano on Guadeloupe, unlike those of Martinique and St. Vincent, shows no decrease of temperature over the past. The summit of the Soufrière gives opportunity for temperature observations on the fumaroles and the study of the escaping gases. These fumaroles have been active, with varying degrees of strength, during all the historic period of the volcano. A marked increase of discharge of sulphureted steam took place at the time of the eruptions of Martinique and St. Vincent, and an area several acres in extent was then added to the active region. The vents maintain to-day the force of their discharge, but the temperature does not in any case exceed 100 degrees C. (212 degrees F.). The eastern member of the twin islands forming Guadeloupe is sedimentary in origin, and presents geological facts of value in their bearing on the general history of the Antilles.

GROUND-SLOTH FROM A CAVE IN PATAGONIA

By W. D. Matthew

COLONEL ROOSEVELT has recently placed on deposit with the Museum three fossil specimens of remarkable interest. These are a fragment of the skin and hair, a piece of the bone and a mass of dung of an extinct ground-sloth from the cave at Last Hope Inlet in Patagonia, presented to him by Señor Moreno, director of the La Plata Museum, near Buenos Aires.

The great ground-sloths of South America are among the most remarkable and interesting of the giant quadrupeds which formerly inhabited that country. Many skeletons have been found, especially in the Pampean formation of Argentina, and a fine series of them is shown in the Quaternary mammal hall. They were supposed however to have been extinct for many thousands of years, and it was a disputed point whether or no they were contemporaries of primitive man in that continent. The exploration of this cave about fifteen years ago furnished abundant proof that one species at least of these strange animals survived to within a few centuries of the present day, and was not only contemporary with primitive man but was in some sense of the word domesticated by him. Numerous bones and pieces of skin were disinterred from a layer composed of dust and ground-sloth droppings beneath the floor in a dry protected corner of the cave, in company with tools or weapons of stone and bone and bearing unmistakable marks of being cut and fashioned artificially. Bundles of grass spread as though intended for fodder, and other indications showed that the animals had been stabled or imprisoned within the cave and fed by their captors. The dry floor protected against damp and weather has preserved skin and bones with bits of tendon and dried flesh clinging to them, and the hair is often in perfect condition. Making all reasonable allowance for these favorable conditions, one can hardly suppose that these remains are more than a few centuries old. There is reason to believe that they are not much less than that, and that they antedated the arrival of white settlers in this region.

The skin is covered with a thick coat of golden brown hair, of the same peculiar coarse brittle texture as that of the modern tree-sloth, the nearest living relative of the great ground-sloths. In the under side of the skin are imbedded numerous rounded nodules of bone studded thickly enough to make it a fairly effective defense against the attacks of carnivora. Quantities of similar nodules have been found associated with petrified skeletons of ground-sloths and it had been supposed but never before proved that they were imbedded in the skin during life.

The bone fragment has remnants of the dried flesh and tendons still adherent, and shows clearly the marks of the tools used in cutting it up. The mass of dried dung, utterly unlike that of any living animal of that region completes the illusion. It is difficult indeed to believe that these are relics of animals extinct for some hundreds of years. But the rumors that the *Grypotherium* still survives in the wilds of Patagonia, based probably on the extraordinary freshness of these remains, have been repeatedly investigated by subsequent explorers and found to be baseless.

Miss Dora Keen of Philadelphia, who visited the locality a few years ago, has also presented to the Museum a sample of hair of the ground-sloth taken from this cave.

THE SOMAIKOLI DANCE AT SICHUMOVI

By F. S. Dellenbaugh

ARTICLES in the March number of the JOURNAL on dances of American Indians recalled to me that I have seen several Indian dances in years past. In 1884 I spent some weeks on the East Mesa of what we then called the Moquis Villages, now the Hopi, at that time a somewhat remote region. There were no white men in that country except three or four at Keam's trading post, fourteen miles from the East

Mesa, until one reached Hubbell's Pueblo, Colorado, forty-six miles from Keam's, and then thirty-five miles farther east at Fort Defiance. To the south it was eighty miles to the new town of Holbrook on the just completed Atlantic and Pacific Railway, now the Atchison, Topeka and Santa Fé, and to the west and north there was no camp or settlement until the great cañon of the Colorado was crossed and then it was about one hundred miles to Kanab. The only other white man in the Hopi Province at the time I was there, was Dr. Jeremiah Sullivan, who lived in Sichumovi with the chief, Anawita, and had been to some extent initiated into that tribe.

I had rented from Tom Polacka, a Hano (Tewa) native, the top story of Tewa, a single large room with a fireplace in one corner, and with a porch in front of the door, formed by the roof of the house below, where I could smoke my pipe and easily imagine myself, as I looked along the entire mesa toward Walpi, much farther away from the toiling world than actually I was.

On Saturday, November 8, I recorded in my diary: To-day the Moquis have been making great preparations for to-morrow which is a great dance day. To-night they cleaned up the rubbish and threw it over the cliff. To-night is *Tō-tō-kĭ-ä*, *Tō-tō-kĭ-pĭ* or *Tōk-tīght-ä*, the "night of dancing."

My diary for Sunday, November 9, further records: To-day was a great one on this mesa. About sunrise I heard the drum going at Sichumovi and a great yelling, and getting up I saw a crowd in the plaza, but the principal actors soon returned to their kiva. The dancing did not begin again until about eleven o'clock and then it did not stop until sunset — dancing with singing and hammering on the drum. The drummer, with his big drum, sat in the center of the plaza with six or seven singers, around whom was a circle of about forty men, boys, women and girls, all togged out in their best. "Mose" was there dressed all in black (cambric) and did not look half so well as in his ordinary clothes. It is strange what a fancy these Indians and the Navajo have for black. One man had on calico trousers, one leg one pattern, the other another.

The women wore white blankets with red borders and they had their hair done up in quite a different fashion from the ordinary. It was brought down smoothly and fastened behind in a sort of long knot wrapped with red yarn. Over the forehead from ear to ear was a kind of thick fringe of black hair about four inches long, sewed to a string and tied about the head in such a manner that the eyes were almost obscured. Their feet were moccasined, which they are not on ordinary occasions, and the buckskin of the top of the moccasin swathed their legs, as when they ride.

The members of the circle sang together as the circle slowly moved from left to right. Each man or boy chose a partner and joined the circle with her. It was absurd to see a tall Indian enter with a girl of only seven or eight years. [I learned later that the older girls were not permitted to take part].

Presently there was a shouting in the direction of the kiva, "Yah-hai — yah-hai," very loud, and looking that way I perceived a man coming, nude excepting for a kilt, and painted yellow. On his head were feathers. His hair was "banged" in front above the eyes, cut short on the sides, and hung down long behind. From his waist at the back trailed a foxskin. In his right hand he carried a gourd rattle painted green and white and filled with small pebbles, judging from the sound. In the left hand he carried a sort of baton with a cloud symbol in the middle and a free swinging pendant at either end. Immediately behind him was one of the most grotesque figures I have ever seen. It was one of those innumerable Hopi ghosts, saints or minor gods known as a "katcina," covered with all sorts of trappings, and heavy wrapings about the head with the semblance of a mask in front (the mask fantastically decorated with green and other colors), a strong bow in his right hand which he used as a staff (the quiver being hung to his left side), and in his left hand an ear of corn and a small bent stick. He came prancing and dancing and jumping after his leader in the most extraordinary way. The deer hoofs hung around his waist rattled loudly. He was supposed to be blind. His leader rattled as hard as he could rattle and advanced a few steps toward the group shouting an incantation, then suddenly turned and faced the katcina and yelled "Yah-hai — yah-hai" at the top of his lungs. Then he walked on shouting, the drummer thumped away on the drum, the singers and dancers sang, and the katcina capered about in frantic spasms of tramps and jumps, never stopping for an

instant. They neared the circle, which broke on one side, and as it became a semicircle, the dance ceased. The leader and katcina then circled around the drum. The leader shouted in the ear of the katcina at frequent intervals his "Yah-hai — yah-hai" and yelled his incantation, waving the balance-looking arrangement. This, by the way, is the charm that attracts the katcina and yet holds him off [Sullivan]. After several rounds of this yelling, singing, shouting and jumping, the leader returned to the kiva, slowly followed by the skipping katcina. The circle continued the dance, closing its ranks, and so on until another leader and katcina made their appearance. Sometimes there were three or four at the same time and then the noise was deafening.

All day long this continued, and all day I stood my ground with camera and sketch book, notwithstanding certain disapproving looks from the dancers. At one time I thought they meant to tell me to stop using the camera but they did not do so; probably as they had never seen a hand camera before, they did not understand its nature. With the plates manufactured then, and the slow shutter, it was very difficult to get the swiftly darting figures; and that day I was as much of an object of interest to the visiting Navajo, and the Hopi from the other towns, as were the katcinas and the dancers. Nobody molested me however and at sunset when the long procession of katcinas and leaders had passed through the village and received the contributions of sacred meal and prayer feathers from the populace, all weird enough in the gloaming, I returned to my housetop and slept without a break until Hoski, my native boy, after his usual fashion, threw the door open in the morning and set down the olla of water which he always brought up fresh from the spring near the foot of the mesa, some seven hundred feet below.

MUSEUM NOTES

A JOINT anthropological expedition will be undertaken with the University of Colorado of which the distinguished anthropologist, Dr. Livingston Farrand, is now president. The field party will be under the direction of Mr. N. C. Nelson, assistant curator of anthropology in this Museum, and Mr. E. H. Morris, curator of the University Museum, and will explore the little-known cliff-dwelling regions of Colorado.

THE New York Academy of Sciences has published an essay on "Climate and Evolution" by Dr. W. D. Matthew. This is an attempt to find in the slow cyclic climatic changes of geologic time a fundamental cause controlling the course of evolution and geographical dispersal of animals and plants. The author accepts the view that the deep ocean basins have been substantially permanent during the later ages of geologic time, the continents alternately emerged and more or less completely united to the northward, or submerged and extensively overflowed and isolated by shallow seas. The continental shelf at or near the one hundred fathom line marks the extreme limit of emergence. The epochs of elevation have been associated with arid climates and polar cold; the epochs of submergence with warm moist uniform climates. The record of the evolution and dispersal of the various races of mammals is interpreted in accord with this theory, that of the lower vertebrates briefly outlined.

THE New York Aquarium gave its second annual reception to the members of the New York Zoölogical Society on the evening of May fifth. About five hundred guests were present and were entertained with motion pictures of marine life. The Aquarium had just come into possession of a new collection of tropical fishes from Key West, which were on exhibition, and two more porpoises had been secured for the porpoise pool.

SOME years ago Mr. G. Frederick Norton began a special study of the so-called blue or "glacier" bear (which had been named *Ursus emmonsi*). These bears are confined to the vicinity of Saint Elias range of mountains in Alaska and have a very limited distribution. Mr. Norton secured a number of skins and skulls which have satisfactorily demonstrated that the blue bear is only a color phase of the black bear (*Ursus americanus*). The black bear apparently is a polychromatic animal and has several well-marked color

phases which in some instances are very local. A few years ago the Museum secured two beautiful skins and skulls of the white bear from Gribbell Island, British Columbia, (which had been named *Ursus kermodei*), through Mr. Kermode, curator of the Provincial Museum, Victoria, British Columbia. There seems to be little doubt that instead of being a new species, the white bear is also a color phase of the black bear. The so-called cinnamon bear is a well-known color phase of this same species. Very often in a single litter black and cinnamon bears are found together. The Museum has in mind the preparation of a group showing all of these color phases of the black bear. Through a gift to the Museum by Mr. Norton of a magnificent specimen of a glacier bear taken in Disenchantment Bay, Yakutat, Alaska, there remains only the lack of a cinnamon bear to allow the construction of such a group.

The department of invertebrate zoölogy will actively participate in the Porto Rico Survey during the coming summer. Dr. F. E. Lutz and Mr. A. J. Mutchler will prosecute entomological investigations in various parts of the island; Mr. Roy W. Miner and Mr. H. Mueller will establish headquarters at Guanica Harbor for studies upon marine invertebrates; while Professor Raymond C. Osburn will carry on dredging operations mainly along the southwest shores, coöperating with Mr. Miner. For several weeks Dr. A. G. Mayer of the Carnegie Institution and a group of zoölogists will also be carrying on special investigations about Guanica.

Since the last issue of the Journal the following persons have become members of the Museum:

Patron, Mrs. Bashford Dean;

Fellow, Mr. Henry Ford;

Life Members, Dr. Emilie Snethlage, and Messrs. Frederic Almy Cammann, James P. Chapin, Andre de Coppet, Frank LeGrand Gilliss, Herbert Lang, P. W. Livermore, Herman Stutzer and James B. Wilbur;

Annual Members, Mrs. George Conrad Cook, Mrs. Rachel Lenox Porter, Miss Alice L. Clark, Miss Elizabeth Douglas, Dr. P. Maxwell Foshay, Dr. Harry Justin Roddy, Dr. Charles H. Young, and Messrs. I. de Bruÿn, George H. Clapp, Herbert Stanley Connell, Henry Doscher, Frederic Huntington Douglas, Holland S. Duell, John M. Glenn, F. Herrmann, August Kuhn, Julius Kuhn, Lee Laurie, Ivy L. Lee, E. A. McIlhenny, William C. Murphy, D. E. Pomeroy, Roger M. Poor, Robert W. Sayles, H. Jermain Slocum, Jr., Frank B. Smidt, Jacob Steinhardt, Carll Tucker, William Young Westervelt and Frederick N. Willson.

Mr. Herbert Lang has been appointed assistant in mammalogy and Mr. James P. Chapin assistant in ornithology. Mr. Lang and Mr. Chapin have also been elected life members of the Museum in recognition of their efficient services in conducting the Congo expedition.

Mrs. Bashford Dean has recently been elected patron of the Museum in acknowledgment of her recent contributions toward the preparation of the bibliography of fishes; Mr. Henry Ford has been made fellow, in appreciation of his generosity in presenting to the institution the bust of John Burroughs; and Dr. Emilie Snethlage, life member, in recognition of her practical interest in the development of the Museum's South American collections.

Dr. Chester A. Reeds and Mr. Prentice B. Hill of the department of geology and invertebrate palæontology will leave on May 29 to carry on stratigraphic and palæontologic investigations in Porto Rico in connection with the Porto Rico Survey.

Messrs. H. E. Anthony and D. S. Ball have returned from an expedition to the mountains of the Isthmus of Darien in eastern Panama, bringing with them a collection of 1100 birds and 250 mammals, many of which are new to the Museum's collections and some undoubtedly new to science. These collectors left for the field the latter part of January, but owing to the inaccessibility of the country to be explored, they had only about two months in which to accomplish their work before the rainy season set in. It took them nearly a month to reach the ground where they were to do their collecting and almost as long to return from there. At the City of Panama they were joined by Mr. W. B. Richardson, who had been doing some preliminary work in Darien. The party left the City of Panama on February 8 and going

down the coast in a gasolene launch to El Real, began to ascend the Tuyra River, a river several miles across at the mouth. In the lower part of the river they were obliged to leave the launch and take to canoes, traveling in this way as far as the foothills of the mountain. There they got natives for packers and carried their outfit for three days' journey to the foot of Mount Tacarcuna, from which point most of the work was done. Later camp was made at the very highest point on the mountain where there was any water. From this site on the mountain range that forms the boundary between Panama and Colombia, the Atlantic could be seen in the distance. The region, probably because of its inaccessibility, has never before been explored biologically. Indeed the Indians there had never seen a Northern white man before. Its fauna presents an important scientific problem because it seems to indicate that the mountain range which forms the Isthmus of Darien was at one time connected with the western Andes of northern Colombia.

In 1913 Dr. William T. Hornaday, advocate of wild life protection, decided that the cause could not be adequately supported through annual subscriptions. He determined upon the creation of what is now known as the "Permanent Wild Life Protection Fund," for nation-wide campaign work during the next one hundred years, the "income only for use on the firing-line." The wild life protective principles are formulated as follows: Stop the sale of wild game; promote laws to prevent unnaturalized aliens from owning or using rifles and shot-guns; stop all spring and late-winter shooting; stop all killing of insectivorous birds for food, and of all birds for millinery purposes; increase the number of game preserves; oppose the use of all extra deadly automatic, auto-loading and "pump" guns in hunting, and secure the passage of laws against them; secure perpetual close seasons for all species of wild life that are threatened with extinction from our fauna.

The plan has already received a remarkable series of indorsements. The minimum fixed upon was $100,000, and up to date $73,050 has been subscribed. This is the second largest endowment fund in existence for the benefit of wild life. The Banking Trustees of the Fund are Messrs. Clark Williams and A. Barton Hepburn. Dr. Hornaday, as the ampaigning trustee, expends the annual income of the Fund in accordance with the principles originally formulated. A rather novel feature of the plan provides that the names of all persons who make large sacrifices for the formation of the Fund shall be known as Founders, and that their names shall be permanently associated with the Fund and its results. The most important work to be undertaken in the immediate future under the auspices of this Fund, is the promotion of a very comprehensive plan for the creation of game sanctuaries in national forests. This campaign will begin on September first and will be prosecuted with much vigor until complete success is achieved.

Through interest created by the Roosevelt South American expedition, the Museum has received six hundred birds and fifty mammals, presented by the Goeldi Museum of Pará, through its director of zoölogy, Dr. Emilie Snethlage. The members of the North American expedition when passing through Pará in May, 1914, called on Dr. Snethlage to examine the rich collections of Amazonian fauna which she, and her predecessor Doctor Goeldi, have amassed. Dr. Snethlage writes that shortly after the Roosevelt party passed through Pará she herself embarked on an expedition into the unexplored portions of the Upper Xingú, on which she was absent seven months. Unfortunately, within a month after her departure from Pará, the middle finger of her right hand was bitten off to the base by a piranha, the small man-eating fish of South America.

An exhibit to illustrate the principles of Mendelian heredity has recently been installed in the Darwin hall and is temporarily labeled. As at present exhibited, there are five panels showing as many instances of inheritance in plants and animals: first the classical case of the seed color of the common pea, based on Mendel's original experiments; second, complex inheritance as illustrated by the colors of the sweet pea, based on the experiments of Bateson; and third, three panels to illustrate the inheritance of coat color in the common rat, namely, the effect on the third generation of crossing one, two and three varieties of unit characters respectively. A more detailed account of this exhibit will be given in a future issue of the Journal.

The exhibit in the Darwin hall showing variation under domestication has been rearranged and forms one of the items in a series illustrating Darwinian principles. In this case the chief variations of the dog, the pigeon and the common barnyard fowl are shown.

Mr. N. C. Nelson of the department of anthropology is engaged in excavating the prehistoric and early historic ruined villages in the neighborhood of Santa Fé.

"The Evolution of the Jaw Muscles of Vertebrates" was the subject of a recent presentation before the New York Academy of Sciences by Prof. L. A. Adams, who has been investigating this subject in the Museum laboratory of vertebrate evolution. By means of the stereopticon he exhibited a series of very clear drawings of the skull and jaw muscles of a score or more of representative vertebrates of all classes, and showed by what comparatively slight successive changes the arrangement of the jaw muscles of primitive fishes has given rise to the various modifications that are characteristic of the higher types.

The civic exhibition at the National Arts Club is one of the most instructive yet brought together on the problems touching artistic betterment of New York City. Maps, photographs, architectural designs and sculptural models bring out many proposed plans for beautifying Riverside Drive and its docks, besides various bridges, streets and parks. Among suggested features for decoration of buildings may be noted mural designs by E. W. Deming and Will S. Taylor and sculptural animal designs by Carl E. Akeley, all of the American Museum's staff and at present engaged in work for the artistic improvement of the Museum buildings.

Substantial progress has been made in installing the new storage system for dinosaurs and other fossil reptiles. Most of these large and heavy specimens have hitherto been laid out on mats on wooden tables ranked three deep, filling up the large dinosaur storeroom at the top of the southwest tower wing; the remainder stored in wooden trays piled up in every available corner of the storerooms and laboratories. The arrangement was originally intended as a temporary one, but for lack of a better equipment has lasted fifteen years. It was somewhat cumbersome, the larger fossils were exposed to dust and risk of breakage, the smaller ones difficult of access, and the danger of serious fire damage became continually greater as constant additions crowded the collections more and more.

The new system will provide ultimately three double stacks of steel racks twelve feet high with strong but light steel framed trays three by four feet, and wall racks for the smaller wooden trays. The specimens are laid out on mats in the large trays and lifted up by a small movable elevator. The system is adjustable and compact, and enables the large heavy and often fragile bones to be moved with safety and convenience. The great saving in space is shown by the fact that the one double stack now installed accommodates most of the contents of the storeroom, so full under the old system as to be unmanageably crowded. Other collections which for lack of room were temporarily placed elsewhere will find ample storage space and security in the second stack now under construction and in the wall racks. The third stack is planned for accommodation of future collections but will not be installed at present.

The trays will be protected from dust by fireproofed covers and curtains. The risk of fire is now slight as there is practically nothing to burn except the old wooden trays which must be retained for the present to contain the smaller specimens, and the adequate space around these will make it easy to control any fire that might get started. The room now available to lay out dinosaur skeletons for study and comparison has been urgently needed for research work on these collections. The lighting of the storeroom has also been greatly improved.

The Southwestern Anthropological Society for promotion of research work in the history and ethnology of the Southwest has recently been organized at Santa Fé. Dr. Livingston Farrand, president of the University of Colorado and formerly curator in the American Museum, was elected president and Dr. Paul Radin, secretary. Dr. P. E. Goddard and Mr. N. C. Nelson of this Museum have been invited to become members of the committee on research.

Mr. Charles W. Mead, assistant curator of anthropology, in charge of the South

American collections, has just completed an exhaustive investigation of the native copper and bronze industry of the New World. The primary part of the investigation was the chemical analysis of one hundred and sixty museum specimens, so selected as to give typical series for each important locality. The laboratory tests were made by Mr. W. A. Wissler, A. M. Mr. Mead finds by correlating the chemical determinations with the distribution and types of implements, that the prehistoric Peruvians thoroughly understood the art of making bronze from copper and tin. In addition, he has brought together the early fragmentary accounts of Spanish explorers as to how these metals were worked, which became more intelligible in the light of the chemical studies. Among the obscure and little-known sources is the *Arte De Los Metales* by Alvaro Alonso Barba, published early in the seventeenth century, a copy of which was kindly placed at Mr. Mead's disposal by Mr. E. P. Mathewson of the Anaconda Copper Mining Company. The full report of this study will soon appear in the *Anthropological Papers* of the Museum.

Dr. Robert H. Lowie and Mr. Alanson Skinner of the department of anthropology have just completed five publication reports upon their last year's field work among our western Indians. Dr. Lowie made a special study of the societies and social organizations of the Ute and Shoshone, while Mr. Skinner investigated the same aspects of primitive culture among the Iowa, Kansa and Ponca tribes. These reports will appear in a special volume of the *Anthropological Papers* now nearing completion, treating the societies and social organizations of the Plains Indians in an exhaustive manner.

On April 9, Dr. W. H. R. Rivers of Cambridge University, England, visited the department of anthropology of the Museum, having stopped a day in New York on his return from attendance at the Australian meeting of the British Association for the Advancement of Science and a subsequent visit to several of the South Sea Islands. Dr. Rivers is known among anthropologists throughout the world for his intensive researches into the ethnology of the Torres Straits Islanders and of the Todas of southern India. More recently he investigated various of the Melanesian groups as director of the Percy Sladen Trust Expedition. He has profoundly stimulated ethnological thought by developing the genealogical method as a means of research in the study of social usages and by directing attention to the importance of kinship nomenclature. His latest publications, *Kinship and Social Organisation* and *The History of Melanesian Society* are largely devoted to the latter topic and form a landmark in the history of the subject. At the Museum, Dr. Rivers examined with interest the collections in the South Sea hall and discussed the investigations of kinship terminologies of North American and Oceanian peoples.

Mr. Russell J. Coles has presented to the Museum an eighteen-foot female *Manta* (devilfish or giant ray). This was caught on April 11 in the Gulf of Mexico, some one hundred miles south of Tampa, after a dangerous twenty-two-minute fight with the giant fish. Mr. Coles was instrumental last year in procuring for the Museum two specimens of *Manta*, respectively eleven and seven and one-half feet across, but knowing that the species reached a much larger size, he has not rested until a finer specimen was secured. The one just captured is, as far as we are aware, the largest recorded on our Atlantic coast, for while the species is popularly said in books to reach a width of twenty feet, none of these giants has as yet come to hand. A reproduction of this eighteen-foot animal will make a magnificent addition to our exhibit of fishes.

In the New York City building at the Panama-Pacific Exposition, to the right of the entrance, is an alcove containing photographic exhibits of the several museums and libraries of New York City. The selected exhibits from the American Museum of Natural History aims to indicate to the general public the institution's scientific scope, its financial status, and its place in the city as an educational institution.

Dr. Robert H. Lowie will leave early in June for field work among the Kiowa Indians of Oklahoma, the Hopi of Arizona and the Paiute of Nevada. From the Kiowa Dr. Lowie hopes to secure information concerning their military societies; the investigations among the Hopi will cover social organization or clan system; and the work in Nevada is a continuation of that undertaken last year as part of the Museum's extensive survey of Shoshonean tribes.

THE American Ethnological Society, which was founded in 1842 by Mr. Albert Gallatin, has adopted a new constitution with a view to incorporating a society for the safeguarding of its growing endowment fund.

THE Museum has recently secured a large collection consisting chiefly of pottery taken from the island of Marajo, Brazil, by Mr. Algot Lange. This pottery was secured on Mr. Lange's second expedition to South America, the first having been made for the University Museum of Philadelphia.

A REPRESENTATIVE collection of Salvador archæology which Dr. Herbert J. Spinden obtained last summer by arrangement with the government of Salvador, has lately arrived at the Museum and has been installed in the Mexican hall. The specimens include pottery and stone, and represent a long period of art with several distinct phases. There are many examples of archaic pottery which may date from before the time of Christ, as well as beautiful painted vases of the Maya civilization and glazed ware of the Aztec period.

PROFESSOR C.-E. A. WINSLOW has been appointed to the newly established Anna M. L. Lauder professorship of public health at the Yale Medical School. He will give up his connection with the New York State Department of Health and the Teachers' College to take up this work next fall, but will continue to act as curator of public health at the American Museum.

AT the May meeting of the New York Academy of Sciences Dr. Charles H. Townsend exhibited moving pictures of recent Biological Survey dredging operations in Long Island Sound by the United States Fisheries steamer "Fish Hawk." The fauna of the muddy bottom in the middle of the Sound, Dr. Townsend said, is considerably different from that along the margins where oyster beds abound. It includes great numbers of spider crabs, flounders and whelks. Dr. Charles B. Davenport, director of the Carnegie Station for Experimental Evolution at Cold Spring Harbor, described the fauna of the brackish waters on the north shores of Long Island and showed how different forms which are dependent upon salt water, such as mussels, Littorea and barnacles, manage to live in brackish water if they can get purer salt water at high tide. Professor Raymond C. Osburn read a paper on the "Geographical Distribution of the Bryozoa of the Atlantic Coast of North America." Nearly three hundred species of Bryozoa are known to inhabit the coastal shelf down to the hundred-fathom line. The species fall for the most part into three groups: (1) cosmopolitan species or those of wide range; (2) northern species often circumpolar, which range southward along the coast; (3) tropical species, which range northward from Florida. Charts indicating the relation of the bryozoan distribution to ocean temperatures and currents were exhibited.

DR. RAYMOND C. OSBURN of the New York Aquarium, assistant professor of zoölogy in Barnard College, Columbia University, has accepted the professorship of biology in the Connecticut College for Women at New London. He will be greatly missed by his colleagues in New York, who hope that he will be able to keep in touch with his scientific interests here.

NOTICE of the death of the distinguished English palæontologist and zoölogist, Richard Lydekker occurs in *Nature* for April 29. Dr. Lydekker was well known as a high authority upon mammals both living and extinct. His most notable contributions to scientific research dealt with the fossil mammals and dinosaurs of India and Argentina, but he is perhaps better known as the author of a number of excellent text-books and treatises of a more popular kind dealing with the living and extinct mammalia. Among these may be especially mentioned: *A Geographic History of Mammals*, *Mammals Living and Extinct* (Flower and Lydekker), *Manual of Palæontology* (Nicholson and Lydekker), *The New Natural History*, *Deer of All Lands*, *The Horse and its Relatives*, *The Ox and its Kindred*, *Game Animals of Africa*, *Game Animals of India*, *Mostly Mammals* (a collection of essays). He was the author of the Catalogues of Fossil Mammals, Reptiles, Amphibians and Birds in the British Museum, of numerous articles in the last edition of the *Encyclopedia Britannica*, a frequent contributor to *Nature*, *The Field*, *Knowledge*, *Science Progress* and other English periodicals, to the *Proceedings of the Zoölogical Society* and other journals of research.

Mr. Howard McCormick has begun work on the canvas for the background of a second Indian habitat group to be placed in the Southwest Indian hall. The group represents Apache Indians engaged in various occupations under a flat-topped shelter of boughs and gives as a background a view of the San Carlos river valley and neighboring mountains where these Apache live. Studies for the group were made by Mr. McCormick in Arizona in 1914.

The Museum has recently secured by purchase through the Dodge fund, from Mr. P. A. Bungart, a local collector of Lorain, Ohio, a valuable collection of Dinichthyids from the Devonian shales of Ohio. The collection of thirty-three specimens includes several complete crania and a number of other remains of high scientific value.

Mr. F. A. Watson is on the north coast of Santo Domingo making collections for the department of invertebrate zoölogy. The expenses of his trip are being covered by Mr. B. Preston Clark of Boston, Massachusetts. Mr. Clarence R. Halter, who is spending May and June in the same region, is collecting reptiles and batrachians for the Museum.

The sledge used by Admiral Peary on the expedition which reached the North Pole, has been loaned to the Oakland Museum for exhibition during the period of the Panama-Pacific exposition.

The purchase of the collections made by Mr. Richard Douglas in Matebeleland, South Africa, a few years ago, secures to the Museum a large series of prehistoric stone implements and a considerable series of baskets and other ethnological specimens, as well as small collections of reptiles, mammals and birds from the region.

Two accessions of interest recently received by the department of anthropology are an Indian-made canoe, weighing thirty-nine pounds and decorated with beads on the bow, the gift of the Hudson Bay Importing Company, and a beautiful feather hammock from Brazil presented by Mr. Charles R. Flint.

A preliminary report on the fishes obtained in Porto Rico last summer by Mr. John T. Nichols is published in the *American Museum Bulletin*. Mr. Nichols lists twenty-two species not previously recorded from the island and describes two new species. His work on the fishes of Porto Rico was done in connection with the biological survey of the island made by the New York Academy of Sciences for the insular government.

Among the recent anthropological publications of the Museum is one on Pawnee Indian Societies by James R. Murie, a distinguished Pawnee chief. For several years Mr. Murie has been gathering data from the oldest men of his race and under the immediate supervision of Dr. Clark Wissler, has prepared several manuscripts for publication, of which the present issue is the first.

Professor A. L. Kroeber, head of the department of anthropology in the University of California, will spend the next academic year in New York City as a guest of the Museum. He has also volunteered to assist in the Museum field work by spending the summer in the Pueblo of Zuñi. Professor Kroeber was formerly connected with this Museum, when he distinguished himself in the investigation of American decorative art.

Dr. Frank E. Lutz, of the Museum's department of invertebrate zoölogy, has been appointed a member of the board of editors of the *New York State List of Insects*. Mr. Charles W. Leng, honorary curator of Coleoptera of the Museum, is also a member.

General Thomas H. Hubbard, lawyer, veteran of the Civil War and director in many corporations, died at his home in New York City on May 19 after an illness of but a few days. General Hubbard had been a member of the American Museum of Natural History since 1875 and had been somewhat closely associated with it through his interest in Arctic explorations. He was an active member of the Peary Arctic Club from the date of its first meeting in 1899 and was its president after the death of Mr. Morris K. Jesup in 1908. It was his financial aid together with that of Mr. Jesup, Mr. Crocker and other members of the Club, which made possible the discovery of the North Pole by Peary. Several Arctic geographical names, such as Hubbard Glacier and Cape Thomas Hubbard, bear witness to Peary's acknowledgment of General Hubbard's aid. General Hubbard was also one of the most generous contributors to the Crocker Land expedition.

The American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

Open free to the public on every day in the year.

The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people. It is dependent upon private subscriptions and the fees from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world The membership fees are,

Annual Members	$ 10	Patrons	$1,000
Sustaining Members (annually)	25	Associate Benefactors	10,000
Life Members	100	Associate Founders	25,000
Fellows	500	Benefactors	50,000

Guides for Study of Exhibits are provided on request to members and teachers by the department of public education. Teachers wishing to bring classes should write or telephone the department for an appointment, specifying the collection to be studied. Lectures to classes may also be arranged for. In all cases the best results are obtained with small groups of children.

The Museum Library contains more than 60,000 volumes with a good working collection of publications issued by scientific institutions and societies in this country and abroad. The library is open to the public for reference daily — Sundays and holidays excepted — from 9 A. M. to 5 P. M.

The Technical Publications of the Museum comprise the *Memoirs*, *Bulletin* and *Anthropological Papers*, the *Memoirs* and *Bulletin* edited by J. A. Allen, the *Anthropological Papers* by Clark Wissler. These publications cover the field and laboratory researches of the institution.

The Popular Publications of the Museum comprise the JOURNAL, edited by Mary Cynthia Dickerson, the *Handbooks*, *Leaflets* and *General Guide*. The following list gives some of the popular publications; complete lists, of both technical and popular publications, may be obtained from the Librarian.

POPULAR PUBLICATIONS

HANDBOOKS

NORTH AMERICAN INDIANS OF THE PLAINS. By Clark Wissler, Ph.D. *Paper*, 25 *cents; cloth*, 50 *cents.*

INDIANS OF THE SOUTHWEST. By Pliny Earle Goddard, Ph.D. *Paper*, 25 *cents; cloth*, 50 *cents.*

ANIMALS OF THE PAST. By Frederic A. Lucas, Sc.D. *Paper*, 35 *cents.*

ILLUSTRATED GUIDE LEAFLETS

GENERAL GUIDE TO THE COLLECTIONS. New edition issued December, 1914. *Price*, 25 *cents.*

THE COLLECTION OF MINERALS. By Louis P. Gratacap, A.M. *Price*, 5 *cents.*

NORTH AMERICAN RUMINANTS. By J. A. Allen, Ph.D. *Price*, 10 *cents.*

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH. By George H. Pepper. *Price*, 10 *cents.*

PRIMITIVE ART. *Price*, 15 *cents.*

THE BIRDS OF THE VICINITY OF NEW YORK CITY. By Frank M. Chapman, Sc.D. *Price*, 15 *cents.*

PERUVIAN MUMMIES. By Charles W. Mead. *Price*, 10 *cents.*

THE METEORITES IN THE FOYER OF THE AMERICAN MUSEUM OF NATURAL HISTORY. By Edmund Otis Hovey, Ph.D. *Price*, 10 *cents.*

THE HABITAT GROUPS OF NORTH AMERICAN BIRDS. By Frank M. Chapman, Sc.D. *Price*, 15 *cents.*

THE INDIANS OF MANHATTAN ISLAND AND VICINITY. By Alanson Skinner. *In preparation.*

THE STOKES PAINTINGS REPRESENTING GREENLAND ESKIMO. *Price*, 5 *cents.*

BRIEF HISTORY OF ANTARCTIC EXPLORATION. *Price*, 10 *cents.*

TREES AND FORESTRY. By Mary Cynthia Dickerson, B.S. *A new edition in course of preparation.*

THE PROTECTION OF RIVER AND HARBOR WATERS FROM MUNICIPAL WASTES. By Charles-Edward Amory Winslow, M.S. *Price*, 10 *cents.*

PLANT FORMS IN WAX. By E. C. B. Fassett. *Price*, 10 *cents.*

THE EVOLUTION OF THE HORSE. By W. D. Matthew, Ph.D. *Price*, 20 *cents.*

REPRINTS

THE GROUND SLOTH GROUP. By W. D. Matthew, Ph.D. *Price*, 5 *cents.*

METHODS AND RESULTS IN HERPETOLOGY. By Mary Cynthia Dickerson, B.S. *Price*, 5 *cents.*

THE WHARF PILE GROUP. By Roy W. Miner, A.B. *Price*, 5 *cents.*

THE SEA WORM GROUP. By Roy W. Miner, A.B. *Price*, 10 *cents.*

THE ANCESTRY OF THE EDENTATES. By W. D. Matthew, Ph.D. *Price*, 5 *cents.*

Protected entrance to the Altamira cave, near Santillana, northern Spain. Long ago the thinner part of the cavern roof fell in, creating a sink-hole from which one could walk in under the roof that still held. Here, near the entrance, Solutréan and Magdalenian men made their homes for a time and in a side gallery left a most remarkably preserved collection of paintings, the admiration of both the artist and naturalist who sees them. Later the wall entrance was sealed up by débris and was accidentally discovered in modern times by a fox hunter.

THE AMERICAN MUSEUM JOURNAL

A STORY OF THE BALKANS
COLLECTING IN THE CONGO
ANCIENT GOLD ART
GIANT DINOSAURS FROM AMERICA

The American Museum of Natural History

The American Museum Journal

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Mary Cynthia Dickerson, *Editor*

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The Journal is sent free to all members of the Museum.

LAYSAN ISLAND GROUP.—THE STATE UNIVERSITY OF IOWA

[*Series of Recent Museum Groups*]

Portion of cyclorama (one-tenth of it) filling one hall of the Iowa Museum. The canvas is 138 feet long and 12 feet in height and a foreground covers some 400 square feet of floor space. Laysan Island in the Pacific, with an area of less than two square miles, is the home of millions of birds

FUR SEALS AT KITOVI ROOKERY.— AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK

[*Series of Recent Museum Groups*]

Modeling of foreground and painting of canvas by Albert Operti, seals mounted some years ago by Frederick Blaschke. The view includes a part of Kitovi Rookery, St. Paul Island, known as the "amphitheater," looking northeast toward Lukanian Point. In 1897 there were 1200 seals here, but in 1877 there must have been at least 5000

VIRGINIA DEER IN THE ADIRONDACKS.—BROOKLYN INSTITUTE MUSEUM

[*Series of Recent Museum Groups*]

Animals in summer pelage collected and mounted by R. H. Rockwell, landscape painted by H. B. Tschudy. The group is lighted by what seems natural daylight obtained through the use of nitrogen-filled lamps and a color screen which eliminates the excess of red and yellow rays

NEARING THE END OF A TIGER HUNT.—BRISTOL MUSEUM AND ART GALLERY, ENGLAND

[*Series of Recent Museum Groups*]

This tiger, shot by His Majesty, King George V, in Nepal, India, has been skillfully utilized to show the finish of a hunt when the circle of beaters has closed in and the tiger has been driven near his Royal Highness, mounted on an elephant as shown in the background

THE PROPOSED TYRANNOSAURUS GROUP FOR THE AMERICAN MUSEUM, AS SHOWN IN A REDUCED MODEL BY MR. ERWIN CHRISTMAN

THE AMERICAN MUSEUM JOURNAL

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TYRANNOSAURUS, THE LARGEST FLESH-EATING ANIMAL THAT EVER LIVED

By Barnum Brown

DAWN glows along the shore of a lagoon near the sea three millions of years ago in Montana. The landscape is of low relief; sycamores and ginkgo trees mingle with figs, palms and bananas. There are few twittering birds in the tree-tops and no herds of grazing animals to greet the early sun.

A huge herbivorous dinosaur *Trachodon*, coming on shore for some favorite food has been seized and partly eaten by a giant *Tyrannosaurus*. Whilst this monster is ravenously consuming the carcass another *Tyrannosaurus* draws near determined to dispute the prey. The stooping animal hesitates, partly rises and prepares to spring on its opponent. With colossal bodies poised on massive hind legs and steadied by long tails, ponderous heads armed with sharp dagger-like teeth three to five inches long, front limbs exceedingly small but set for a powerful clutch, they are the very embodiment of dynamic animal force.

This is the picture conjured by a group of three fossil skeletons in the American Museum which completed will occupy a space fifty-four feet long and twelve feet wide. The erect *Tyrannosaurus* skeleton now finished measures forty-seven feet in length from tip to tip and eighteen and one-half feet in height. Larger herbivorous dinosaurs have been found in the United States and in Africa in rocks of an earlier age but their carnivorous contemporaries were at least a third smaller than *Tyrannosaurus* which we can safely state is the largest terrestrial flesh-eater of all ages.

A complete skeleton has never been found; even scattered remains are rare; but the Museum's skeletons fortunately supplement each other in such a way that bones missing in the one have been cast from the other. Only the tip of the tail and the lower part of the front limbs have been modeled from an allied form.

The discovery of these rare fossils is of peculiar interest. While hunting deer along the Missouri River some years ago, Dr. W. T. Hornaday, director of the New York Zoölogical Park, discovered several large fossil bones. One of these shown to me, I identified as part of a horn of a dinosaur *Triceratops;* and photographs which Dr. Hornaday had taken of the scene of discovery showed a striking similarity to localities in Wyoming where many Cretaceous fossils have been found.

The following year, 1902, an expedition was sent to the new locality. Our outfitting point and base of supplies was Miles City, Montana, a point on the railroad one hundred and thirty miles from the "bad lands." After five long days across measureless undulating prairie, past numerous flocks of sheep

THE GIANT CARNIVOROUS DINOSAUR TYRANNOSAURUS

The skeleton is forty-seven feet in length, and stands nineteen feet in height from the floor. The gigantic head, sharp teeth and claws all show the carnivorous adaptations and habits of the animal

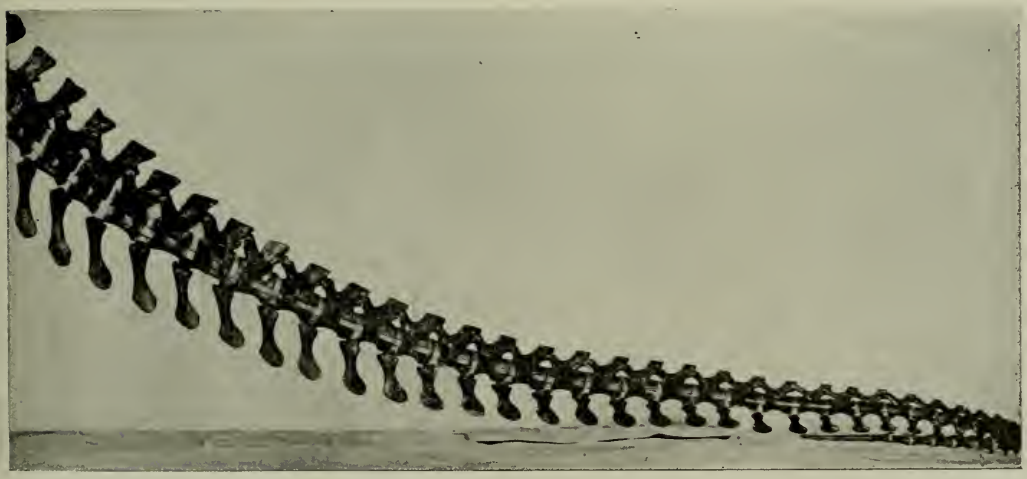
It can safely be said that *Tyrannosaurus*, which lived three millions of years ago, is the largest terrestrial flesh-eater of all ages. The skeleton is intended to form part of a group representing two Tyrannosaurs quarreling over the carcass of a *Trachodon* or duckbilled dinosaur. When the new west wing is built the Tyrannosaur group will be the central exhibit of the Cretaceous dinosaur hall. Owing to lack of space, only one skeleton can be mounted at present and this has to be placed temporarily in the Quaternary hall on the fourth floor

and fewer herds of cattle, we arrived at the little log post-office Jordan.

A few miles beyond this point at the head of the small streams tributary to the Missouri River, the prairie abruptly changes to a panorama of wonderful bad lands; a wilderness of variegated sculptured cliffs and domes intersected by deep cañons with scattered pine trees and pockets of junipers; while on the hillsides in the broader valleys, lines of cottonwoods mark the stream courses. The dullness of the denuded earth is relieved by bright-colored clay in bands traceable on the same level for miles. Hard globular sandstones of all sizes are scattered among the layers of sand, and groups of them cluster the slopes of the hills.

We established camp on Hell Creek near the old Max Sieber ranch, where the first bones had been discovered. Nearby, the stream has cut into a hill exposing rounded sandstones, many of which have rolled down to the water. Some of the stones contained bones and we traced them up the hillside by broken pieces until the original position of the layer was located. Here in the buff-colored sand half way up the hill we found the first skeleton of *Tyrannosaurus* lying in the position in which it had been interred and petrified millions of years ago.

The skeleton was disarticulated and scattered on the same level and almost every bone was separately enclosed in a bluish sandstone as hard as granite. The loose surface sand was easily removed but below the frost line the hard cemented mass was almost unyielding to a pick. The area over which the bones were scattered and the almost vertical slope of the hill necessitated removal of a vast amount of material. With additional help, plows, scrapers and dynamite we attacked the task, carving off slices of the hillside down to



SKELETON RECENTLY MOUNTED IN THE AMERICAN MUSEUM

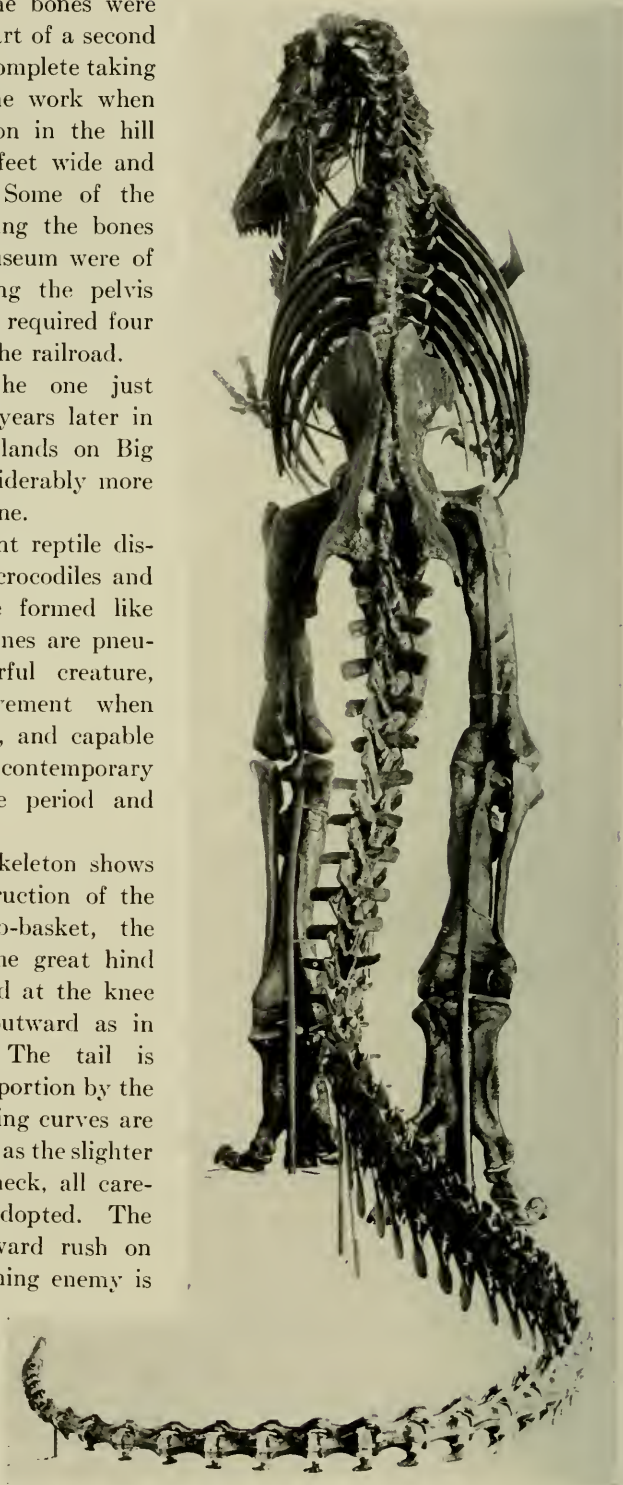
The successive expeditions under Mr. Barnum Brown in the Cretaceous of Montana and Alberta have secured for the Museum a large series of dinosaur skeletons representing all the principal types of this period. The *Tyrannosaurus* mount is regarded as the finest piece of work in this line which has yet been accomplished. The articulation and pose are the result of prolonged and thorough studies and criticism, and the mechanical problems have been solved and managed with great skill and a clear appreciation of the artistic and scientific concept which was to be executed. The mounting was done by Mr. Charles Lang under the direction of Professor Henry Fairfield Osborn and the scientific staff of the department of vertebrate palæontology

the bone layer, where the bones were taken up one by one. Part of a second summer was required to complete taking out this skeleton and the work when finished left an excavation in the hill thirty feet long, twenty feet wide and twenty-five feet deep. Some of the sandstone blocks containing the bones shipped back to the Museum were of huge size; one containing the pelvis weighed 4150 pounds and required four horses to transport it to the railroad.

A second skeleton, the one just mounted, was found six years later in the same Montana bad lands on Big Dry Creek. This is considerably more complete than the first one.

Tyrannosaurus is a giant reptile distantly related to lizards, crocodiles and birds. Its hind legs are formed like those of birds and the bones are pneumatic. It was a powerful creature, doubtless swift of movement when occasion demanded speed, and capable of destroying any of the contemporary creatures, a king of the period and monarch of its race.

The rear view of the skeleton shows the narrow birdlike construction of the pelvis, and compact rib-basket, the massive proportions of the great hind limbs, which bend forward at the knee as in birds, instead of outward as in crocodiles and lizards. The tail is enlarged out of its due proportion by the perspective, but its sweeping curves are clearly brought out, as well as the slighter curves of backbone and neck, all carefully studied for the pose adopted. The sudden pause in its forward rush on coming close to its crouching enemy is well suggested, but the attitude could be more clearly seen if the outlines of the flesh of the body and limbs were restored.



SANDSTONE CONCRETIONS WEATHERING OUT IN THE CRETACEOUS BAD LANDS

TYRANNOSAURUS QUARRY. HELL CREEK, MONTANA

Excavating with team and scraper, to remove a *Tyrannosaurus* skeleton lying in the position in which it had been interred and petrified millions of years ago

HAULING COLLECTION TO RAILROAD FROM CAMP AT MOUTH OF SAND CREEK, RED DEER RIVER

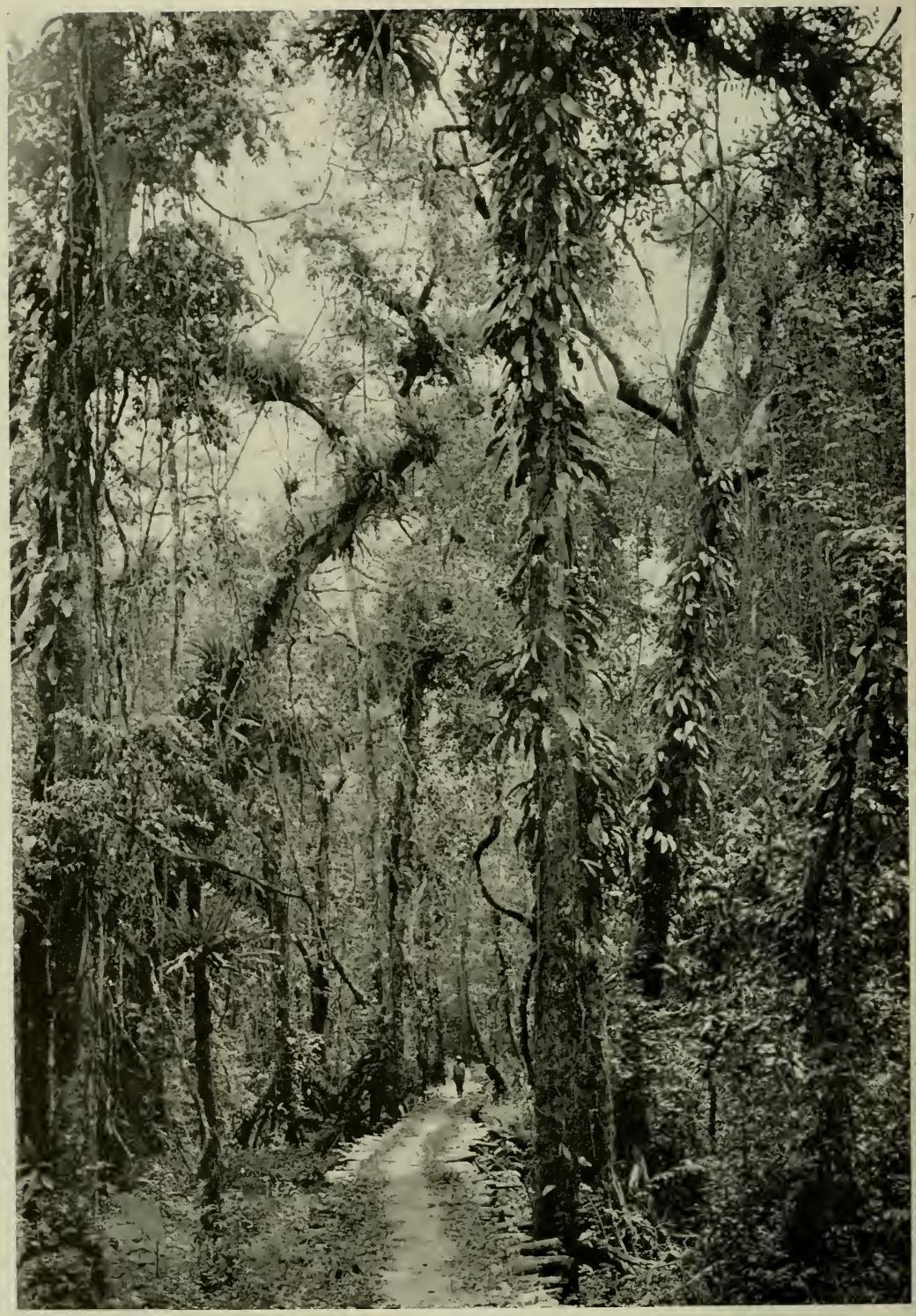
Museum Expedition of 1914

CRETACEOUS BAD LANDS LOOKING TOWARD THE MISSOURI

Almost impassible on horseback and very picturesque, a wilderness of variegated sculptured cliffs and domes intersected by deep cañons with scattered pine trees and pockets of junipers; while on the hillsides in the broader valleys, lines of cottonwoods mark the stream courses. The dullness of the denuded earth is relieved by bright-colored clay in bands traceable on the same level for miles

RED DEER RIVER, ALBERTA, CANADA. HERD CROSSING A FORD

American Museum Expedition of 1914



CAUSEWAY THROUGH SWAMPY FOREST NEAR MEDJE (ITURI DISTRICT)

Note the abundance of epiphytic plants on the trees. [For birds found in such a forest, see footnote on following page]

BIRDS OF THE CONGO

By James P. Chapin

Illustrations from photographs by Herbert Lang

THE Congo offers wonderful opportunity to the naturalist, and surely it will be difficult for one who from childhood has been a bird-lover to express the fascination of bird study in central Africa — to tell the charm of knowing the birds of a Congo forest almost as he knew those of the woods of his boyhood, recognizing them by their voices, finding their nests, investigating their ways of life, their food and enemies; and finally of cultivating this acquaintance for more than five years.[1]

In a country like tropical Africa, of course all serious study must be intimately correlated with collecting, for exact knowledge is otherwise impossible. The preparation and care of specimens, although apt to be more tedious in such a damp hot climate, are in principle much the same as at home; but it is the experiences in collecting, and the information one cannot fail to gather in the course of such work that prove of the highest value. Much of our success I believe was due to the endeavor to profit by this knowledge as well as to rely whenever possible on the assistance of natives.

Negro ornithology is interesting, although often far from exact. Names for birds are usually generic, as might be expected. Sometimes one term includes all the members of a family, although a common and conspicuous species, like the great blue plantain eater or the fish-eagle, has a name of its own. These names have originated frequently in the calls of the birds, as *nakurubu* (pigeon), *nambulukuku* (dove), *magiligili* (lapwing) and *buku* (wood-owl). Among the Medje, a green-backed cuckoo's plaintive whistled note is very well imitated in its name, *papunzisodu* [literally, "Father is dead, so there!"]. Others are named from their habits, as the tick-bird that clings to the bodies of buffalos and rhinos is known to the Azande as *zeregbe*, or buffalo-bird.

The birds of Africa are generally conceded to be inferior in song to those of Europe, yet there are some worthy of high praise. Best are the thrushes, three of which (of the genus *Cossypha*) are also expert mimics, often mocking eagles, hawks, fruit-pigeons and cuckoos from hiding places in dense second-growth. One of their small relatives, an extremely wary denizen of the virgin forest, has a song so sweet that my native helper christened it the "king of music." On the granite hills of the Sudan border and fond of the most inaccessible rocks there, is another first-rate songster (*Thamnolœa*) of the thrush family. The orioles of course have mellow whistles, as do also a few of the numerous

[1] For this unique opportunity I am indebted to the American Museum of Natural History, in whose Congo Expedition I have had the privilege to take part as scientific assistant to Mr. Herbert Lang, and I feel it my duty here to express my sincere admiration of Mr. Lang's efficient direction of the work and my heartfelt appreciation of his invaluable advice and encouragement throughout our long stay.

Footnote: — Most important among the characteristic birds of this equatorial forest are the crowned eagle (*Spizaëtus*), the black guinea fowl (*Phasidus*), wood rails (*Himantornis* and *Canirallus*), plaintain eaters (*Corythæola; Turacus*), gray parrots and hornbills, but in addition there are many smaller eagles and hawks, crested guinea fowls (*Guttera*), forest doves (*Calopelia*), fruit pigeons (*Vinago*), cuckoos, horned and wood owls, beautiful trogons, spine-tailed swifts, barbets, woodpeckers, starlings, black-headed orioles, bulbuls, thrushes and weaver birds.

Native climber at a hornbill's nest thirty-five feet from the ground. He has made the ascent by means of two stiff ropelike loops encircling the tree, one supporting his right thigh, the other the left foot

and varied shrikes. Even the emerald cuckoo utters pleasant whistled notes. This bird is known among Europeans as the most beautiful of Congo birds, although a lover of tall trees, where the jewel-like green of its back and head can hardly be admired. On the other hand, none of the larks we met with had anything worthy to be called music, indeed one of them simply beats its wings loudly at intervals (whence its name "clapper-lark") while making long flights high in the air.

Congo birds are not lacking in brilliant and striking plumage. The flower-loving sunbirds, somewhat larger than hummers, have gorgeous metallic purple, violet and green hues, often with red and yellow beneath, and sometimes with two long feathers in the tail. Paradise flycatchers have the two middle feathers of the tail much elongated, and white. Kingfishers, with their glossy blues and greens range in size from one of the largest species in the world down to little red-billed fellows no bigger than warblers, feeding on insects, but digging their burrows in the characteristic way. Several of the plantain-eaters, large, dark green and violet, surprise one when they take flight with extensive crimson patches in the wings. Among the many other brightly colored forms are the soft-feathered trogons, the graceful bee-eaters and rollers, glossy starlings, golden orioles,

Head of hornbill (*Ortholophus cassini*), owner of nest shown above

VIEW IN THE CONGO FOREST

Here tree ferns grow and there is no danger of forest fires, for everything is saturated with moisture. The woodpeckers of this region are all rather small, in spite of the great trees and abundant insect life. Not a few feed principally on ants. One of the smallest, known as a "piculet" has soft tail-feathers and is only three inches long. Some of the weaver birds are insectivorous and two species climb about the bark of trees like nuthatches

In these forests it is a common thing for the smaller insectivorous birds of many different species to gather in parties, all moving in the same direction as they search for food. Some of the "babblers" (family Timeliidae) and true thrushes recall the "ant-thrushes" of South America by their dull colors and terrestrial habits. A few of them are in fact attracted by the moving columns of driver ants

A RIVER FERRY IN THE FOREST

Small native dugout crossing the Nava River about four miles west of the post of Medje. Such streams are the haunts of white-crested bitterns (*Tigrornis*), rufous ducks (*Pteronetta*), small rufous-headed rails (*Sarothrura*), sun grebes (*Podica*), fish owls (*Scotopelia*) and small brilliant kingfishers (*Alcedo*)

THE ROAD BETWEEN DUNGU AND FARADJE

The dry season in grass and bush country (Uele District). During the rainy months (May to November) the coarse grass grows until it stands higher than a man's head but is later burned off by the natives. The fauna is strikingly different from that of the forest, including as most important perhaps among birds the marabous, vultures and kites, the colies or mouse birds, widow birds, and pennant-winged nightjars, besides many of less importance such as francolins, typical guinea fowl (*Numida*), quail, bustards, turtle doves, blue rollers, bee eaters, the ground-hornbill (*Bucorvus*), hoopoes, larks, shrikes and bishop-birds

MAKERE NATIVE WITH GREAT-CROWNED EAGLE

azure cuckoo-shrikes and flaming bishop-birds.

The Congo furnishes some examples of birds of most remarkable instincts. The honey guide fully merits its fame for attracting men with its chattering cry and leading them to beehives in order that it may share in the spoils. A bird of the more open grass country, it greets you with an insistent "cutta-cutta-cutta-cutta!", flies off ahead, and if you have time to follow it, will take you to the hive it knows of, although you will then have to watch and listen yourself for the bees, while your informant sits quietly watching in some nearby tree. Honey guides eat a good deal of beeswax; in preparing the specimens we usually found some in their stomachs, even in those of some of the smaller related species that do not call upon man for assistance.

The pennant-winged nightjar (*Macrodipteryx vexillarius*) hunts at night in the open grass country. It assembles in flocks when the winged termites are leaving their nests at dusk

The nesting habits of hornbills, of which we secured no fewer than ten different species, are especially curious. The eggs are laid in a hole in a tree, where the female is confined until her young are fully ready to leave, perhaps some six weeks. The entrance is partially closed with muddy material, and food is brought to her regularly by her mate; in fact the nests were discovered by watching his movements. Natives stated that the female sheds all her quills from both wings and tail, during this period, and we found that in some cases at least this was true.

The collector in the Congo has often great difficulty in approaching birds, especially in the great trees of the Ituri forest, where a bird on the upper branches may be one hundred and twenty feet above anyone standing beneath the tree. Yet certain species were seldom seen elsewhere, just as certain others skulked continually in dense underbrush. Since my return I have been struck by the comparative tameness of many American birds, and have wondered to what to ascribe it. Can it be that the abundance of mankind, instead of making them wary, actually causes them to become indifferent, or

A living "scarecrow" watching over a field of ripening grain (sorghum) to scare away the weaver birds. He shouts and throws pebbles or shoots little reeds from his bow, while women and children walk about among the grain to help protect the harvest

Coly, also called "mouse bird" from its habit of creeping about among the branches. The tail-feathers are molted so gradually, and are so often broken that an individual with a complete tail is rare. The foot is peculiar in that all four toes can be turned forward at once

are the fears of African birds kept sharpened by their other more numerous enemies, rapacious mammals, birds and reptiles? Many small Congo birds take wing at thirty yards or more; although in strong contrast to this, one bird, the common black-and-white wagtail is so confiding that it nests in the thatched roofs, and walks about on the verandas, coming up to within six feet sometimes if one sits very quiet.

Others are not only shy but also very clever at hiding away in dense vegetation, their voices alone betraying them. I remember particularly some small brown warblers (*Bradypterus*) in the papyrus, whose prolonged chirping notes and loud wing-beats induced me to spend hours and hours breaking pathways into the swamps, often knee-deep or more in mud and water, and then waiting motionless, until at last, after

Wild date palms in a papyrus swamp, bearing large numbers of nests of a large yellow-and-black weaver bird (*Hyphantornis cucullatus*). Many weavers are fond of nesting on boughs overhanging rivers, also on thorny trees or vines, and a few species build in the tree where an eagle, buzzard or marabou is nesting, also evidently for protection

days of such work, I was able to see and collect a few of them.

Still others, such as swifts, some birds of prey, hemipodes, quail, partridges, and snipe had to be shot on the wing. At this I was at that time far from expert, but even my moderate success never failed to surprise native witnesses. They would grin, and then cover their mouths with the hand, later to deliver speeches on the strong arm or sharp eye of the white man. They themselves never think of shooting an arrow at a flying bird, and the few of them who possess old muzzle-loading guns would not risk powder or caps on such a hazard, so they have little idea how it is done.

Hadadah ibis, typical of forested river-banks

Among the water birds the elusive finfoot or sun-grebe (*Podica*) caused me a good deal of trouble. Traveling along the Ituri River in native dugouts we would occasionally come upon them, usually singly, swimming close to the shore. One bird to four days' journey was about the average frequency. The long stiff tail lies on the water and the back is so nearly immersed that little can be seen except the head and the neck. On sighting us, the finfoot would either make straight for shore or fly ahead some distance, dropping into the water, to swim ashore and hide in the bushes. From this concealment it was sometimes impossible even for several boatmen working together to drive it out again, although with luck it would return to the water, scuttling off with a noisy patter of feet like a coot. Balancing oneself upright on the bow of a small canoe in such pursuits as these is often a ticklish performance.

Nightjars, owls, and other nocturnal birds with their mysterious habits tempt one to evening strolls. Two species of the nightjars (*Macrodipteryx*) have a

very long feather in the wing, and in one of these species the feather has a bare shaft and racquet-like tip, so that in flight at dusk the bird looks as though pursued by two smaller ones, hovering continually a little above and behind.

In the posts of the Uele, on moonlight nights in the dry season the large-eyed stone curlews (*Œdicnemus*) walk about on the ground uttering at intervals a series of shrill whistles. These calls puzzled us at first, for the streaked brown plumage of the birds made them difficult to see, and they spent the day in quiet spots along the rivers, coming to the stations to feed only at night. We used to watch at twilight for a chocolate-black hawk (*Machærhamphus*) that seldom flies by daylight, but subsists largely on small bats, flying rapidly about in the growing darkness, swift as a falcon. This peculiar hawk although rare in collections, ranges widely over Africa, and we observed it all across the Belgian Congo.

Immature specimen of crown eagle (*Spizaëtus coronatus*)

The natives often secured good specimens, sometimes with their arrows, and brought them to us, to secure in exchange some coveted gilt tacks, tablets of salt, or other small objects they considered valuable. They procured us even the great crowned eagle (*Spizaëtus coronatus*), a forest species preying on monkeys. This bird makes an enormous nest — under one of which I once spent the better part of three days waiting for the bird, pestered by tiny ticks and honeybees. Some of the natives used birdlime made by boiling a rubber-like sap together with palm oil, a method however which we always discouraged.

But it was by trapping that they aided us most effectively. There were many birds in the forest, living on and near the ground that were exceedingly difficult to see, and some of these we were hardly able to get save through this coöperation. The Medje and Mangbetu tribes make a very good trap. A young tree is trimmed and its stem bent over to serve as a spring; attached to this is a slipknot, which is jerked taut when anything touches a horizontal stick in the middle of the noose. These traps are set in the game paths in the forest or in cultivated fields, and baited with

termites, sometimes broken pieces of the hard clay nests containing these insects but preferably with the large, fat, winged termites themselves so beloved by birds. Such a trap is very effective, catching francolins, guinea fowl, large wood-rails, pigeons, and a great variety of smaller birds. Ants of course, were unfortunately so numerous and industrious that specimens left too long in the traps were sure to be mutilated — and many a time too, I have had to berate well-meaning men who brought us the birds but kept all the quills which they had pulled out from wings and tail to decorate their hats.

Sometimes simple loops of thin cord would suffice to snare birds, especially near their nests. The Logo trapped the large bustard by constructing a rude fence in places where the grass had been freshly burned, with openings at intervals where loops of cord awaited the neck of a victim. I have seen men of the same tribe capture waxbills in rude cages built on the ground, with a little grain as bait.

The most curious way of catching birds however, that I ever witnessed was at a small cave, large enough to hold two or three men, in a steep bank of a wooded ravine. Here a man would sit inside, having fastened a piece of calico like a curtain above the small entrance, and wait for the colies, or mouse-birds, which came in numbers to eat the earth in this recess. When a number of birds had entered he would suddenly pull down the cloth, cutting off their escape, and catch them in his hands. I have known thirty to be caught in this way within a few hours.

Some small red-headed rails that we found very difficult to flush, we could often catch in the hand — as the Mabudu taught us — after we had surrounded them by a circle of a dozen or more natives or even children. In the same fashion we once caught a crake, almost as large as a clapper-rail.

I knew a man of the Ababua tribe, who was able to call forest guinea-fowl (*Guttera*), and have seen him bring up a whole flock to within a few paces by imitating their nasal calls. He was a corporal in the native police force and a very useful man to his European officer, for besides these guinea-fowl he could call also the small antelopes of the forest — with a loud sound like "n-n-n-y-au!" made with fingers pressed to the nose — providing the means of many a welcome change in the menu.

With regard to the migration of birds, we enjoyed unusual opportunities for observations extending over several years. Not only are there many that come from Europe to spend their winter in central Africa — for example, the nightingale, swallows, warblers, falcons, storks, snipe and other water birds, but also a number of African forms that do migrate to a certain extent, including certain of the lapwings, storks, bustards, hawks, kites, nightjars and weavers. The bird collection made by the expedition is remarkably rich, not only in the number of specimens, but particularly with regard to the variety of different species, which number close to six hundred, many of them as yet very rare in museums, and some still unknown.

Our long stay in the Congo, with its trying climate, would have been impossible without the many privileges and favors bestowed upon us by the Belgian Government, whose amiable representatives always welcomed us in the most cordial manner and assisted us in every way, contributing very much to the success of our work and winning our deepest admiration and gratitude.

REPRODUCTIONS OF AFRICAN PHOTOGRAPHS FROM THE WORK OF HERBERT LANG AND CARL E. AKELEY

Photo by Herbert Lang

THE WHIRLING DANCE OF THE ABARAMBO

This dance is performed only by men. Note the man at the right jumping high in air.
Near Poko, in the Uele District of the Belgian Congo

Photo by Herbert Lang

IN THE VILLAGE OF A BANGBA CHIEF

Part of the great circle of huts for the chief's wives. The wall of the hut is of clay; the conical grass roof rests on this wall without other supports. Tasteful geometric designs are painted in red, white, and black on the clay walls. Near Rungu, Uele District, Belgian Congo

Photo by Herbert Lang

MANGBETU ARCHERS IN SHAM BATTLE, UELE DISTRICT

The Congo is policed by soldiers recruited from native tribes. The troops are commanded by European officers, Belgian, Swiss, and Scandinavian, are drilled with French words of command, and armed with an old-model military rifle, the single-shot Albini. They have proved themselves of immense service in maintaining order and preventing intertribal warfare. At the opening of the present war the Germans in German East Africa with such black troops attacked the Belgian Congo, which was able to defend itself successfully with the native soldiery

Photo by Herbert Lang

CARVED IVORY HORN FOR CEREMONIAL AND DANCE

The head of the human figure at the end of the horn shows the characteristic female headdress of the Mangbetu (Uele District, Belgian Congo). This particular specimen is in the collection which Messrs. Lang and Chapin brought back to the American Museum from their six years' work in the Congo

Photo by Herbert Lang

BAFUKA, AN AVUNGURA-AZANDE CHIEF

At the head of his Azande warriors (Uele District, Belgian Congo), he helped Commandant Chaltin drive the Dervishes out of the Congo in 1897. His shield is of rattan; his garment is of bark cloth. Spear and shield are going out of use in the Congo both for war and the hunt because of the importation of guns. The flintlock is the only gun allowed to be sold to natives, although a limited number of percussion-cap guns are granted to chiefs

Photo by Herbert Lang

CHILDREN OF A CHIEF DANCING

Near Aba, in the northeastern corner of the Belgian Congo

Photo by Carl E. Akeley

NATIVE FAMILY AT HOME IN THE JUNGLE

The natives on the eastern slope of Mount Elgon (British East Africa) are seldom seen by white men. This family fled on the approach of the Akeley caravan, abandoning a young babe in the haste of flight. They were brought back and the man proved a valuable guide

Photo by Carl E. Akeley

MILITARY ROAD IN UGANDA

Along this road, shut in between high walls of green except where the elevation gave an extended view, the Akeley expedition carried elephant skins out from the wilderness camp

Photo by Carl E. Akeley

ON UASIN GISHU PLATEAU, BRITISH EAST AFRICA

Colonel Roosevelt on an elephant hunt with Carl E. Akeley discovers a hyena naturally trapped in the carcass of an elephant

Photo by Herbert Lang

IN THE KING'S KITCHEN

Women grinding flour for making beer from *Eleusine*, a small millet-like grain which has been sprouted and dried in the sun. Village of Okondo, near Niangara, Uele District, Belgian Congo

Photo by Carl E. Akeley

SCENE ON THE TANA RIVER

This river is the main drainage of the Mount Kenya region, British East Africa

Photo by Carl E. Akeley

FOREST SCENE ON MOUNT KENYA BELOW THE BAMBOO BELT

THE TRAIL OF WAR IN MACEDONIA

By David Starr Jordan

NOTE.— The following interesting and significant statement is quoted from Dr. Jordan's letter to the Editor, who had suggested at some time previous that an article on the effect of the war on science would be interesting to readers of the JOURNAL: " . . . .I am sorry my sketch does not more nearly meet your needs. However there are certainly elements of science in a study of the unscientific ways of the men of the Balkans. . . .The effect of the war on scientific endeavor in Europe can be stated in few words. It has been to blast it — excepting only in the lines in which science has been prostituted to murder, and in the lines in which men try to save life, even if only to destroy it when saved. Half the young scientific men are in the ranks and many have been killed or wounded. A few scientific papers are printed, mostly written before the war, but science cannot thrive in an atmosphere of lawless hate. The end of the war will come — before long, I hope and believe — but the center of gravity in scientific work will have shifted to America. Europe will be supine."

IT was my fortune, not long ago, with three good friends [1] and two soldiers, to follow in a King's automobile along the trail of war. This was in Macedonia. The line of an army's march is not pleasant to look upon even though the people along it had not much to lose. The pinch of suffering is very real even if, as in the Balkans, folks have grown used to it. There are two plain marks by which you may recognize the path of war in a land of farmers. The one is the charred village, with its white-washed stone walls blackened by fire. The other is the presence here and there in the ploughed field of three poles fastened together at the top, and from the crotch a baby suspended just high enough to baffle inquisitive dogs or goats. Somewhere in the field, anywhere in the Balkan valleys in May, you will see one woman driving or leading a bullock or a buffalo, while another behind her holds the plough. The men are in the army — or else they were there.

Photo by Antonio Reinwein

Characteristic scene on the hills above Rjeka near Cettinje, Montenegro

The memory I shall longest hold of Montenegro is a picture taken by my guide, Antonio Reinwein, of this land of stony graves, of the resolute people of the limestone crags who have never done homage to the Turks nor to any other outside power.

It will be remembered that all these Balkan folk were for years under the dominion of the Turk, and that none of them have been free for half a century. The Turk was most acceptable when he was asleep. When he was awake, he had his own ideas of "Union and Progress." Union meant uniformity. A nation should have one ruler, one flag, one religion, one language. Progress was his way of bringing about this condition. This was by massacre. And as the actual Turks were few in

[1] Dr. John Mez, R. H. Markham and Emil F. Hollmann.

number, ruling over an empire of Slavs, Greeks, Italians, Jews, Armenians, Albanians, Kurds, Egyptians, Moors and Arabs, it demanded eternal vigilance to keep them all in a state of union and progress.

These people have had constantly before them the choice of revolt, conversion, assimilation, banishment and massacre. And at one time or another, some of each race have chosen each one of these, often two or three of them at once. Meanwhile, following the wicked lead of Bismarck and Disraeli, Europe has kept the Turk alive, because from financiers in each nation, the Ottoman Sultan has borrowed considerable sums of money. If the "Sick Man of Europe" should die, his debts might be left unpaid; worse than that, they might be unsecured. And so the Balkans were kept in confusion and the rest of the Ottoman Empire as well, in the hands of wild soldiers. Besides there were still wilder hordes of local *andartes, comitiji,* ruffians, camp-followers, or *bashi-bazouks,* always ready for murder and plunder. Whenever a period of peace and tolerance set in, as was sometimes the case, it was due to sheer inanition on the part of the Turk and as such it was followed by a fierce relapse. One by one the Balkan states, in different fashion escaped from Turkish rule. First Greece and Serbia, Rumania and Bulgaria; then Rumelia, to become part of Bulgaria; Bosnia and Herzegovina to be absorbed by Austria, and in the war of 1912, Macedonia with Thessaly and Thrace, to be unequally divided among their neighbors, and finally Albania to be segregated as an impossible kingdom under an impossible king.

Macedonia lies along the southern slopes of the Balkan Peninsula. It is a fertile region crossed by chains of rounded mountains, with green valleys and swift streams, in physical conditions not unlike the south of France. It has 45,000 square miles of territory, is about as large as the state of Maine, with a population nearly two-thirds that of the city of New York, and before the war of liberation it had about 2,250,000 people. The majority of these were Bulgarian in blood and they were allowed to have their own churches and schools. Some called Pomaks had adopted the Moslem religion, others were Greeks in language as well as in religion. These were in the west (Castoria) adjoining the land called Thessaly. But Greek or Bulgarian, they were nearly all of the same blood originally, for the modern Greek is not the son of the incomparable Hellenes, but is described as a "Byzantinized Slav." The suicidal wars of Athens and Sparta, with the greater and lesser struggles which history describes, exterminated the choice blood of Hellas and when the Greeks were gone, with them went "the glory that was Greece." Turks, Jews, Armenians, Rumanians (Valaques) and gypsies made up the population of Macedonia. The Jews in Saloniki were refugees from Spain, still speaking a dialect of Castilian. In the face of "democratic famine working day and night," fully half of these have now found their way to New York.

As to the campaigns which have desolated Macedonia in the last few years we need say only a word. The history of the two Balkan wars is given with accuracy and justice in the monumental report of the Balkan Commission of the Carnegie Endowment, a document of especial value in any study of the conditions preceding the "third Balkan war" which to-day has set the world in flames.

The first Balkan war was altruistic as far as any war can be. Its purpose was

the relief of a distressed people, suffering for centuries from the laxities of Turkish rule, always incompetent and everywhere unscrupulous, and on the other hand continuously overrun by the outlaw patriots which kept the land in incessant turmoil.

The Balkan alliance was a Russian inspiration. It was planned by Hartwig, Russian minister at Belgrade, "the

A burned Macedonian village

Greek refugees at Saloniki (from Thrace)

Evil Genius of the Balkans." It ended in the Treaty of London, where the blind intermeddling of the Powers, baffled by Austrian intrigue, agreed only on the kingdom of Albania, leaving the states to fight it out so far as Macedonia was concerned. This brought on the second Balkan war, in which Bulgarian

Greek refugee camp at station of Demir-Hissar in Macedonia

Levenovo, in Macedonia, a burned village partly restored

diplomacy made all the mistakes it had a chance to make. For these she was duly punished by the brigand Treaty of Bucharest, in which Rumania forced into her own hands the fertile meadows of the Dobrudja, while the best of Macedonia was divided between Serbia and Greece.

If the Powers had not been a group of wrangling agents sparring for advantage, they would have considered the interests of Macedonia first. They would have made it an autonomous province held in trust for the welfare of its people and above all, with entire tolerance of religion, language and race. But no such tolerance yet exists in Europe outside of its westernmost nations.

The Treaty of Bucharest left Macedonia crossed by artificial boundaries. The effect of intolerance, worst in Greece, bad enough everywhere, was to drive out of each nation all who belonged to the wrong language or religion. I do not say race, for they are all of the same general stock, even the bulk of the "Turks" and Greeks. This has filled the region with refugees, men and women whose fault is that they lived on the wrong side of boundaries made for them in the Treaty of Bucharest.

Passing down the long highway which leads over two hundred miles from Sofia to Samokov and Dubnitza in old Bulgaria, then across the border of Macedonia, down the Struma River past Dzumaia to Petritch, we found everywhere the Bulgarian refugees from the Saloniki district in Greek Macedonia. These have been roughly estimated at 50,000 in number. Some of these have been given farms or houses abandoned in Macedonia by Turks who followed the Turkish army away. Others received farms left by Greeks when the Greek army went back after the treaty of Bucharest. The government grants each person some fourpence a day. Some find work, but after the war there are few employers. The cost of living has doubled, the means of living has fallen. At Petritch, near the present boundary of Greece, there were hundreds of these waiting about on the stone sidewalks day by day. They were waiting for the Powers to revise the Treaty of Bucharest and give them back their homes in the region above Saloniki. Some local journal had said that this revision was coming soon. It was my duty to assure them that it would never come. The phrase in Sofia, "Europe exists no more," is the truth so far as Balkan affairs are concerned.

The reason for that is clearer now. Europe was paralyzed by the great terror which has since come on it in an unthinkable catastrophe. There were some in the "Concert of the Powers," who were striving to bring on this catastrophe. The "war of steel and gold" was about to give place to real war, which would end, they hoped, in speedy victory and world power. It has not ended in that way. It has not yet ended at all. But those who most looked forward to war were the ones who had least conception of its certain consequences.

The condition of the Bulgarian refugees has been especially hard because their flight took place mostly in the fall and winter and before the cholera was stamped out. Very many died on the road, and many more died after reaching the inhospitable Bulgarian towns, where they received scanty welcome because the people were overborne by their own troubles.

The Rumanian invasion caused also great hardship in Bulgaria. The annexation of Silistria and the Dobrudja, with its population of about 180,000, was

Greek army stationed on Bizbutza River boundary between Bulgaria and Greek Macedonia. Third from the left, General Evangelos Tsanas; fifth, Themistocles Papajeaines; seventh, beside Dr. Jordan, John Pappamelins

En route Saloniki to Constantinople — Moslem and Turkish refugees in steerage

followed by the exodus of all those unwilling to be summarily Rumanised in language and in religion. These refugees swarm in Varna and Plevna, while it is said that at Burgas, near the Turkish frontier, there are now 43,000 more forced out of Turkish Thrace since the recapture of Adrianople by the Turks with the wiping out of the Enos-Midia boundary line so carefully drawn by the Concert of Powers.

In the whole length of the Struma Valley in western Macedonia, towns have been burned in whole or part by the Greek army which pursued the Bulgarians as far as the old border of Bulgaria. In Greek Macedonia, at the hands of some one or all of the three successive armies — Turkish, Bulgarian and Greek — most of the towns between Saloniki and Drama have suffered the same fate. Each of these towns has now its share of Greek refugees from Turkish Thrace. These have been estimated by Greek authorities as numbering 300,000. They have come by railway from Adrianople in box cars belonging to the Greek Government. These cars are left at the various stations, a dozen or more at each. In these the people keep their bedding and their scanty effects. The government of Greece allows them two or three sous a day, with rice which they cook on fires of thistles and other weeds. I was told by one of these at Demir-Hissar that their homes about Adrianople and Kirk Kilisseh, were wanted for Albanian refugees from the Novibazar (now annexed to Serbia), and that they were given by the Albanians from two hours to four days to get out of Thrace. He summed up the conditions in the Italian word *duro* (hard). I was told also that a Turkish town near Nigrita (or possibly Nigrita itself) had been turned over bodily to Greek refugees, and that the rest of these would in time be placed on farms abandoned by Turks and Bulgarians. Other Greeks, not refugees, were coming from Russian ports, attracted by the prospect of free land in Macedonia.

In a Turkish journal, vigorous complaint was made against the Albanian refugees in Thrace as more "proficient with the Mäuser than with the plow, and skillful only as cattle thieves." A plea was made for bringing back the Bulgarian farmers as far more desirable neighbors. "The Bulgarians are now our friends."

In the larger towns, as Saloniki and Kilkush, the refugees are ranged in tent cities, ten thousand or more in one encampment. There were perhaps sixty thousand Greek refugees a little more than a year ago along the road from Drama to Saloniki.

A little more than a year ago, when I was at Saloniki, the Turks were leaving in great numbers: 212,000 took steerage passage for Stamboul in April. Saloniki, (Thessalonike) beautifully situated, in full face of Mount Olympus and with a noble harbor should be one of the great cities of the world. In the aftermath of the second Balkan war it lost half its population. It is no better off to-day than in the times when St. Paul called out for help in Macedonia. A year ago, there were still many Turks in Saloniki, teamsters, laborers, idlers about the wharves, gentlemen smoking in the cafés. Even in Bulgarian towns, as Dzumaia, one may see the red fez, but its wearers seem to have nothing to do save to lie about in unoccupied lots or to sit upon the steps of burned buildings.

In Serbian Macedonia, the Bulgarian is turned by force into a Serbian. If he resists, he risks his life. His name is changed, as from Popoff to Popovitch, from Stephanoff to Stephanovitch. His

religion, Greek in either case, transfers its allegiance from the heretic exarch in Sofia, to the orthodox patriarch in Athens. The theory is that Bulgarians in Macedonia are really Serbians perverted by their environment.

These harsh and often terribly brutal operations in Serbia and Greece result from the unchecked operations of the military element. The soldier, as such, considers neither economic conditions nor the soul of man. It was claimed that the two wise ministers Pashitch in Belgrade and Venizelos in Athens were both opposed to the policy of repression. Both would, if they could, have proclaimed religious linguistic tolerance in those parts of Macedonia turned over to them by the Treaty of Bucharest. But the fact of victory, and especially victory over their sister state, Bulgaria, intoxicates the military, and fills the mob with the "east wind." In such times the civil authority cannot hold its own against the military.

Bulgaria, being on the defeated side, recognizes better the value of tolerance. A Greek church and school stand undisturbed in Sofia. In the Bulgarian national assembly there are about a dozen Turkish deputies, representing Thrace. These Turks, supporters all of the King, hold the balance of power against the combined Democrats and Socialists, the group opposed to all war. The spirit of hate is still very strong among the people of Bulgaria. They hate Rumania, as the robber-state who has done them the most harm. They hate Greece and Serbia, but they cannot fight them, and the broad-minded among them recognize that when Bulgaria is strong enough to fight, she will be able to carry her points in some better way than by war.

In the crisis of the early part of 1915, the upper classes of Bulgaria were strongly on the side of Germany. They hate Russia, believing (perhaps on insufficient evidence, for the Russian government had given them fair warning) that Russia had betrayed and abandoned them in the Treaty of London.

The common people do not want any more war, and they have a very high respect for England. Bulgaria has 250,000 soldiers, but very little in the way of arms. She is not sure what her army would do if it were called together. She does not care much for the rest of the world, but her heart is fixed on Macedonia and Dobrudja, for these were mainly Bulgarian, before the Bulgarian people were driven away. The public in Bulgaria expects the nation to go into the war somewhere. If it does so, it will fight for the group that promises the return of the lost provinces. Demands for war and for neutrality fluctuate with each movement of the Russian troops in the Carpathians. Meanwhile, the old days have come back to Macedonia. Outlaw bands of discouraged farmers harass the Serbians and the Greeks as formerly they harassed the Turks, from Monastir to Kavala. And the farmer still goes out furtively from his half-burned village to gather in his crops as he can or he dares.

There can never be settled quiet in the near East, until the "Balkans belong to the Balkans," until civil authority everywhere dominates the military and until customs unions and other unions cause these people to realize that one fate befalls them all and that the welfare of each state is bound up in that of its neighbor.

A pair of courting birds standing on a shoal overlooking the sea

THE PENGUINS OF SOUTH GEORGIA

"JOHNNIES" AND "KINGS" ON A DESOLATE SUBANTARCTIC ISLAND[1]

By Robert Cushman Murphy

QUITE unlike the Johnny Penguin is its big neighbor, the king penguin. This species was once abundant at South Georgia, but it is now obviously in danger of extinction, partly because of the foraging raids of sealers and whalers, partly from the ravages of traders in penguin oil.

We discovered three king penguin colonies, all in the neighborhood of Johnny penguin rookeries, but all on low ground. The largest of these was situated south of the Bay of Isles among a barren waste of morainic stones. A great bank of unmelting névé bounded the settlement on the west, while a violent glacial torrent separated it from the sloping edge of a glacier on the east. In such a gulch, between walls of snow and ice, swept by southerly gales that descended through a rift in the mountains, a band of about three hundred and fifty king penguins made their home.

When we found the colony, on December 16, many of the kings were incubating eggs, while at the same time half a dozen young of the previous year, fully grown but with ragged patches of long down still attached to their contour feathers, were associating with free adult birds. The sitters stretched up to as great a height as possible at the approach of their first human visitors (at least during that season), and clung tenaciously to their eggs. After the members of our crew had gathered many eggs and had placed them in one spot on the ground, the robbed penguins approached the pile and slyly appropriated eggs to replace the lost ones. But not only did they attempt to take one egg — the proper complement — several tried to tuck *two* in the space

[1] Continued from the last issue of the JOURNAL. Illustrations from photographs by the Author.

A king penguin tucking its egg into the so-called "brood-pouch," which is merely the space between belly, feet and tail

A Johnny standing over its eggs and momentarily spreading its brood-pouch, or incubating surface

between belly, tail and feet. I was never able to discover in either sex of the king penguin anything resembling a "cavity," such as Weddell mentions.

Incubating king penguins can shift about slowly, in spite of the eggs on their insteps. They drag themselves along rather painfully, maintaining their hunched positions, and hitching their feet with short steps so that the egg may not roll out. They are fond of crowding together closely — yet seemingly for no better purpose than to facilitate quarreling! Day after day at the colony I was a neutral witness of their noisy squabbles. The sitters glare at each other, with sinuous necks twisted and heads cocked sidewise, and deal resounding whacks with their flippers, or lunges with their sharp bills, to all their neighbors. Often whole groups will be engaged in an indiscriminate skirmish with these rapiers and broadswords. The birds are careful to maintain their equilibrium while banging each other, but it is a wonder nevertheless, that no harm comes to the eggs. On February 5 I photographed a typical battle. One sitter was employing its bill to mutilate the back of another's neck. The latter bird, grunting vehemently, was delivering backhand blows with one wing but without turning to face its opponent. Only the intrusion of weapons of other pugnacious penguins succeeded in diverting the attentions of these two from each other. The affair ended in a general mêlée in which nine birds took part, each for itself and against every other. Such is the reach and flexibility of the king's extensible neck that each sitter can very easily become the center of a large circle of trouble.

It seems probable that the breeding season of this species extends through the major part of the southern summer, with great individual variation in the

IN THE WATERS OF SOUTH GEORGIA

A Johnny penguin swimming under water and rolling his back above the surface

A king penguin entering the sea, and a king [the third photograph] coming ashore

The king penguins on the left are in sleek new plumage. The central figure is completing its molt

time of laying. I saw a few birds still engaged in pairing about the end of January. Courting couples stroll apart from the main flocks, and seem fond of standing side by side on high places such as knolls overlooking the sea. Caresses are then exchanged, the usual form being for the birds to cross their necks, swaying from side to side.

King penguins commonly deport themselves in an amusingly lofty manner toward human beings, paying slight attention to a man's quiet intrusion into their midst. If they are annoyed they march away, slowly and with an air of indifference, until they have been actually frightened by abuse when they fall upon their breasts and scurry on all fours. I have seen a fox terrier put a whole band of kings to ignominious

At the right — a yearling king penguin with his coat of down at its maximum length

Main group — a yearling king molting into his first adult clothes, and a group of old birds in the throes of the annual molt

flight. Sitting birds alone are stolid and fearless, refusing to be stampeded even after their eggs have been taken.

The voice of an adult king penguin is a martial sound, a long-drawn bugle call, highly musical and almost worthy of being dubbed a tune. When delivering the call the bird stretches grandly to its full height, points its bill skyward, and the long volley rings forth from an expanded chest. At the close of the effort the head is tilted forward with a jerk and the bugler stands at attention — a rigid, artificial pose always held for several moments. The yearling penguin's call is a clear whistle of three notes, as soft and sweet as the whistle of an oscine bird.

The actions of "bachelor troops," that is birds of both sexes which are neither molting nor incubating, furnish continual entertainment to an observer. Such bands frequently come out of the sea during the warmer parts of the day to sun themselves on the beaches. The birds sleep either prone or upright; if in the latter position, often with the bill turned behind the wing where ages ago the ancestors of penguins may have had warm coverts. They preen themselves scrupulously and even perform the difficult stunt of balancing on one foot while they scratch their heads with the other. Their regimental characteristics, such as standing at attention, marking time, and marching in single file or in doubles, are very striking.

As regards enemies, I judge that this species is little troubled by the skua gull, the scourge of the Johnny penguin rookeries. Its enemy in the ocean is the sea-leopard. From the stomach of one of these seals killed at the Bay of Isles, I took the remains of four king penguins, besides fish and other material. The magnitude of this breakfast may be more fully appreciated if I record that the weight of a mature king penguin in good condition averages forty-four pounds.

Since South Georgia has been made a political dependency of the Falklands, the resident birds have come under the protection of law, but perhaps too late to save the king penguins because of the impracticability of enforcing legal restraint along hundreds of miles of isolated uninhabited coast.

Mimicking small brothers! I broke the spell by stooping to pat one on the head, when they all wiggled their tails and hurried back into the pond

ANTIQUE GOLD FROM COSTA RICA

Many specimens in Mr. Minor C. Keith's remarkable collection of ancient gold art from Costa Rica, represent gods in human, animal and bird form elaborated with the heads of crocodiles. The collection is now on exhibition in the Mexican hall of the American Museum

ANCIENT GOLD ART IN THE NEW WORLD

By Herbert J. Spinden

THE Isthmus of Panama includes part of Colombia and the entire republics of Panama and Costa Rica. It has long been famous for the beautiful specimens of gold work, as well as of pottery and stone sculptures found in the stone-box graves of its early inhabitants. Most of the gold objects were seemingly worn as ornaments before being buried with their owners. In these gold objects the characteristic animal life of the region is represented and there are also many figures with a mythological or religious significance.

Gold is taken from only a small percentage of the graves — probably from those of chiefs. Pottery and stone carvings are found in the ordinary run of burials but rarely in the ones that contain gold. A systematic rifling of the ancient cemeteries by treasure-hunters has been going on since the coming of the Spaniards but most of their finds have gone into the melting pot. The burial places are sometimes made evident by low platforms built over a number of graves. Sometimes the searchers use an iron rod giving forth a hollow sound when the stone cists are struck. The graves are small chambers lined with river boulders or with slabs of stone. Bones are rarely found in them but this may be no indication of great age, for the climate is such as to hasten decay. There is little doubt that the makers of the gold figures were simply the ancestors of the Indian tribes that now inhabit the region. Costa Rica takes its name "rich coast" from the large quantity of gold obtained from the natives.

Mr. Keith's collection, now on deposit in the Mexican hall for a term of years, is the finest ever made in Central America. At Mercedes in northern Costa Rica many hundreds of graves were opened and a vast amount of pottery and stone sculptures was taken out, in addition to a considerable quantity of gold and jade. At this place there is now a great banana plantation but formerly the site was covered with dense forest. Mr. Keith relates that one night

NOTE BY THE AUTHOR.— The ancient gold here described is part of a collection of more than 15,000 archæological articles in gold, stone and pottery collected by Mr. Minor C. Keith in Costa Rica. From this great collection about 7000 specimens chosen for exhibition and study, were deposited by Mr. Keith in the American Museum for an extended period. The exhibition now occupies about one-third of the Mexican hall and is unrivaled in beauty and richness as in more prosaic scientific virtues. The gold specimens are installed in specially devised cases.

Mr. Keith went to Costa Rica when a young man and engaged himself in the railroad building and commercial developments which have brought Costa Rica to the front rank among Central American republics. Foreseeing the great possibilities of tropical fruit in northern markets, he was instrumental in organizing the United Fruit Company which now operates the largest fleet of steamships under the American flag. Under Mr. Keith's direction the growing, transporting and marketing of bananas has been brought to such high efficiency, that this wholesome fruit of the torrid zone can now be purchased cheaply the year round in every city, town and village in the United States. The banana is grown in the humid lowlands. The great plantations of the United Fruit Company have been cleared from dark and dripping jungle; problems of sanitation similar to those encountered in building the Panama Canal have been met and solved; railroads have been laid across morasses; towns and cities have risen where before there were a few palm-leaf huts of squalid Indians.

It was in clearing a great banana plantation at Mercedes that the remains of a prehistoric city were found. Mr. Keith at his own expense, carried on excavations for several years at this site, and his interest increasing with the finds, he extended the archæological survey to cover other parts of Costa Rica. Thus it happens that there is opened to the scientific world, results of exploration in the humid lowland areas of Central America to add to the results previously gained from the more easily explored arid districts.

a storm swept over Mercedes and upturned a great tree. The next day in the earth that still clung to the upturned roots, he caught the glitter of gold and upon examination thirty pieces of ancient gold craft were found. The great tree had grown over the grave of some forgotten chief and its roots had enmeshed the funeral offerings. In addition to long continued excavations at Mercedes, supplementary work was carried on in other parts of Costa Rica. Many fine examples of art in gold were found in the region of Rio General.

Birds of prey are often figured in a simple but forcible fashion, with spread wings and tail and outstretched talons. These pieces have a ring at the back for suspension and were probably worn about the neck as ornaments

The technical processes of the ancient goldsmiths are admirably illustrated in Mr. Keith's collection. Many ornaments including the disk-shaped gorgets are made of beaten gold and have designs in repoussé. Others are castings. Of the latter some examples were cast in one piece and others in several pieces afterwards welded together. The patterns were made of resin or wax. They were enclosed in clay and the resin or wax was melted out and a mould was left. Hollow castings were made by building the patterns over a core of clay held in position by sprues or pins. In a number of specimens a portion of the clay core can still be seen. The rough castings were finished off by hammering and burnishing. Two kinds of gold plating were accomplished by the ancient metal-workers. One is a heavy plating made over copper and the other a very thin and impermanent gilding. It has been suggested that the molds were lined with leaf gold or sprinkled with gold dust before the copper was poured in. The metal runs from pure gold to pure copper with all the intermediate alloys. In addition to copper, silver and even platinum may occur as a natural alloy in the gold. Bronze was apparently not made. The gold was obtained from placer deposits that sometimes yielded nuggets of good size.

The range of natural forms is well covered. Human beings are represented

The gold objects cover the range of animal forms in the Isthmus. The tapir is represented in one specimen while the jaguar and the monkey and various reptiles are favorite subjects. Sometimes composite forms are seen

Human beings are represented either singly or in pairs. Various activities are shown. Headdresses and necklaces are on the otherwise nude subjects, and objects such as bells are held in the hand. A remarkable specimen [upper right-hand corner] shows a man being devoured by two vultures

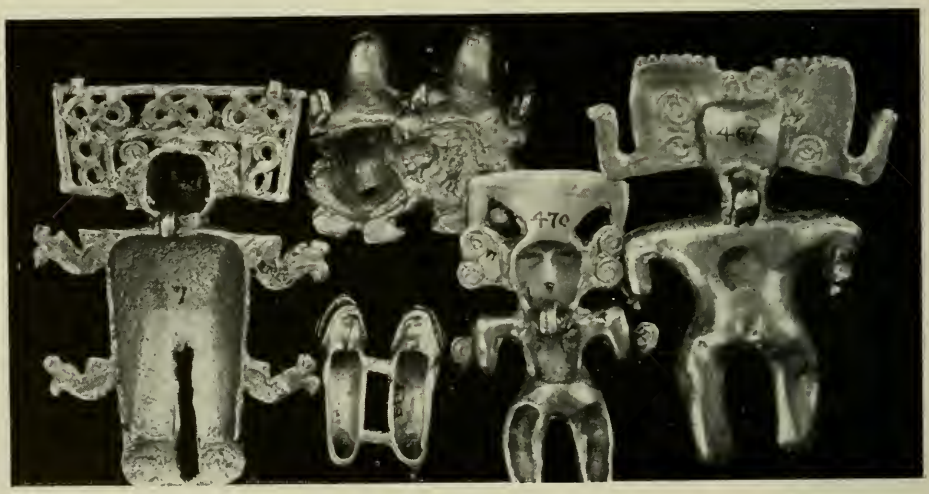
Bells served as money in ancient America. The sleigh bell or hawk's bell was made in exactly the form in which we know it and was often modified so as to represent animal heads, birds, monkeys and crabs

Some of the most interesting pieces of Costa Rican gold work are made to represent frogs and lizards. Often these are amulets or brooches

THREE REMARKABLE PIECES OF ANCIENT GOLD

The most elaborate specimens in the Keith collection show bird and animal gods ornamented with the sacred crocodile heads. The three animal-gods figured above are in the act of devouring a fish, a snake and a lizard respectively

Although naively drawn, there is an unmistakable touch of nature in many examples. The student of primitive peoples sees in these ancient pieces of gold craft the close relations existing between man and the animal life that surrounded him. The animals that were powerful or possessed some special efficiency were transformed into gods



Mr. Keith's collection illustrates excellently the ancient processes such as hammering, engraving and hollow casting

with peculiar headdresses and with various objects carried in the hands. Sometimes they are joined in pairs. Many of the most beautiful amulets are frogs arranged either singly or in groups of two or three. These little figures are all provided on the under side with a ring for suspension. Lizards, turtles and crocodiles or alligators, are also represented in amulets. Clamshells were used as beads and clever imitations of them were made in gold. The monkey is an interesting subject, and we find it treated in the gold work much as it is treated in the stone sculptures.

Perhaps the most numerous amulets are those which figure birds with outstretched wings. Many of them are of the vulture and harpy eagle types. Others represent the gull, the man-of-war bird and the parrot. An interesting series of ornaments shows the amalgamation of two birds into a single figure. Among the unique examples in the Keith collection are a large spider with egg ball attached, a fine figure of the tapir, a curiously conventionalized butterfly, and a number of pins and odd pendants which represent highly modified crocodiles and monkeys.

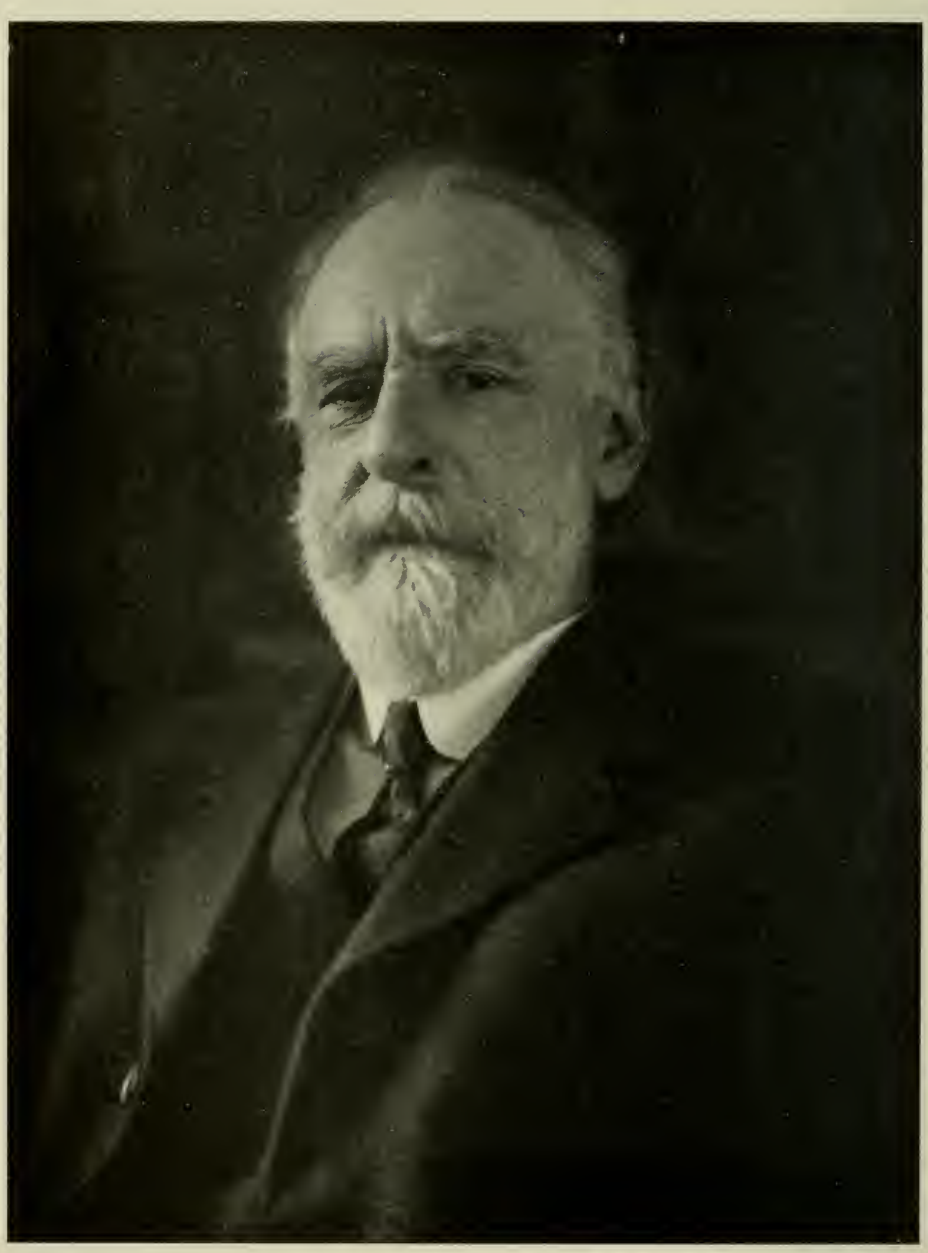
The more elaborate specimens of ancient Costa Rican gold work deal with religious subjects. In particular the crocodile was deified and elaborated. It is often represented with a human body and a characteristic animal head. The profile of the crocodile head is used to embellish other forms. In pottery and stone sculpture as well, the crocodile motive is very prominent, while the jaguar and various sorts of birds are seen in many examples.

Perhaps the finest specimens of gold work in the Keith collection are those which show some of the highly conventionalized figures of gods. One series of such figures have canopies made of rectangular gold plates on standards. Others show the animal-god in question performing some act. Examples of this are two bird divinities, one with a lizard and the other with a flying fish in its mouth. In both cases the headdresses of these deified birds are elaborated with the profile head of the crocodile. In another instance a bird is shown with a fish in its mouth while four fish are attached to its head and legs.

Gold and copper bells served as a medium of exchange among the peoples of Mexico and Central America. They were all of the hawk's bell type. The gold bells of Costa Rica are exquisite examples of metal work. Many of them are modeled in the form of birds, monkeys and grotesque heads.

Most of the tribes of Costa Rica belong to the Chibchan linguistic stock and are connected with the Indians of Colombia. The languages however are differentiated to such an extent as to be mutually unintelligible. The political units at the time of the Conquest were small and there was no centralized government. The Nicoyan peninsula in northwestern Costa Rica and adjacent territory near Lake Nicaragua was inhabited by the Chorotega or Mangue Indians of a different linguistic stock. Intrusive Nahuan tribes from the highlands of Mexico were also found here.

Gold becomes scarcer as we go north from Colombia and Panama but identical processes of metal-working were in use as far north as Central Mexico. The succession and interrelation of the various ancient civilizations have only been roughly blocked out for the Isthmian area. There is no doubt that the artistic development extended over many centuries. Many features of art and technology can be traced to Mexico and it is hoped that future study will bring to light connections with Peru.



FREDERIC WARD PUTNAM, 1839–1915

Professor Putnam was one of the most eminent American anthropologists. He had official connection with many learned societies and had been decorated by the French Government with the Cross of the Legion of Honor. It is directly due to his influence that anthropology has come to occupy its present high position in American museums, making these institutions the instrument of field research. Professor Putnam was an optimistic believer that proofs of man's presence in America during the last period of glaciation will ultimately be found

FREDERIC WARD PUTNAM

By Clark Wissler

THE founder of anthropological research in the American Museum, Frederic Ward Putnam, died at his home in Cambridge, Massachusetts, Saturday, August 14, 1915. He was born in Salem, Massachusetts, April 16, 1839. He attended the Lawrence Scientific School of Harvard where he studied under the distinguished Agassiz. From 1857 to 1864 he was Agassiz's laboratory assistant, and later he was curator of Vertebrata in the Essex Institute, Salem, and also curator of ichthyology in the Boston Society of Natural History. Thus at an early age he began an unusual career in that he served a number of institutions simultaneously.[1]

Professor Putnam's interest in anthropology was a later development and seems to have had its origin in his museum experience. He was above all a genius in museum development and is far and away the most conspicuous figure in the history of American museums. Anthropology as we now use the term had scarcely come into existence when he took it up. Doubtless he saw in America a great undeveloped field for research and particularly for the investigation of the antiquity and the origin of man. At that time such museums as there were, contented themselves with receiving gifts of such random anthropological specimens as came to their doors, but Professor Putnam's idea was to make the museum an instrument of field research, to go out with trained men, collect, and study the evidences of man's antiquity on the ground. This is the modern idea and it can truthfully be said that Putnam is the father of municipal anthropological research institutions in America.

The Peabody Museum in Cambridge as it stands to-day is due to his leadership; his coming to the American Museum resulted in the development of anthropology as a department of research and the beginning of a policy of extensive systematic field investigation. It was Professor Putnam who encouraged the late Marshall Field to establish in Chicago a great museum which now bears his name, and it was Professor Putnam who guided its department of anthropology through the formative period. Later, he organized a department of anthropology and a museum at the University of California where he was director for several years. One of his strongest traits was his genius in interesting wealthy men in museum development. In almost equal measure he had a way of inspiring capable young men. Among those whose early anthropological careers were under his guidance are Franz Boas, Roland B. Dixon, George A. Dorsey, Alice C. Fletcher,

[1] Some of the positions Professor Putnam has held in corporations and institutions are as follows:— curator of ornithology, Essex Institute, Salem, Massachusetts, 1856–1857; assistant to Professor Louis Agassiz, Harvard University, 1857–1864; curator of Vertebrata, Essex Institute, 1864–1866; superintendent of the Essex Institute Museum, 1866–1871; superintendent Museum East Indian Marine Society, 1867–1869; director Museum Peabody Academy of Science, 1869–1873; state commissioner of fish and game, Massachusetts, 1882–1889; curator of ichthyology, Boston Society of Natural History, 1859–1868; permanent secretary, American Association for the Advancement of Science, 1873–1898; assistant Kentucky Geological Survey, 1874; instructor, Penikese School of Natural History, 1874; assistant to United States Engineers in surveys west of 100th meridian, 1876–1879; assistant in ichthyology, Museum of Comparative Zoölogy, 1876–1878; curator of the Peabody Museum, 1875–1909; honorary curator, 1909; honorary director, 1913; Peabody professor of American archæology and ethnology, Harvard University, 1886–1909; Peabody professor emeritus, 1910; chief of department of ethnology, World's Columbian Exposition, Chicago, 1891–1894; curator of anthropology, American Museum, New York, 1894–1903; professor of anthropology and director of the Anthropological Museum of the University of California, 1903–1909; professor emeritus of anthropology, 1909.

George Byron Gordon, M. R. Harrington, A. Hrdlička, A. L. Kroeber, Charles W. Mead, Warren K. Moorehead, George H. Pepper, Marshall H. Saville and Harlan I. Smith.

When Professor Putnam was invited to the American Museum by President Morris K. Jesup, there had as yet been no important anthropological expeditions. At once Professor Putnam began to solicit funds and soon had important work under way. Among the most important expeditions were the Hyde explorations in the Southwest, resulting in the famous discoveries at Pueblo Bonito by George H. Pepper; the Loubat Mexican expedition by Marshall H. Saville; the organization of the Jesup North Pacific work under the direction of Professor Boas; and the Villard expedition to Peru under A. F. Bandelier.

Under his own personal supervision were the exploration of the Delaware Valley for traces of early man and the archæological investigations in the vicinity of New York Bay. The field work for the former was conducted by Ernest Volk, and the latter by M. R. Harrington. Each of these undertakings yielded important results and their published reports are conspicuous in anthropological reference literature. In these, as in all other undertakings, Professor Putnam's chief work was administrative, but it was the kind of work that made possible these several researches bearing the names of others.

In the main the history of Professor Putnam's call to the American Museum can be read in the following quotation, from his own report to the trustees of the Peabody Museum:

> During the spring the trustees of the New York Museum offered to me the position of curator of the department of anthropology of that museum, with the understanding that I was to reorganize the department on a broad basis, to plan for its future development and for exploration, and to direct its work. The opportunities here offered were in every way worthy of my most earnest consideration; but I felt that I could not leave the Peabody Museum to which for the last twenty years I have given my thought and my work. After several conferences with the trustees of both museums and with the president of the University, it was finally arranged that I should continue my duties in Cambridge both in the museum and in the college, and should also accept the position of curator of anthropology in the New York Museum to which I should give one week each month. Thus since the first of June I have held both positions, and have so arranged my duties as to take one week of each month for my work in New York. This arrangement has thus far proved possible and I trust satisfactory to all concerned. My field of usefulness is certainly increased, and I am confident that mutual benefit will result from thus bringing into perfect harmony two important centres of anthropological research. The aims of the two museums are different, and perfect coöperation and harmony between them cannot fail to result in benefit to science.— F. W. Putnam

A continuation of the history of Professor Putnam's connection with the American Museum is set forth in the following quotation from a report of 1903 by Morris K. Jesup, the late president of the American Museum:

> Professor Putnam was appointed curator of anthropology in the spring of 1894. At that time the exhibition of the collections relating to Man was confined to what is now the shell hall on the fifth floor, and the western half of the bird gallery on the third floor. There had been no systematic explorations, no scientific publications, and the head of the department had but a single assistant. Within these ten years the department has grown until, at the present time, the collections occupy eight large exhibition halls and twelve storage rooms. Explorations have been made throughout America and parts of Asia, the scientific publications fill a score of volumes, and the present department staff includes no less than seven men of recognized scientific attainments.— Morris K. Jesup

As we are reviewing Professor Putnam's work while he was connected with the American Museum only, it is not necessary to consider the expeditions sent out under his direction from other institutions. Yet, note may be made of the fact that he is the most conspicuous figure in Ohio mound exploration and really began what the state of Ohio is now carrying out so well — namely, a systematic archæological exploration of the entire state.

Although living to an advanced age Professor Putnam was an enthusiastic anthropologist to the very last. Just a few weeks before his death the writer received from him a long letter in his own handwriting discussing the problem of man's antiquity in America. Notwithstanding the disappointments in the pursuit of this problem, he was still cheerfully optimistic and firm in the faith that we should ultimately find satisfactory proof of man's presence in America during the last period of glaciation.

His death marks the end of a long and interesting career. To him was granted the privilege of living happily and long enough to see the results of his striving; but what is still more, he continues to live in the hearts of the many men and women he has helped to something better than they could have attained alone.

MUSEUM NOTES

A RARE collection of archæological objects from the Department of Ica, Peru, was recently purchased by Mr. A. D. Juilliard and presented to the Museum. This collection represents the results of numerous expeditions during the last nine years by Mr. Manuel Montero to the desert regions to the south and west of Ica. These visits to the prehistoric burial grounds were his vacations, and every object in the collection was excavated by him. The most notable objects are nine large shawl-like garments covered with conventionalized figures in embroidery. The beautiful color schemes seen in these textiles make them a joy to the artist, and they will doubtless be copied eagerly by the numerous art students who make constant use of the Museum collections. Besides these shawl-like garments there are many smaller pieces of cloth which are highly ornamented.

The metal work of these ancient people is represented by objects in silver and copper. There are several pairs of large silver ear-plugs, ornamented with embossed figures of birds, silver tweezers also ornamented with raised bird figures, and a number of shawl pins with finely executed figures of birds and pumas on the upper ends. The other objects in the collection consist principally of the women's workbaskets, with spindles and various colored threads, a loom with cloth in process of weaving, feather ornaments, slings, musical instruments and a few choice pieces of pottery.

THE twentieth anniversary of the foundation of the New York Botanical Garden at Bronx Park was celebrated during the week of September 6. As early as 1888 the need of a botanical garden in the City of New York was considered. In 1889 the Torrey Botanical Club obtained the consent of the Department of Public Parks to the establishment of such an institution. By 1895 the necessary sum of $250,000 had been subscribed, and the site of the Garden covering an area of 250 acres had been selected. Through the concerted efforts of the several committees of the Torrey Club the Botanical Garden in twenty years has acquired such an extensive number of collections that an additional appropriation of land has been made necessary, totaling in the entire reservation nearly four hundred acres.

Among the more important features of the week's program were the several sessions for the reading of scientific papers, inspection of various botanical exhibits, and visits to Staten Island and to the Brooklyn Botanical Garden.

NEWS of the safety of Vilhjálmur Stefánsson, leader of the Canadian Arctic expedition,

SQUARE-LIPPED RHINOCEROS, THE SO-CALLED "WHITE RHINO" OF AFRICA

Shot by Mr. John H. Prentice north of the Lado Enclave, Bahr-el-Ghazal Province, Anglo-Egyptian Sudan, and presented to the American Museum in mounted form. The work of mounting was done by Mr. James L. Clark as the first of the specimens for the Museum's white rhino group

and of his success in finding new land north of Prince Patrick Island, has just been received. After a dangerous trip of seven hundred miles northward across the ice from Martin Point on the mainland, Stefánsson and his two companions were able to reach Bank's Island. Here the winter was spent and during the next spring exploration toward the north resulted in the discovery of land which may or may not be connected with the supposed large land mass north of Alaska and Siberia. In the meantime the Southern Party of the expedition has been carrying on work in geology, topography and ethnology along the northern coast of Canada from the Mackenzie River Delta to Coronation Gulf. Because of the great delay through the loss of the "Karluk" it is planned to continue the explorations until 1917. A base camp for the northern party has by this time probably been established at the northern end of Prince Patrick Island. This will allow a wide radius for exploration over the ice during 1916.

The Collins-Day South American expedition previously announced from these pages, presented on its recent return large collections of birds and mammals to the American Museum. The interesting itinerary of the expedition will be reported in a succeeding issue of the Journal.

On June 24, the new orange, white and blue flag designed for the municipal buildings of the City of New York was hoisted on the American Museum building, where it has since floated on the tower of the east wing. The colors under which the new Constitution was founded in 1626 have again become the official colors of the City, their renewed adoption taking place on the 250th anniversary of the installation of the first Mayor and Board of Aldermen. At the ceremonies in commemoration of this anniversary and of the adoption of the ancient civic emblem as a new flag of the City, the American Museum was represented by the following delegates: Messrs. Cleveland H. Dodge, Frederic A. Lucas and Bashford Dean. The addresses of the occasion were by Governor Charles S. Whitman, Mayor John Purroy Mitchel, William Robert Shepherd, professor of history at Columbia University, and Dr. John H. Finley, president of the University of the State of New York.

Dr. Robert H. Lowie and four members of the Museum resident in California, Dr. Jaime De Angulo, and Messrs. W. B. Bourn, William H. Crocker and William Kennon Jewett, were appointed by the Museum and the appointment officially confirmed by Marcus M. Marks, president of the Borough of Manhattan, to act as delegates on Manhattan Day, at the Panama California Exposition in San Diego, August 9, and the Panama Pacific Exposition in San Francisco, August 19.

The third and final shipment of the Lang-Chapin collections from the African Congo was received at the Museum in August. Recent word from Mr. Lang indicates that he will probably arrive in New York about the middle of October.

The American Dahlia Society in coöperation with the Horticultural Society of New York gave with gratifying success their first annual exhibition of dahlias at the American Museum of Natural History, September 24–26.

During the summer President Osborn accompanied the new Assistant Secretary of the Interior, Hon. Stephen Tyng Mather, on an excursion in the High Sierras, from the region of the Sequoia National Park westward. The tour included the ascent of Mount Whitney and extended to Owen's Lake on the east of the Sierras, from which point the party passed northward and took part in the opening of the reopened roadway along the line of the old Tioga Trail. The object of Mr. Mather's tour was to survey the region lying west of the Sequoia National Park with a view to its enlargement to include the superb region around Mount Whitney.

The Museum was represented at the recent meeting of the American Association for the Advancement of Science by Professor Henry Fairfield Osborn and Dr. W. D. Matthew, who took part especially in the conferences and discussions on the past history of the Pacific coast region during Miocene time. The meeting was followed by an expedition to the region of the Mohave Desert where fossil beds containing horses, camels, and other extensive Miocene forms have been discovered within the last few years. Professor John C. Merriam of the University of

California, who led this excursion, has been instrumental in presenting to the Museum recently several very fine skeletons of the mammals from the Rancho La Brea deposits near Los Angeles, including a complete sabre-tooth tiger and a complete wolf, which are now being mounted as an addition to the group exhibit prepared two years ago.

A SERIES of enlargements of the remarkable photographs taken by the Australasian-Antarctic expedition under Sir Douglas Mawson has been placed on temporary exhibition in the west assembly hall of the Museum.

MR. N. C. NELSON assisted by Mr. E. W. Morris of the University of Colorado, has completed for the time being the survey and excavation of the Galisteo ruins. At San Marcos, one of the largest of the ruins south of Santa Fé, Mr. Nelson excavated 475 rooms. Besides the San Marcos ruin five other ruins were excavated. Mr. Nelson will also visit the Mesa Verde country to inaugurate joint work between the University of Colorado and the American Museum.

THERE has been on exhibition during the past few months in the west assembly hall of the Museum a collection of paintings and bronzes by William de la Montagne Cary from studies made by him in the West between 1861 and 1874. Mr. Cary's sketches are unusually interesting from the historic standpoint. They record the phase of western life when the buffalo was still on the Plains and the Indians were living according to their old ways.

PROFESSOR A. L. KROEBER of the University of California spent the month of July and part of August among the Zuñi of New Mexico where he secured over nine hundred specimens illustrating the everyday and religious life of these people. He made a detailed study of their system of relations and the terms employed to denote relationship.

DR. CLARK WISSLER, curator of the department of anthropology, has spent the summer in an intensive study of the religious ceremonies of the Pawnee, with the aid of James Murie, the religious leader and chief of the tribe. Mr. Murie is able to read and write not only English but his own language as well, using for the purpose an adapted form of our ordinary alphabet.

ATTENTION has already been called in the notes of the JOURNAL to the remarkable Laysan Island group in the University of Iowa. The photograph published in this number (page 266) represents one-tenth of the whole cyclorama. Laysan Island in the mid-Pacific has a surface of sand and "phosphate" rock and is encircled by an irregular series of coral reefs. It has no human inhabitants but in 1902 was said to be populated by nearly ten million birds.

The group reconstructs this island, attempting to show the real conditions on the island and the twenty-four species of birds nesting there. The canvas (138 ft. long) was painted by Mr. C. A. Corwin and the foreground (400 sq. ft.) was built by Mr. Homer R. Dill, requiring three years to mount the many birds and make the more than fifty thousand artificial leaves and the grasses used in the construction.

THE annual meeting of the National Association of Audubon Societies will be held at the American Museum Tuesday, October 26. Among other features there will be an exhibition of motion pictures by Mr. Herbert K. Job, who was sent by the Association on a tour of inspection of the bird reservations in Florida and Louisiana. It was during this trip that Mr. Job was detailed by the National Association as Colonel Roosevelt's photographer when the latter inspected the bird islands off the Louisiana coast, made reservations during his presidency.

MRS. WILLIAM M. IVINS has recently presented to the Museum a very valuable collection of baskets from Arizona, California and British Columbia.

DURING the past summer Mr. Roy C. Andrews spent several weeks in the Adirondack Mountains securing specimens and material for a group of Virginia deer which will be placed in the North American mammal hall of the Museum. The site selected for field study for the group was Shingle Shanty Stream on the Brandreth Preserve.

MRS. WILLIAM CHURCHILL, who was born in Samoa and lived there for many years, has presented to the Museum a large collection of photographs and ethnological specimens illustrating the native life of the Samoan Islands.

The American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

Open free to the public on every day in the year.

The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people. It is dependent upon private subscriptions and the fees from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world. The membership fees are,

Annual Members	$ 10	Patrons	$1,000
Sustaining Members (annually)	25	Associate Benefactors	10,000
Life Members	100	Associate Founders	25,000
Fellows	500	Benefactors	50,000

Guides for Study of Exhibits are provided on request to members and teachers by the department of public education. Teachers wishing to bring classes should write or telephone the department for an appointment, specifying the collection to be studied. Lectures to classes may also be arranged for. In all cases the best results are obtained with small groups of children.

The Museum Library contains more than 60,000 volumes with a good working collection of publications issued by scientific institutions and societies in this country and abroad. The library is open to the public for reference daily — Sundays and holidays excepted — from 9 A. M. to 5 P. M.

The Technical Publications of the Museum comprise the *Memoirs*, *Bulletin* and *Anthropological Papers*, the *Memoirs* and *Bulletin* edited by J. A. Allen, the *Anthropological Papers* by Clark Wissler. These publications cover the field and laboratory researches of the institution.

The Popular Publications of the Museum comprise the JOURNAL, edited by Mary Cynthia Dickerson, the *Handbooks*, *Leaflets* and *General Guide*. The following list gives some of the popular publications; complete lists, of both technical and popular publications, may be obtained from the Librarian.

POPULAR PUBLICATIONS

HANDBOOKS

NORTH AMERICAN INDIANS OF THE PLAINS. By Clark Wissler, Ph.D. *Paper*, 25 *cents; cloth*, 50 *cents.*

INDIANS OF THE SOUTHWEST. By Pliny Earle Goddard, Ph.D. *Paper*, 25 *cents; cloth*, 50 *cents.*

ANIMALS OF THE PAST. By Frederic A. Lucas, Sc.D. *Paper*, 35 *cents.*

ILLUSTRATED GUIDE LEAFLETS

GENERAL GUIDE TO THE COLLECTIONS. New edition issued December, 1914. *Price*, 25 *cents.*

THE COLLECTION OF MINERALS. By Louis P. Gratacap, A.M. *Price*, 5 *cents.*

NORTH AMERICAN RUMINANTS. By J. A. Allen, Ph.D. *Price*, 10 *cents.*

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH. By George H. Pepper. *Price*, 10 *cents.*

PRIMITIVE ART. *Price*, 15 *cents.*

THE BIRDS OF THE VICINITY OF NEW YORK CITY. By Frank M. Chapman, Sc.D. *Price*, 15 *cents.*

PERUVIAN MUMMIES. By Charles W. Mead. *Price*, 10 *cents.*

THE METEORITES IN THE FOYER OF THE AMERICAN MUSEUM OF NATURAL HISTORY. By Edmund Otis Hovey, Ph.D. *Price*, 10 *cents.*

THE HABITAT GROUPS OF NORTH AMERICAN BIRDS. By Frank M. Chapman, Sc.D. *Price*, 15 *cents.*

THE INDIANS OF MANHATTAN ISLAND AND VICINITY. By Alanson Skinner. *In preparation.*

THE STOKES PAINTINGS REPRESENTING GREENLAND ESKIMO. *Price*, 5 *cents.*

BRIEF HISTORY OF ANTARCTIC EXPLORATION. *Price*, 10 *cents.*

TREES AND FORESTRY. By Mary Cynthia Dickerson, B.S. *A new edition in course of preparation.*

THE PROTECTION OF RIVER AND HARBOR WATERS FROM MUNICIPAL WASTES. By Charles-Edward Amory Winslow, M.S. *Price*, 10 *cents.*

PLANT FORMS IN WAX. By E. C. B. Fassett. *Price*, 10 *cents.*

THE EVOLUTION OF THE HORSE. By W. D. Matthew, Ph.D. *Price*, 20 *cents.*

REPRINTS

THE GROUND SLOTH GROUP. By W. D. Matthew, Ph.D. *Price*, 5 *cents.*

METHODS AND RESULTS IN HERPETOLOGY. By Mary Cynthia Dickerson, B.S. *Price*, 5 *cents.*

THE WHARF PILE GROUP. By Roy W. Miner, A.B. *Price*, 5 *cents.*

THE SEA WORM GROUP. By Roy W. Miner, A.B. *Price*, 10 *cents.*

THE ANCESTRY OF THE EDENTATES. By W. D. Matthew, Ph.D. *Price*, 5 *cents.*

Photographing the recently mounted skeleton of the giant dinosaur Tyrannosaurus, American Museum of Natural History

THE AMERICAN MUSEUM JOURNAL

A WOMAN ELEPHANT HUNTER

NEW LAND IN THE ARCTIC

EVOLUTION OF ARMOR

EXPLORING IN THE ANDES

HOME OF THE HOPI

The American Museum of Natural History

THE AMERICAN MUSEUM JOURNAL

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MARY CYNTHIA DICKERSON, *Editor*

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The Journal is sent free to all members of the Museum.

MRS. CARL E. AKELEY IN ELEPHANT COUNTRY

Tusks 112 and 115 pounds respectively, the record tusks for the Mount Kenya region

"....We ventured forth to lead Bíbi to her prize, and a prize it proved to be, eleven feet and two inches high at the shoulders, tusks nineteen and a half inches in circumference, and eight feet ten inches long.... The record elephant for a woman and the record pair of tusks for a sportsman's license in British East Africa.... Our dusky followers in a weird chant, announced the success of the day, telling their comrades of how Bíbi had killed "tembo Kubwa." There within the glow of the camp fire Bíbi held court while with simple childlike enthusiasm, our little army of followers crowded around to offer their congratulations...." — p. 336.

THE AMERICAN MUSEUM JOURNAL

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ELEPHANT HUNTING ON MOUNT KENYA

A WOMAN WINS THE RECORD PAIR OF ELEPHANT TUSKS FOR A SPORTSMAN'S LICENSE IN BRITISH EAST AFRICA

By Carl E. Akeley

Illustrations from photographs by the Author

IN the past months we had hunted with but poor success in the dismal bamboo forests below the summit of Abadare. We had plodded up and down slippery leaf-strewn trails worn in places by the passing of generations of elephants into giant stairways, the steps of which could be easily managed by elephants, by even a toddling youngster of only half a ton weight, but which to puny man were exceedingly difficult of negotiation, even with the helping hand of a companion or the aid of a projecting root or convenient bamboo.

We had been enticed back and forth through the icy waters of mountain streams, Bíbi[1] carried on the shoulders of stalwart natives. We had bivouacked many a dark night on the trail around a blazing fire of dead bamboo. At a little distance on one side always blazed another fire where the Masai trackers and Kikuyu guide, stripped to the waist, prepared their food. On the other side still a third fire crackled in the midst of a busy group of gun-bearers and porters, Swahili, Myamwezi, Kamba and Baganda. Under such conditions Bibi snugly rolled in her blankets fell asleep

[1] Bíbi, pronounced as though spelled "Beebe," is Swahili for "woman" and the name by which Mrs. Akeley was known among the native members of the expedition.

to be awakened at early dawn by the distant trumpeting of elephants.

Many another night we had forgotten disappointment and weariness in a comfortable camp, perhaps lulled to sleep despite the cries of hyenas and the coughing of leopards which gathered about the camp, by the patter of raindrops on the tent.

Now at sundown of the third day on the trail of an old bull elephant, we came out of the bamboos, up on the heather-clad summit of Abadare Mountain. The spoor here led us along a migration path, a path over which countless thousands of elephants must have passed in their migrations from one feeding ground to another, for in places the solid rock was worn to a depth of several inches.

We were greatly discouraged and camped beside the trail. The little firewood that we were able to collect was so wet that it required a forced draught to keep it alight and after preparing our supper the fire was allowed to die down; and Bíbi slept with nothing but her blankets to protect her from the rain and frost.

When in the morning we had emerged from our chrysalids of icy blankets, thawed ourselves out and were preparing to start on our return journey, the sun broke through and dispelled the mists, disclosing to our view a scene which held us spellbound; from our feet, down between the glistening slopes of a bamboo-clad valley, on and across a billowy sea of fleecy clouds, to the rugged, rocky, snow-clad peaks of Mount Kenya, our gaze roamed and lingered.

Many times during the past months had we seen this beautiful mountain and from many points, but never so close, and never had it so impressed us. We knew of it as a land of promise to the elephant hunter, but it was forbidden ground, and we little dreamed that it would ever be for us to try our fortunes within the domains of this snow-mantled goddess of the Equator. We turned wearily to retrace our steps campwards, determined to strike into the mountains farther to the north.

We were off bright and early on the following morning to the Government Boma at Nyeri, along the summit of the Abadare, down into the moss and creeper-draped forest of the lower levels, and out into the open hill country of the Wakikuyu.

When at Boma however, we received information which gave us a new hope. Instead of going back into the mountains, we made a two-day march to Fort Hall where to our great delight, we received permission to hunt elephants on Mount Kenya.

We went from Fort Hall to the base of Kenya, through the thickly populated country of the Wakikuyu, where no white woman had passed before, which until within a few months had been unsafe for a white man. The first sign of our quarry was a field of sweet potatoes which had been "harvested" by elephants the night before. Bíbi remained at first with the main camp at the edge of the forest. The remainder of the expedition spent many days in locating the feeding grounds of the elephants in the primitive forest and in the bamboo jungle farther up the mountain side; and two exciting days with a herd of elephants in jungle so dense that we could almost touch, but scarcely see them, finally killing two bulls, one a "charger" who gave us no choice but to kill or be killed. All this however I shall pass over, for this is to be the story of Bíbi's hunt.

Finally we sent a message bidding Bíbi come; with the keenness of an old campaigner she brought the safari to the

Sounds of elephants in the jungle enticed the hunters back and forth through icy streams, Mrs. Akeley carried on the shoulders of stalwart natives

Cunningham at work on an elephant skin in the Kenya forest. At this time he was having his first experience as an expedition guide, but is now well known for his professional work as safari manager for the Roosevelt and other important expeditions

THE AKELEY EXPEDITION MAKING CAMP

ABOVE TIMBER LINE ON MOUNT KENYA

About 15,000 feet altitude; two hours from the top of the ridge seen in the distance. Fresh tracks of elephants were found at this elevation. Mrs. Akeley is in the foreground at the base of the large rock

appointed place in the forest. Having exhausted my sportsman privileges so far as bulls were concerned, the only chance of adding a needed fine male elephant to the collection was through Bíbi.

A bad start was made on this occasion: the two highly perfumed Kikuyu guides ran us around in circles, while the ten porters carrying camp equipment and rations for four days, contributed to the annoyance and delay by continually falling behind and losing themselves in the jungle. About noon we came to a fresh trail, not of elephant, but of our own making where we had passed three hours before. Considerable valuable time was then devoted to sitting on a log while the Swahili interpreter cursed the guides in Swahili, Kikuyu, and several other dialects, and the gun-bearers rounded up the porters, after which we administered a fine of a week's wages all around, put the guides in the rear and struck a course due northwest, by compass.

The guides came up at regular intervals with the protest that if we continued in that direction, we would come to a stream, crossing which would land us in the country of a hostile tribe and we would be promptly annihilated. We continued on however until dark without reaching the dead-line or finding spoor fresh enough to tempt us away from our course. This course had led us through the more open ground of the timber belt which lies between the shambas (cultivated fields) and the bamboo forests. It was here that we hoped to cross the spoor of elephants where they had passed from one to the other of these, their two favorite feeding grounds.

We made our camp beside a great fallen tree whose dry top afforded a good supply of firewood; water was brought from a hundred yards down the slope where an ice-cold rivulet had found a bed in the sombre shade of great ebony-stalked tree-ferns. Amidst such scenes as these the weariness and disappointments of a hard day of fruitless hunting become as but the memory of an unpleasant dream, and by the time camp is made and tired limbs are stretched before the fire, we are longing for the morning, that we may be off again, away through the great, mysterious forest, forgetting at times, as we go, the main object of our search, lost in admiration of the weird and sombre vistas, brightened here and there by festoons of flowering vines or the crimson flash of a plantain-eater's wings. As we travel along through the forest gloom, silently, in harmony with our surroundings, we may be startled from our reveries by the hoarse leopard-like bark of an old Colobus monkey, followed by the wild reckless rush of the whole troop as they make for the topmost branches of some great forest tree. There they sit motionless, invisible, although in plain view, their white plumed tails waving gently in the breeze, midst waving streamers of moss.

Guided by the compass, we had traveled less than an hour next morning when we came to the spoor of an old bull, where he had been mooning about, feeding, during the night. Following it, we soon became lo t in a maze of tracks which seemed to indicate that not only one but three or four old fellows had spent the night in and about the somewhat open forest in which we now found ourselves.

For a long time we puzzled about on these tracks trying to strike a lead, but more often than not coming back to a familiar spot. Then we would strike off and pick up the spoor in a new place only to be led back to the unsolvable network of tracks again. At one

place the "big one" had lain down (an unusual act for an elephant) flat on his side, the imprint of his great body, head and tusks being clearly outlined on the soft earth, while the zone of flattened vegetation marked the reach of his proboscis.

The game of blind man's-buff continued until we were well-nigh discouraged; for roaming about in this way, we were in constant peril of getting to the windward of the animals who would then move away and leave us far behind — before we would discover what had happened. At last as we were working about in scattered formation, trying to solve the puzzle, one of the Kikuyu guides came scuttling back to us with distorted features and frenzied gesticulations. We promptly dropped to a kneeling position as a signal to the porters behind us, who noiselessly deposited their loads and themselves about the base of a tree. We crept carefully forward to the second Kikuyu, who had remained on guard and now stood with his eyes riveted to some object beyond a clump of dense high bush. As we approached him there dawned upon our vision, through the mist, the indistinct outline of the great rounded back of a "big un." He was feeding, quite unconscious of approaching danger, as he moved leisurely along a few steps at a time, reaching this way and that with his trunk, breaking off choice bits of food. There was little time for contemplation of the picturesque however, for the wind was shifty and he was working dangerously near to the concealed porters. He might at any moment crash away without giving us a view of his ivory, the size of which might be an important factor in the determination of his fate.

With Bíbi in the choice of positions, we crept carefully forward behind the low-hanging branches of a vine-draped tree to within forty feet of where the giant stood. Breathlessly we waited until, as he moved slowly forward, there came into view a splendid pair of tusks followed by the massive head and great flapping ears of the best elephant we had seen. What a monster he looked as Bíbi raised her rifle and with steady aim, placed a bullet in just the right place. As he collapsed two more like messages were despatched and a few minutes later, Bíbi stood beside the prostrate form of her prize. He was a fine specimen, standing ten feet and ten inches high at the shoulders and carrying one hundred and eighty pounds of ivory.

We promptly decided to preserve the skin for mounting. A series of photographs, sketches and measurements necessary in mounting were then made. The guides were sent back to the main camp to bring up additional porters with a full camp equipment; and the operation of removing a two-thousand-pound skin was begun. To preserve an elephant skin is no easy task, even under the most favorable conditions, and especially is it difficult in a dense forest on a mountain side in the interior of Africa. The skin must be put in shape to be carried by native porters down through the mountain forests and jungles, many miles, on through the open hill-country to the plains, and then a hundred miles farther, to the railway. We began our task at twelve o'clock, noon, and we worked without stopping even for food until four o'clock, next morning. The skin was then off, in three parts, lying on the cool, damp ground, and the carcass was left to the scavengers — natives, leopards, hyenas and the smaller carnivorous animals.

When we returned to our work next morning, it was apparent that the hungry

MRS. AKELEY'S FIRST TUSKER

This specimen is now to be seen as the large bull in the elephant group in the Field Museum, Chicago. The tusks weigh 93 and 95 pounds

ones had all been there for their portion, and on following one of the many trails which radiated in all directions through the jungle, we found several huge pieces of flesh where the leopards had concealed them for future reference.

The news of a kill spreads rapidly among the native Wandorobo hunters and in a short time they had gathered from all quarters. Little camps of men, women and children, were scattered all about the place, while over each fire festoons of elephant "biltong" were being cured for the future. The killing of an elephant is a blessing to these poor wretches.

Finally six days had passed, six days of exhausting, disagreeable work; but the skin, reduced by shaving to half its original weight, and thoroughly salted, had been made into three oblong packages and firmly lashed to long poles, ready for the porters, four or more for each load, to begin their heart-breaking journey out of the forest. All in camp were now in good spirits for the worst of the work was past; the sick had recovered — there had been much illness in camp during the week, and everyone was keen to be on the hunt again.

The guides and gun-bearers had been sent out to determine, if possible, whether or not there were elephants in the vicinity. There still remained the cow to be secured, and Bíbi was entitled to another bull — if she could get him. Before noon the gun-bearers returned to report that they had found a herd only two hours from camp.

For an hour and a half we followed our guides along well-defined trails through the heavy timber, where there was a minimum of undergrowth to impede our progress. When we came to the place where the herd had been seen we began beating about in an effort to locate a trail which would give some indication of the direction in which they had gone, but before we had succeeded in this, a squeal of fright and a mighty crash warned us that the honor of discovery belonged with the elephants. We had unwittingly given them the wind and they were off. We had every reason to hope that they would not go far before settling down again, as these elephants have had but little experience with the terrible white man and his weapons.

As they were scattered about feeding, at the time they took alarm, it required some little time to pick up the main trail where they had moved off in a body, but within a half hour we were within hearing distance of them, and the occasional crack of a breaking branch told us that they were quietly feeding again. The wind being favorable, we worked carefully forward, until when nearing their position, there was a sudden movement of the whole herd across our front, and the sudden apparition of the great rounded back of an elephant, ten paces in front, combined with the noise made in the hurried "get away" of a troup of Colobus monkeys in the tree tops above us, was sufficient to create the impression that we were surrounded by elephants. It was too much for Bíbi's overstrained nerves and she ran back a few steps, exclaiming under her breath, "They are coming!" Then, checking herself, she stood while the whole herd passed in front showing only the tops of their heads and backs above the high dense bushes. They had not detected our presence and all was well, provided Bíbi had not lost her "nerve," in which case we would have to give up the hunt. Had we not been screened from sight of the elephants when she ran, the move might have led to disaster. None realized this more keenly than did Bíbi herself, but when the question of giving up was put to her,

she had regained her self-control and was determined to go on.

The last move of the herd had put us in danger of being betrayed by the wind again, which made it necessary to act quickly. We worked around to head them off where they had come to a stand in a thick bit of wood whose outer edge was a dense impenetrable mass of greenery. This screen effectively concealed us as we cautiously threaded our way along an overgrown trail, using the utmost precaution to avoid the cracking of twigs or scraping of harsh leaves against our clothing. We were very close to the elephants and the slightest sound might be detected by their keenly sensitive ears. They were perfectly quiet, except for the occasional rumble of a stomach, which indicated peace and unconcern on their part. It was jumpy work, creeping along at a snail's pace, where the slightest misstep might cause the stampede of a herd of elephants, who would be quite as likely to come our way as any other. The screen impenetrable to us would be no barrier to their huge bulk. At last we came to a more open path beneath the larger trees that sheltered them, and as we worked carefully along, we could see here and there, patches of rough barklike skin. A youngster about four feet high was to be seen toddling about on an independent excursion, amongst the legs of his elders.

Now that we had succeeded in placing ourselves among them, our work was cut out. We were to get a cow if possible. Before shooting we must make certain that the specimen chosen was a cow; moreover that it was a good one, such as would properly represent the species; not an easy task in such dense cover. As we stalked stealthily along the line we received a number of thrills. A bull whose suspicions were aroused, stood head on with his great ears thrown forward, listening, his trunk thrown forward and up "feeling for wind." Another old fellow walked out to the path on which we stood, only a few yards away, deliberated a few moments, and to our great relief decided to go down the path, away from us. At such times we dared not stir, for elephants are quick to detect moving objects.

We followed down the path, in the wake of the bull who was moving away, in search of the coveted cow, but we had gone but a short distance when we were stopped by one of the gun-bearers who declared in sign language, that we had passed an elephant with ivory as large as a man's thigh. We retraced our steps somewhat reluctantly to the place from where we could see the elephant which had previously shown signs of suspicion, and there, just behind and towering high above him stood a lordly fellow who until now had escaped our notice. We got a glimpse of the upper part of one tusk and it seemed very large in diameter; but that was not enough, we must determine its length, and if it had a mate. Much of the largest ivory is that of single tuskers. After a time, by dint of stooping low and peering beneath the bushes, we saw as the elephant stepped forward a pace, the tip of a tusk within fifteen inches of the ground. From that lofty head to within fifteen inches of the ground certainly meant a big tusk — good enough even though it had no mate. This decision was scarcely reached when a turn of his head revealed to us the tip of its mate, of the same length.

Excitement ran high. It was the big pair that we had often seen in our "pipe dreams." Bíbi prepared to take the shot, with the understanding that when she had fired we would run down the path to the protection of a clump of

Tree trunk in the Kenya jungle polished by elephants

Mrs. Akeley and Cunningham, with the Kenya record elephant shot by Mrs. Akeley. This elephant stood eleven feet two inches high at the shoulders and carried tusks weighing 112 and 115 pounds

large trees, for it seemed quite probable that the inevitable stampede would be in our direction.

Bíbi was none too soon with her preparations for attack and retreat. Although up to this time the big one had been protected by the body of the nervous member, the latter now scenting danger, wheeled around, exposing for an instant, the ear of the big one ere he had time to follow the lead. His head was raised, ready for the rush when Bíbi's gun sent forth its message, and as he quivered and drooped two more shots followed and with Bíbi we made a dash for the protection of the trees.

After the first crash of the herd's departure all was still, and for a time we were uncertain as to whether they had gone or had stopped — with the possible intention of returning to investigate — in which case we would likely have a very busy time of it. They had gone however, covering their retreat with that

"The Christening." — An Abyssinian custom among elephant hunters requires that the cone of jelly-like pulp in the base of the tusk be drawn out, its tip cut, and a cross marked with the blood on the forehead of the young hunter. Cunningham in his authority as an elephant hunter of long standing was master of ceremonies

ELEPHANTS IN THEIR NATIVE JUNGLE, BRITISH EAST AFRICA

marvelous silence which often attends their movements when frightened.

After waiting and listening for a time we ventured forth to escort Bíbi to her prize, and a prize it proved to be, eleven feet and two inches high at the shoulders, tusks nineteen and a half inches in circumference, and eight feet ten inches long, right and left weighing, respectively one hundred and fifteen, and one hundred and twelve pounds. The record elephant for a woman, and with her first, the record pair for a sportsman's license in British East Africa.

After making a few hurried measurements and photographs, and detailing a guard of four porters to stay with the prize, we started back to camp. Bíbi will not soon forget that mad race against time to gain the shelter of camp ere darkness overtook us. As the last rays of the equatorial sun withdrew from Kenya's cold unresponsive summit, and daylight shrank from before the weird shadows and mysterious voices of the tropical forest night, we sighted the cheery fires of the camp. Our dusky followers in a weird chant, announced

In elephant country on Mount Kenya, at an elevation of 8000 feet in the heavy forest belt

Photo by DeWitt C. Ward

MRS. CARL E. AKELEY, NEW YORK CITY, 1915

the success of the day, telling their comrades of how Bíbi had killed "tembo kubwa." There within the glow of the camp fire Bíbi held court while with simple childlike enthusiasm, our little army of followers crowded around to offer their congratulations.

Next morning we moved camp to a circular, turf-carpeted clearing, near to the fallen elephant, in order that we might care for our prize without a long trek to and from the camp. "Tembo Circus" as we called it, was the one bright, cheerful camping place of our whole elephant hunt. Here, while we continued the search for a cow elephant, Bíbi spent many days surrounded by the ever new, ever changing scenes of primitive life. The forest now sheltered dozens of camps of Wandorobo who had followed us hither to reap the harvest of the last kill. Every day little bands of natives came in from the shambas with offerings for the "Bíbi Mzungu," or to gossip with our followers. Diversion was also afforded by her little "zoo" which was stocked by the Wandorobo boys whose services she had enlisted. In the crude cages built by her boys, the monkeys, antelopes, and hyrax soon learned to know her, and to tell her stories of their lives in the unexplored depths of the forest.

Bíbi at "Tembo Circus" with a member of her "zoo." Tembo Circus near the spot where the record elephant was shot by Mrs. Akeley, was the camp of the Akeley expedition in 1906. Since that time this camping place has been used by Colonel Roosevelt and by Stewart Edward White and interesting mention is made of it in their African writings

REPRODUCTIONS OF PHOTOGRAPHS FROM THE WORK OF THE AUSTRALASIAN-ANTARCTIC EXPEDITION UNDER SIR DOUGLAS MAWSON

Selected from the one hundred and fifteen enlargements of Mawson photographs on exhibition at the American Museum. [The captions are quotations from Mawson's *The Home of the Blizzard*]

"THE NUGGETS" BEACH, MACQUARIE LAND

Royal penguins from rookeries on the hills come down in long processions each day to fish on the beach

Photographs reproduced through the courtesy of Mr. Lee Keedick of New York City, lecture manager for Sir Douglas Mawson

THE FLAGSHIP "AURORA" IN COMMONWEALTH BAY, ADÉLIE LAND

Here was established the main base under Sir Douglas Mawson, a center for sledge journeys over the unexplored glaciers and ice plateau. To-day Science is completely the basis of exploration. "The methods of Darwin were developed in the Challenger Expedition (1872)," and "the torch of the pure flame of Science was handed on" to the explorers of the new century

AN AFTERNOON SCENE IN ANTARCTICA

"Antarctica is a world of color, brilliant and intensely pure . . . the chaste whiteness of the snow, the velvet blackness of the rocks. . . . The widening spaces in the zenith are azure and low in the north they are emerald. . . . Far down in the south the sky is tinged with indigo and ultramarine, washed with royal purple paling into co'd violet and greyish blue . . . each reflected in the dull sheen of freezing sea. . . . Out on the infinite horizon float icebergs in a mirage of mobile gold. A cold picture—yet it awakens a throb of inborn divinity"

ON THE EDGE OF AN ICE RAVINE, ADÉLIE LAND

"The difficulties of exploration in cold regions approximate to the limit of human endurance and often enough exceed it." Bridges of soft snow over the crevasses of the glacier may give way, opening up gaping holes into the darkness of chasms below. " . . . I seemed to stand alone on the wide shores of the world. . . ."

AN ICE CLIFF, ADÉLIE LAND

Walls of ice came down steeply to the sea, "floating extensions of land ice and glacier tongues, riven and distorted by gaping crevasses." "Adélie Land is so overwhelmed with ice that even at sea level the rock was entirely hidden. Here was a picture of Northern Europe during the 'Great Ice Age,' some 50,000 years ago"

IN THE BLIZZARD, ADÉLIE LAND

"Any trace of elation felt at meteorological discovery could not compensate for the ever-present discomforts of life." "Picture the drift so dense that daylight comes through dully although it may be the sun shines in a cloudless sky. The drift is hurled screaming through space at a hundred miles an hour, the temperature is below zero . . . infuriated elements in the darkness of a polar night. . . ."

SNOW PETREL ON THE NEST, ADÉLIE LAND

During sledging journeys through crevassed blue ice, over ridges and past open chasms, occasionally a gentle snow petrel would follow us, circling above our heads. It was a splendid sight to watch the snow petrel in winds of fifty and seventy miles per hour, wheeling, swinging, sinking, and soaring, radiant with life—the wild spirit of the tempest

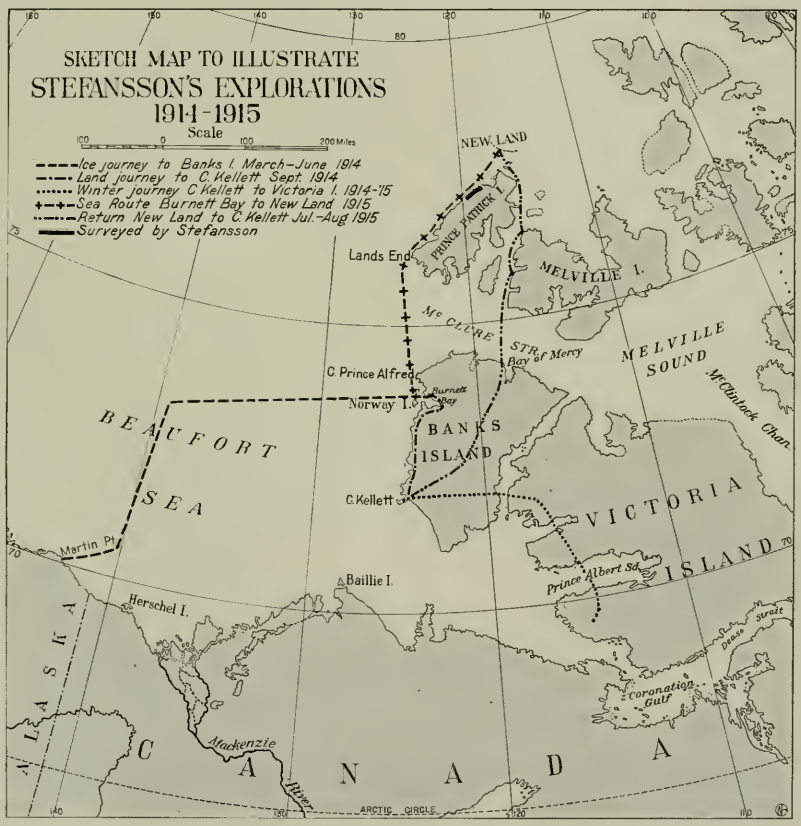
LOTUS-FLOE UNDER THE ICE CLIFFS AT LAND'S END

"The vast solitary snow-land, cold white under the stars; lustrous in the radiance of the southern lights; furrowed beneath the icy sweep of the wind. We had come to probe its mystery, we had hoped to reduce it to terms of science, but there was always the 'indefinable' which held aloof, yet riveted our souls." "One is in the midst of infinities—the infinity . . . of the time past since these things had birth, and the infinity of the time to come before they shall have fulfilled the Purpose for which they were created"

THE STEFÁNSSON EXPEDITION OF 1913 TO 1915

By Major General A. W. Greely, United States Army

THE history of polar expeditions equals, relatively speaking, that of any other phase of exploration in its romantic episodes of unexpected and thrilling character. The retreat of Dr. Elisha Kent Kane across Melville Bay, the ice-drift of Captain George E. Tyson of eighteen hundred miles, the boat journey of Admiral George T. Melville to the Lena Delta, and the rescue of the shipwrecked American whalers at Point Barrow by Lieutenants D. H. Jarvis and E. P. Bertholf, are marvelous successes of American adventurers which every red-blooded individual reads with rapt attention and stirred emotions. It seems surprising that those who control the development of the minds of the rising generation do not supplant trashy and



Courtesy of the American Geographical Society

The new land in 77° 43′ N. latitude and 115° 43′ W. longitude, was discovered on June 18, 1915. It was explored for three days only and through one hundred miles of coast only, but from an elevation of 2000 feet twenty miles inland, mountains were seen at least fifty miles farther, in all directions to the north and east (the land was low to the west).

The route traveled as shown on the map is of course generalized and the distances fall far short of the actual distances covered, which were made longer and indirect because of drift due to contrary winds and currents

debasing fiction by tales which tell of man's control and courage while facing actual and desperate conditions.

To these wonderful victories of peace over the elements of nature, is now added the story of the hazardous sledge-journey, the successful endurance, the wonderful resourcefulness and the final discovery of hitherto unknown land by Vilhjálmur Stefánsson.

The trustees and members of the American Museum of Natural History are especially interested in the success of Stefánsson in his polar expedition of 1913–15. Under the auspices of the American Museum, Stefánsson scientifically explored the Canadian shores of Arctic America, in 1906–07 and 1908–12. The American Museum in conjunction with the National Geographic Society financed at first the present expedition, from which the two societies withdrew in favor of Canada when the Dominion Government expressed its desire to outfit and control the expedition.

Three objective points were in view: the discovery of the land predicted by Greely and by Harris to the northwest of Banks Land; the completion of the charting of the unvisited northern coasts of Victoria Island and of Prince Patrick Island; and the geological, anthropological and biological exploration of the coasts east of the Mackenzie River. The first work was to be done with the "Karluk," the largest ship. She was beset however, off the northeastern coast of Alaska in August 1913, and later, driven by violent gales, she drifted northwest to 73° N. latitude, 164° W. longitude, and thence to the southwest, sinking from ice-pressures January 11, 1914.

Fortunately Stefánsson was ashore hunting when the "Karluk" began her drift. With his largest ship gone, his force largely diminished and his main supplies lost, he faced conditions which would have seemed hopeless to a man of weaker fibre. His courage never failed nor was his purpose shaken. What he had planned to do by ship and sledge was now to be done by sledge alone, as far as geographical work was concerned. Dr. R. M. Anderson was given his ship for the scientific work in the Mackenzie region, while Stefánsson bent his energies to his sledge journey, which necessarily was to be northward over the rough ice of that portion of the Arctic Ocean, known as Beaufort Sea. A supporting sledge accompanied him in March, 1914 to the Continental Shelf, located in about 70° 20′ N. latitude, 140° 30′ W. longitude.

On April 7, 1914, Stefánsson started north, with Anderson and Storkersen, six dogs, 360 rounds of ammunition and food for about forty days. Such a journey would seem to the ordinary man as certain of failure, but Stefánsson well knew the methods of sea-floe life and the possibility of living on game. He was destined to have his courage, skill and determination put to the severest tests. Violent gales, enormous pressure ridges, and absence of game were experienced until on April 27 he was forced to alter his course. He was then in 73° N. latitude, 140° W. longitude, about two hundred and fifty miles of travel from the Alaskan coast. He was in the middle of Beaufort Sea, which although ice-clad showed the effects of the spring sun by its disintegrating floes. He decided to go to the northwest point of Banks Land, about three hundred miles distant. On May 5 his kerosene was gone, and he was barely able for days to melt with lard (carried to oil the boat tarpaulin) enough floe-ice to quench thirst. Ten days later Stefánsson saw the first seal, and the nerve of the hunter was shown by his killing it with a brain shot at three hundred yards. On May 24 when

within forty-five miles of Banks Land a violent southeasterly gale, of twelve days duration, sent the party seaward to a point one hundred and five miles from shore. Stefánsson took matters philosophically, as he was on a floe over one hundred feet thick. Devoting energies to hunting the men accumulated two tons of meat against emergencies. It was not until June 26, that they set foot on land sixty miles south of Cape Albert. For ninety-six days they had lived on the moving ice-pack.

They summered on Banks Land, killing thirty-nine caribou and storing up supplies against any mischance. Despairing of the arrival of either of their two ships, they started south in September with packs, and found the "Mary Sachs" already in winter quarters, although as Stefánsson reports "the sea was absolutely clear of ice." Neither of his ships obeyed orders and Stefánsson's safety was the result of his own efforts — the excuse being that they thought he had perished. As Stefánsson had been absent seventeen months there were some grounds for such belief.

Accidents prevented Stefánsson taking the field again effectively until April 5, 1915. Then he was delayed by a southwesterly drift of twenty-four miles in his effort to explore the sea to the northwest of Banks Land, and was forced to turn back from 76° 40′ N. latitude, about seventy-five miles offshore. After charting the unknown parts of the north coast of Prince Patrick Island the party discovered in June a new land, whereon they landed on the nineteenth. As far as seen, the land covers an area of about five thousand square miles, is rugged and mountainous, and its southern shore trends from west by north to east by south. About one hundred miles of coast were covered during three days of travel. The only point astronomically determined was in 77° 43′ N. latitude, 115° 43′ W. longitude. It is interesting to note that this land is but some fifty miles distant from the farthest point reached on Prince Patrick Island by McClintock in 1853.

Stefánsson considers that the new land is one of considerable extent. It is situated about one hundred miles to the west of the Ringnes Land, discovered by the Sverdrup expedition in 1901. It thus extends some ten degrees of longitude to the westward of that polar archipelago (west of northern Greenland), fringing the great frozen Arctic Ocean, of which the most easterly island is Grinnell Land; the most westerly known is the new land of Stefánsson.

It is most probable that Stefánsson's Land extends far westward, or northwestward, in the shape of an island with probably a low-lying area of large size whereon are formed the great floe-bergs of which Stefánsson saw many in the course of his sledge trip over Beaufort Sea in 1914. It is worthy of note that in all his periods of danger and of distress Stefánsson kept up his observations. His soundings are of special value as indications of land and sea distribution. While the Continental Shelf of eastern Alaska is about seventy miles offshore, Stefánsson's soundings prove that it closely fringes the west coast of Banks Land. While this is not conclusive, yet it apparently indicates that the unknown lands lie rather to the northwest of Banks Land and Prince Patrick Island.

In any event there is reason soon to expect definite information on this point, as Stefánsson sailed from Herschel Island August 23, and northward from Cape Kellett September 3 to carry on further explorations. Meanwhile the world awaits his further report, with confidence that it will materially reduce the vast area of unknown regions which has hitherto disfigured the charts of the North-polar Circle.

THE HOPI GROUP IN THE AMERICAN MUSEUM

Designed by Howard McCormick with the coöperation of Mahonri M. Young

Portion of Walpi, the five-story Pueblo village, or "house" as we should call it, lying in the open sunny land of the American Southwest. The observer looks out across the roof of a detached section of Walpi, where are Hopi Indians engaged in the ordinary routine of the daily life that one might see to-day at the real Walpi. The width of the group is about twenty-one feet, its depth twenty-six feet. The background canvas forty-two feet long was painted by Mr. McCormick.

The figures are by Mahonri M. Young. The woman on the left is making a basket with large coils, one of the well-known types of the first and second mesas. Her basket material is being kept moist by the covering of wet sand. The potter on the right is a fairly good portrait of Nompeyo, the most skilled of Hopi workers in clay. The small boy at the rear has climbed to the top of the ladder, the only means of entrance to a Walpi home

IN THE HOME OF THE HOPI INDIAN

"HUMAN HABITAT GROUP" CONSTRUCTED IN THE AMERICAN MUSEUM — IT GIVES A FEELING OF THE GREAT OPEN LANDSCAPES WHERE THE HOPI INDIAN LIVES — A SNAPSHOT OF TYPICAL HOPI PEOPLE PURSUING THE ROUTINE OF THEIR DAILY LIFE

By Clark Wissler

A NEW life-size Indian group has just been completed in an annex to the hall for the Southwest. It presents a scene among the Hopi of Arizona, one of the best known groups of Pueblo Indians. In general plan the construction is similar to the bird habitat groups which have long distinguished the Museum's exhibits. The original idea as to subject was to select a typical Pueblo village and then to reproduce as far as possible a representative section with the corresponding landscape.

In this case the choice of a type is not difficult, for the principal surviving villages, those of Hopi, Zuñi, Acoma, Laguna and Isleta, while marked by certain individualities are quite alike. This is particularly true of their outward or objective characteristics for they are laid out on the same general plan and show the same architectural lines. Further, they are in the same kind of country, the somewhat arid, sunny and highly picturesque land of the Southwest. The people also, show many similarities in dress and occupation and are to-day living very much as did their prehistoric ancestors. These villages are moreover of respectable antiquity, for several of them were described by the first Spanish explorers (1539–40) in terms that are recognizable to-day. No doubt many of the same houses in Acoma now, were standing when first viewed by Coronado, Alvarado and their followers, and no one knows for how many centuries before. Thus the final choice of a site for this group became merely a practical question, the site best adapted to the space and mechanical limitations. To our mind, this was the Hopi village of Walpi.

The administrative responsibility for the group was accepted by Dr. Pliny E. Goddard who commissioned the artist, Howard McCormick, to design and execute it with the help of the sculptor, Mahonri M. Young. When the design had been approved by the Museum, Messrs. McCormick and Young went to Walpi where they spent a summer making the necessary sketches, color studies and figure modeling.

The near village in the canvas background is Walpi as seen from the south while beyond in the distance is its neighbor, Sichumovi. It may be noted that the Hopi villages are in three groups because they occupy three separate stretches of elevated land, or mesas. These mesas are designated as the first or eastern, the second or middle, and the third or western mesa. On the first mesa are Walpi, Sichumovi and Hano, Walpi occupying the southern end or point.

To the left of Walpi on the canvas appears the second mesa, where the contour is broken by a cañon, through which the lowering rays of the afternoon sun stream in a striking way. To the right are the lowlands in which the Hopi fields are laid out, the artist having indicated the growing corn.

In the foreground is an outlying or

detached portion of Walpi cut off by a small ravine. It is in this small detached group of houses that the visitor stands. He looks out across the roof of the first tier of houses just as he would from the doorway of a second tier house, past an angling portion of the same tier across the valley, or arroyo, into Walpi. Immediately before him, as if he were in their midst, are representative Hopi people pursuing the routine of their daily toil. Thus, in the group as a whole, we get a veritable snapshot of Hopi life, precisely what one might see in a glance through a village. It was not designed to force into the composition many phases of life not usually seen in juxtaposition, but to present one of the commonest scenes of prosaic life. It was not our aim to instruct the visitor in details, such as how cloth is made, how houses are built, the whole life history of a clay pot from the grinding of the clay to the firing, and the like — all subjects far better treated in the exhibition cases of the hall — but to give a concrete idea of Hopi life in its native setting. In a way, the production is a human habitat group, analogous to bird and mammal habitat groups.

In composition the artists have projected the group as a whole. To this end the objects in the foreground are adjusted to the same perspective lines as the canvas. Had the primary aim been to show a Hopi house, it would have been constructed on its own lines, but since the purpose of this group was to show a cross-section of Hopiland, the unity of the whole was sought in one perspective. This unity of perspective between the foreground and the canvas is designed to carry the eye over from the real objects in the foreground to the canvas in the distance, to the end that one may feel the great open landscape of the Hopi Indian's habitat. In this particular the artists have been successful. The specimens in the Hopi cases adjoining the group and the illustrations in books give a wealth of detail as to the multiplicity of pueblo life, but they cannot in anyway take the place of a visit to Walpi where one may see things in their perspective and native color. The very highest praise that could be bestowed upon this group was a remark by a visitor, "It is almost as good as a trip to Hopiland." This was the ideal of its construction.

The success of this group has been sufficient warrant for proceeding with a second one. At the outset it was planned to have three large Southwestern groups to which the architecture of the hall readily lends itself. In the center where the Navajo hogan now stands is to be one for the Navajo, showing a typical habitation, a family at its daily routine, and the landscape setting; while within the hogan, visible through the open door, a ceremony with its beautiful sand painting. On the left is the Hopi group now in place and on the right the Apache group now under construction. Mr. McCormick has the canvas background mounted and almost entirely painted in. Work upon the foreground and the reproduction of an Apache grass-covered shelter are under way. Mr. Young is now among the Apache in New Mexico modeling the human figures.

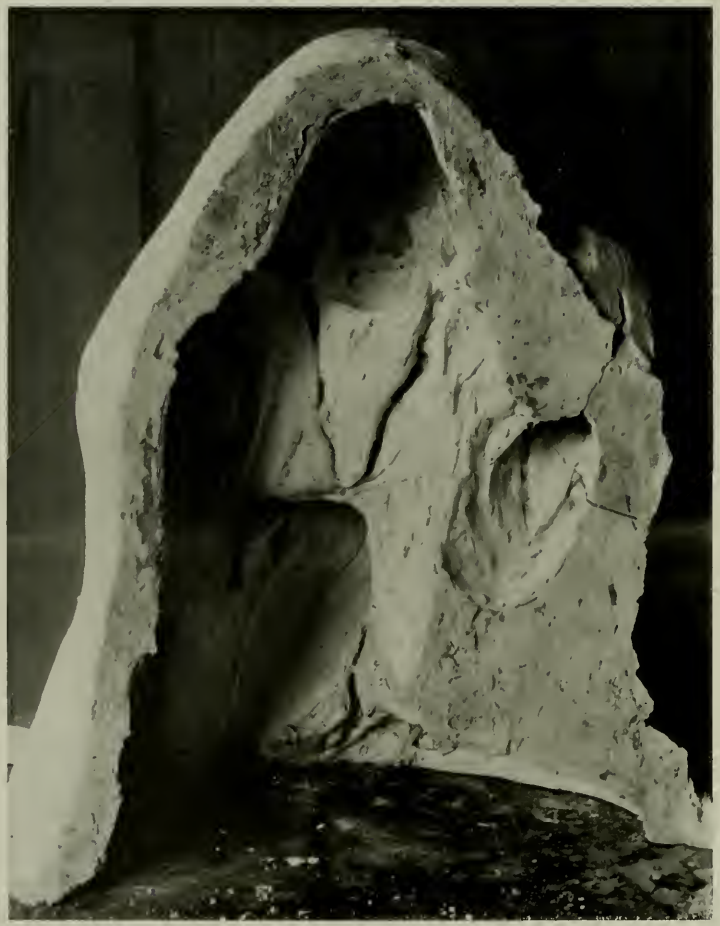
The general plan of the Apache group is the same as for the Hopi, a dwelling with family group in the foreground and the panorama of the landscape beyond. A definite spot on one of the Apache reservations was chosen for reproduction here so that the finished group will present with fidelity a sample of this tribe's original habitat.

DETAIL OF THE HOPI GROUP

The young mother is rocking her baby by moving the primitive cradle with both feet and hands The curtained door is an indication of a new-born infant within. The old man in the distance is spinning and the man in the middle distance weaving. From the roof hang the dried red peppers so much prized by the Indians and Mexicans of the Southwest

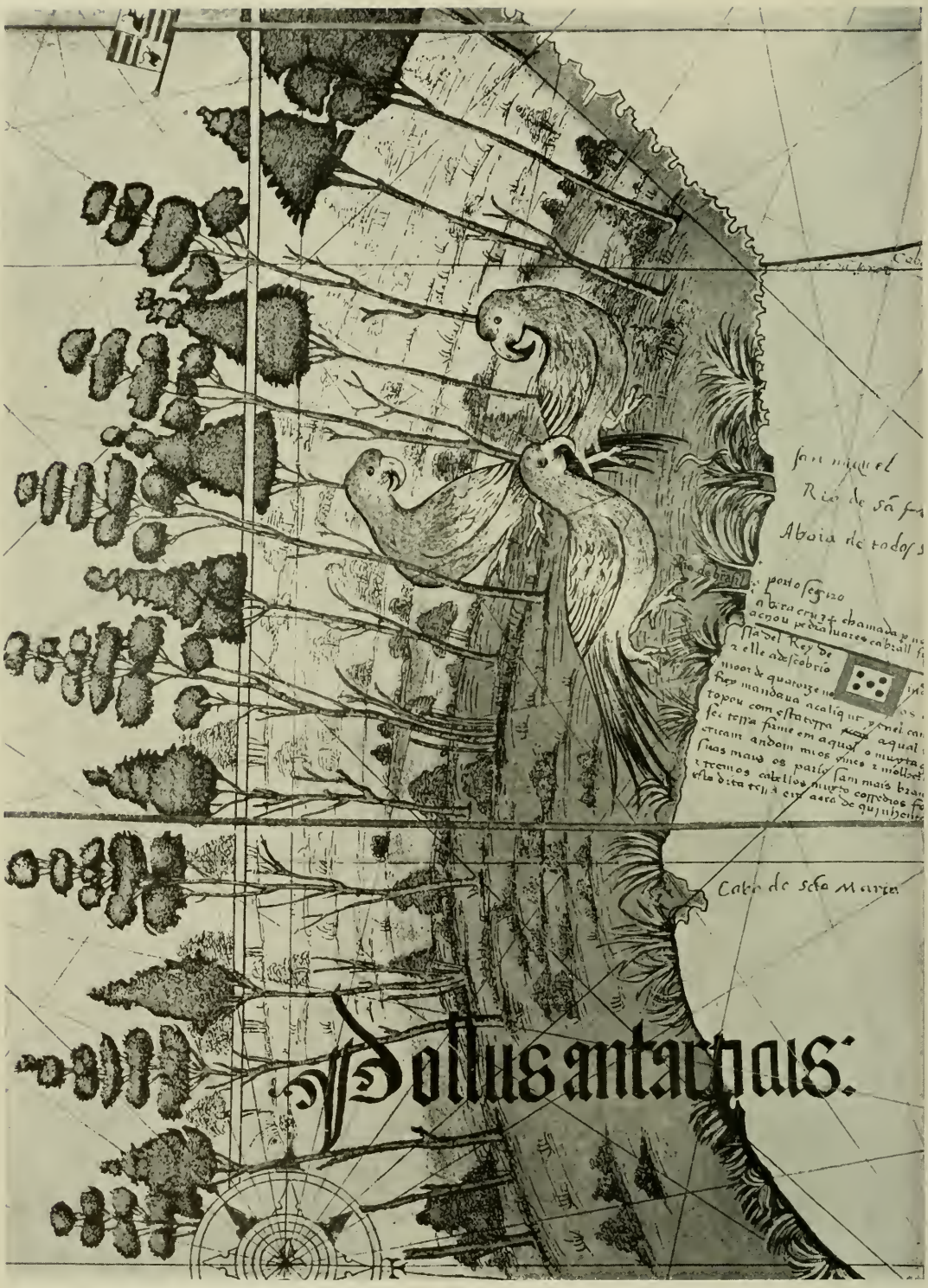
Figure in clay of an old Hopi Indian, modeled by Mahonri M. Young. This figure is seen in the rear of the finished group at the extreme right

The same figure receiving its coat of plaster during the process of making the mold. The casts were made in the Museum's taxidermy shop by Mr. James Bell



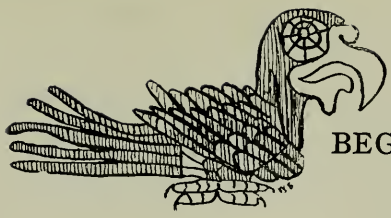
Interior view of a portion of the piece-mold for the figure shown on the preceding page. This is after the plaster put over the clay figure has set and the clay has been removed from within it

A stage in the process by which was obtained the plaster cast of the boy climbing the ladder. A piece-mold of the clay model has been filled with wet plaster which has set in the desired figure. The plaster of the piece-mold is now being chipped away



EARLIEST REPRESENTATION OF AN AMERICAN LANDSCAPE

Brazilian forest scene with red-and-yellow macaws, from the Cantino map of 1502. The original, beautifully colored, is preserved in Modena. Harrissi has published a facsimile reprint



BEGINNINGS OF AMERICAN NATURAL HISTORY

By Charles R. Eastman

THE following notes concerning the first mention in literature of various American animals have been suggested by the discussion which has been running in *Nature* during the past twelve-month concerning early references to the opossum and kangaroo. The article may serve as a sequel also to one on "The Beaver Group" by Dr. F. A. Lucas, in the JOURNAL of the American Museum for March, 1913, and to two or three that have appeared in *Science* and *Popular Science Monthly*, by Dr. E. W. Gudger, on early Brazilian naturalists.

It is surprising how rapidly information accumulated regarding the natural history of the New World directly after its discovery. Columbus himself, a voluminous writer, is proved by his Journal and letters to have been a keen observer of the strange aspects of nature and man in the regions discovered by him. To the Admiral we owe the first account of the alligator, iguana, hutia, manatee, native dog of the West Indies, and numerous species of birds, trees and plants. The letter of Dr. Chanca, who accompanied Columbus, and those of Vespucci[1] are also full of interesting natural history details.

[1] Vespucci's first letter (1497) was republished in facsimile by Varnhagen in 1893, having for frontispiece a design by Stradanus dating from about 1580, in which various South American animals are represented. Mention occurs in this letter of the iguana, puma and ocelot from the coast of Tampico. Dr. Chanca's letter has recently been translated and edited by Fernandez de Ybarra, in *Smithson. Misc. Coll.*, 1906, and *Journ. Amer. Med. Assoc.* for same year.

Cut at the left above, macaw after pre-Columbian Maya codex; at the right, Central American parrot, as shown in Maya codex.

As early as 1504 there was published in Venice a little collection[2] of voyages entitled *Libretto de tutta la Navigatione de Re de Spagna, de la Isole et Terreni Novamente Trovati.* The matter in this Libretto was taken over into the famous *Paesi Novamente Retrovati,* a larger collection edited by Fracanzio da Montalboddo, and printed in 1507, '08, '13 and '19. In the *Libretto* and also in this second collection are found the first printed description of the opossum.

The *Oceani Decas* (Decade of the Ocean) of Peter Martyr was published in 1511, and this and succeeding Decades are enlivened by interesting digressions on the natural history of the new continent. Here occurs the first mention in literature of the potato and the earliest recognizable description of the tapir. This author's statement that a live opossum, captured with her litter by the Pinzons in 1500, was exhibited in Granada, Spain, is confirmed by a Latin inscription which accompanies a figure intended to represent this animal in the Waldseemüller world-map of 1516, and in three succeeding editions of Ptolemy's *Geography.*

A reproduction of a portion of the map known as *Tabula Terre Nove* in the Ptolemy of 1522 showing this same figure and a Brazilian cannibal scene, is given by Edward Everett Hale in Winsor's *Narrative and Critical History of America* (vol. ii, p. 598). Gesner and Topsell also take their illustrations of the so-

[2] Peter Martyr is thought to have been the author of the Latin original, and Angelo Trivigiano the translator and editor of this pioneer work.

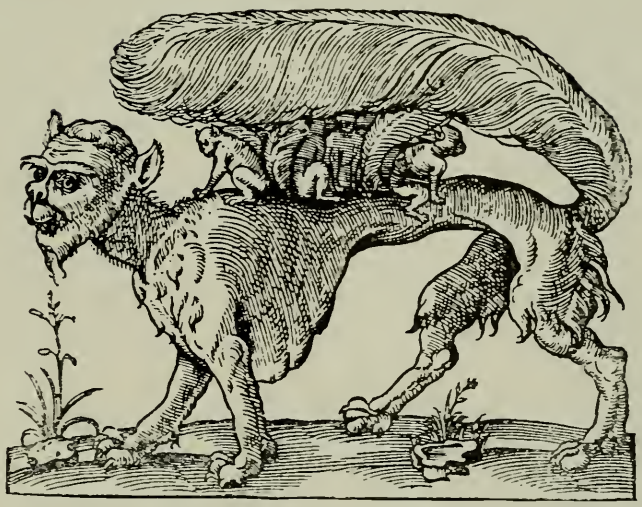
On the right, a Brazilian banquet; to the left, an opossum with brood-pouch. This is the earliest known figure of an American marsupial. [From Waldseemüller world-map of 1516]

called *Simirulpa,* in reality the opossum, from the same source. In later South American cartography, a figure of the tapir, but with long, drooping ears, is often substituted for that which does service for the opossum, and in the Blaeu map of 1605 the latter is introduced into the region that is now known as Argentina. In the same map a drawing of the "Su," originally placed in the region of the La Plata, is shifted to the North American continent, in Nova Francia. The first illustration and description of this fantastic creature, which is in reality merely a caricature of the common opossum, is found in the work published by André Thevet in 1558, entitled *Singularitéz de la France Antartique.* Thevet's figure is copied by Conrad Gesner in his *Historiae Animalium* (1620), both in the text and title-page. Gesner, Topsell and Jonston also copy Thevet's bizarre representation of the three-toed sloth (*Bradypus tridactylus* L.).

In connection with the figures that are here given of the "Simivulpa" and "Su," (*i. e., Didelphis*), which are taken from Thevet's work of 1558, we may quote Topsell's descriptions of these creatures, as given in the English Gesner (1658): *Of the Simirulpa, or Apish Fox.*

Those which have travelled the Countrey of Payran [Parana], do affirme, that they have seen a four-footed beast, called in Latin, *Simivulpa,* in Greek, *Alopecopithecos,* and in German, *Fuchssaffe:* in the forepart like a Fox, and in the hinder part like an Ape, except that it had mans feet, and ears like a Bat, and underneath the common belly, there was a skin like a bag or scrip, wherein she keepeth, lodgeth, and carryeth her young ones, until they are able to provide for themselves, without the help of their dam; neither do they come forth of that receptacle, except it be to suck milk, or sport themselves, so that the same under-belly is her best remedy against the furious Hunters, and other ravening beasts, to preserve her young ones, for she is incredibly swift, running with that carriage as if she had no burthen. It hath a tail like a Munkey: there was one of them with three young Whelpes taken and brought into a ship, but the Whelps died quickly: the old one living longer was brought to *Sivill,* and

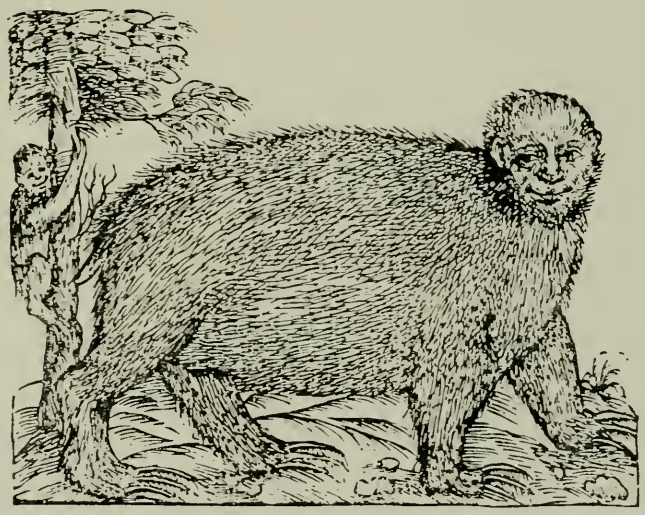
afterward to *Granado*, where the King of *Spain* saw it, which soon after by reason of the change of aire and incertainty of diet, did also pine away and die. The like things doth *Cardan* report of a beast called *Chiurca*, in *Hispania Nova*, and *Stadinius* of a *Suruvoy* in *America*: but I conjecture that the former is this Fox-Ape called in Greek, *Alopecopithecos*, and of the Germans *Fuschsaffe*, the latter the Female *Cynocephal*, which carryeth her womb wherein lie her young ones without her belly."



Opossum and family on the march. This slender-waisted creature is called by Thevet and others the "Su," and characterized as a ferocious and ravenous beast. [From Thevet's "Singularitez," 1558]

Of a Wilde Beast in the New-found World called Su.

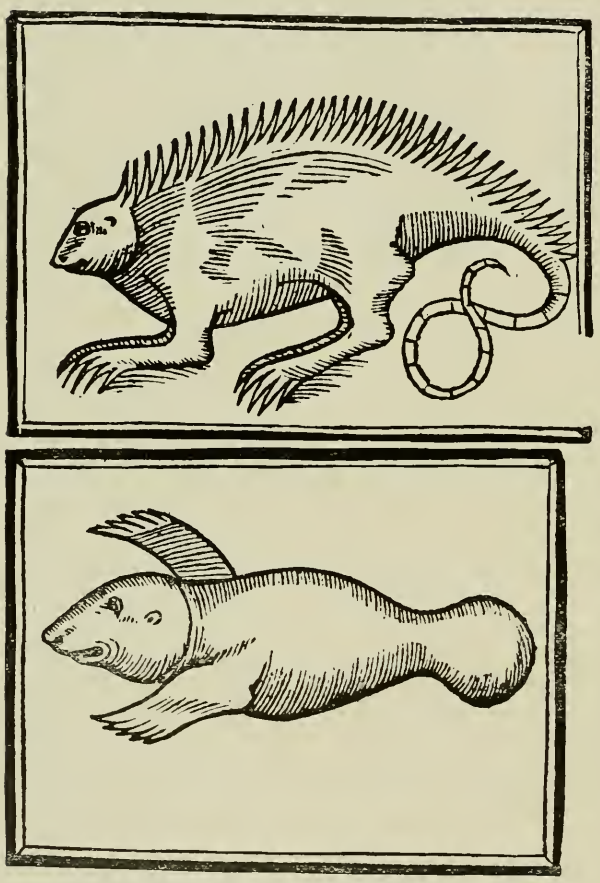
"There is a Region in the New-found World, called *Gigantes*, and the Inhabitants thereof are called *Pantagones;* now because their Countrey is cold, being far in the South, they clothe themselves with the skins of a Beast called in their own tongue *Su*, for by reason that this Beast liveth for the most part neer the waters, therefore they call it by the name of *Su*, which signifieth water. The true Image thereof as it was taken by *Thevetus*, I have here inserted, for it is of a very deformed shape, and monstrous presence, a great ravener and untamable wilde Beast. When the Hunters that desire her skin set upon her, she flyeth very swift, carrying her young ones upon her back, and covering them with her broad tail: now forsomuch as no Dog or Man dareth to approach neer unto her, (because such is the wrath thereof, that in the pursuit she killeth all that cometh near her:) the Hunters dig several pits or great holes in the earth, which they cover with boughs, sticks, and earth, so weakly that if the Beast chance at any time to come upon it, she and her young ones fall down into the pit and are taken.



This amiable-looking creature (three-toed sloth) is called by Thevet "the Haut." The human-like expression is not wholly imaginary, being somewhat characteristic of the young sloth. (From Thevet, 1558)

This cruel, untamable, impatient, violent, ravening, and bloudy beast, perceiving that her natural strength cannot deliver her from

the wit and policy of men her hunters, (for being inclosed, she can never get out again,) the Hunters being at hand to watch her downfall, and work her overthrow, first of all to save her young ones from taking and taming, she destroyeth them all with her own teeth; for there was never any of them taken alive; and when she seeth the Hunters come about her, she roareth, cryeth, howleth, brayeth, and uttereth such a fearfull, noysome and terrible clamor, that the men which watch to kill her, are not thereby a little amazed, but at last being animated, because there can be no resistance, they approach, and with their darts and spears wound her to death, and then take off her skin, and leave the carcass in the earth. And this is all that I finde recorded of this most savage Beast."



Above, the iguana; below, the manatee, or sea-cow. Both figures are from Oviedo's *History of the Indies*, 1535, and are the earliest known representations of these animals

Peter Martyr, as already remarked, gives the earliest and at the same time a very satisfactory account of the tapir. The next writer after the "Father of American history," as this author has been called, to describe the tapir is the bachiller Enciso, whose '*Suma de Geografia*', was first published at Seville in 1519. In 1526 Gonzalo Fernandez de Oviedo published the *Sumario*, or epitome of his comprehensive history, and in chapters twelve and twenty-two of the shorter work are to be found excellent descriptions of the tapir and armadillo. The earliest printed figure of the armadillo is found in the *Exoticorum* of Clusius or L'Escluse (1605), in which work are also found figures, based upon original observation, of the sloth and manatee. De Laet in his *Novus Orbis* (1633), and George Marcgrav[1] in his justly famous treatise on Brazilian natural history (1648), both copy the figure given by Clusius of the rare three-banded armadillo.

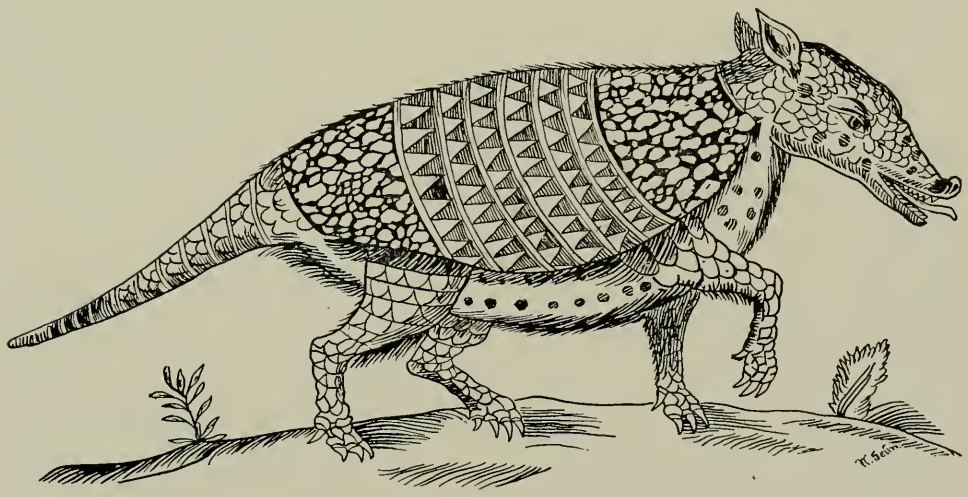
[1] There have been published, by Martius and Lichtenstein, excellent commentaries on the plants and animals of Brazil which were described by George Marcgrav and Wilhelm Piso under the editorship of De Laet in 1648, and the same service was performed by Lichtenstein for the Mexican quadrupeds described by Francisco Hernandez in the Latin edition of his *Historiæ Animalium* published in 1628. (*Abhandl. Akad. Wiss.* Berlin 1827, pp. 88–127. See also earlier volumes for Marcgrav). On Hernandez and his works, see O. Rich, *Books relating to America*, pp. 72–74, and Joseph Sabin, *Bibliotheca Americana*, vol. viii, pp. 239–241. The commentary by Martius, the Munich botanist, is found in *Abhandl. k. bayer. Akad.*, 1853, vol. vii.

Marcgrav, Nieremberg and Jonston also copy Clusius' somewhat fanciful representation of the three-toed sloth, called the Ignavus, Ai or Haut, and in Spanish the *perillo ligero*.

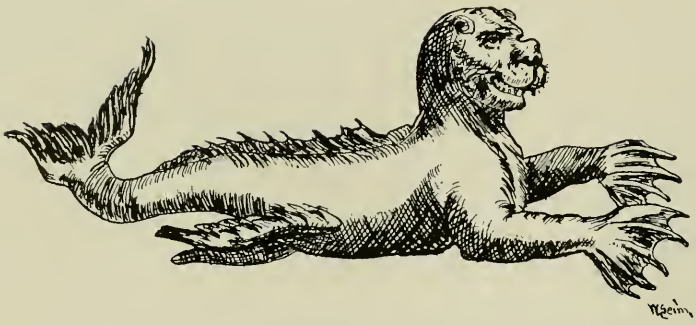
The compendium of Oviedo, published in 1526, was followed in 1535 by his larger work, of which a modern reprint exists, entitled *Historia general de las Indies*. Another work having the same title, by Francisco Lopez Gomara, was first printed in 1553, and passed through several editions. Both these works, excellent in their way, contain much valuable information concerning the aborigines, and animal and plant life of the southern continent and the West Indies. Gomara gives the earliest known figure of the buffalo, or American bison, and Oviedo is the first author to represent the iguana and manatee. Under the native designation of "Anta," two Patagonian animals appear to have been indicated by Gomara. One of them is pretty certainly the guanaco, and the other is conjecturally identified by M. Roulin, in his *Mémoire sur le Tapir* (1835), as the guemul or huemul deer.

Concerning the guanaco, this creature was first seen by Magellan in 1519, in the vicinity of the straits that bear his name. The earliest mention of this animal, of the rhea, penguin and fur seal as observed in Patagonia, occurs in the narrative of Antonio Pigafetta,[1] who accompanied the famous navigator on his voyage around the world. It was near the Straits of Magellan that the guemul deer was first seen by Captain Wallis. In early accounts this animal was confused with a supposed equine species, first scientifically described by Molina under the name of *Equus bisulcus*, and represented in the Chilean coat-of-arms

[1] It is there mentioned that the Patagonians, whom the voyagers encountered at Port St. Julian, were clothed with the "Skinne of a Beast sewed together," and that "This Beast (as it seemed unto us) had a large head, and great eares like unto a Mule, with the body of a Camell, and tayle of a Horse." In the relation of Olivier van Noort's voyage (1598), it is stated that at Port Desire they "found Beasts like Stagges and Buffals." The first English navigator to take detailed notice of this ruminant appears to have been Wood, in the narrative of his *Voyage through the Straights of Magellan* (1670).



This gayly caparisoned creature is meant by Aldrovandi (1637) to represent the nine-banded armadillo. Enciso described it a century earlier, and Bélon and L'Escluse gave good figures



The seal, somewhat conventionalized by Van Brussel, and passing under the guise of "sea-lion" (1799)

The Sea Lion is a large Creature about 12 or 14 foot long. The biggest part of the Body is as big as a Bull: It is shaped like a Seal, but 6 times as big. The Head is like a Lion's Head; it hath a broad Face with many long Hairs growing about its Lips like a Cat. It has a great goggle Eye, the Teeth 3 Inches long, about the bigness of a Man's Thumb....They have no Hair on their Bodies like the Seal; they are of a dun colour, and are all extraordinary fat."—*Voyages*, cap. iv.

as of equine shape.[1] It is interesting to note that the figure of a horse is introduced by Sebastian Cabot in the Argentine region of his world-map of 1544, but this can scarcely be construed as evidence that native wild horses were seen by that navigator anywhere in South America. This view is, however, maintained by Señor Anibal Cardoso in a recent memoir in the *Anales of the Buenos Aires Museum* (vol. xv, 1912) on the origin of Argentine horses.

In regard to the elephant-seal, Dr. R. Lydekker is authority for the statement that our first definite, if not actual, knowledge of this animal seems to have been derived from a specimen brought to England by Lord Anson in 1744 from the island of Juan Fernandez; and also from the figure and account given in the *Voyage Round the World* of that great commander, where the species is called "sea-lyon." It is, however, certain that Dampier in 1684, and Peter Kolben in 1705, also described the same creature (*Macrorhynchus leoninus* L.). The former writes:

Very important for the west coast of South America is Cieza de Leon's *Cronica del Peru* (1553). The Amsterdam edition of this work (1554) contains a fair illustration of the llama, an animal of the existence of which Europeans first became aware as early as 1513, through Balboa's intercourse with the Aztec chieftain Tumaco. Members of the llama race, of edentates, and many of the more characteristic Central and South American birds, mammals and even tropical vegetation, are represented with considerable fidelity in early sixteenth century cartography of the west-

Not a griffin, but a harmless spotted dog, represented in pre-Columbian Maya codices

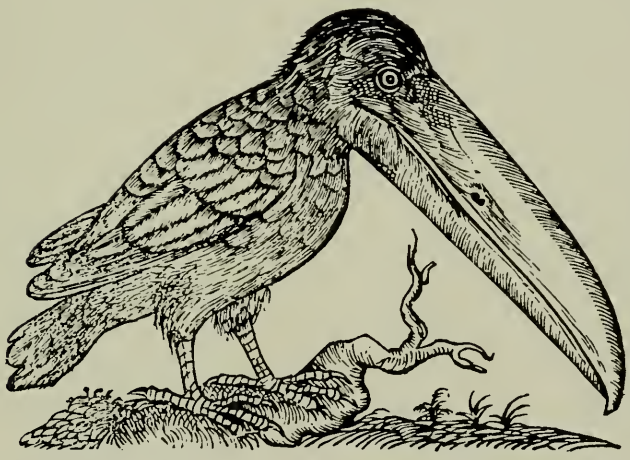
[1] The most recent notices of this large mammal, *Hippocamelus bisulcus*, are those by J. A. Allen, in the Report of the Princeton Patagonian Expedition (1906), and M. Neveu-Lamaire and G. Grandidier, in *Les mammifères des hauts plateaux de l'Amérique du Sud* (1911). Lydekker gives a colored plate of the guemul in *Proc. Zool. Soc. London*, 1899.

ern hemisphere. A real service to science, as well as to the study of history and geography, has been rendered by Dr. E. L. Stevenson, in his facsimile reprints of sixteenth and seventeenth century world maps published under the auspices of the Hispanic Society of America.

It will suffice to mention at this point the names of several authors who treated more or less extensively the natural history of the New World during the latter half of the sixteenth century. The figures and descriptions of South American animals given by André Thevet in his *Singularitéz de la France Antarctique* (1558), and by Jean de Lery, in his *Voyage en Brazil* (1578), were freely made use of in a number of later compilations, one such being the *Historia Naturæ* (1635) of Juan E. Nieremberg, a Jesuit professor at Madrid. Another was a *History of the Indies*, in Latin, published at Florence in 1588 by the Jesuit Father Giovanni Maffei, who had access to the archives in Lisbon. Many interesting notices are to be found in *La Historia del Mondo Nuovo* (1565), by the Italian traveler Girolamo Benzoni; also in the collection of voyages and travels published by Ramusio in 1556 and 1565, and in the "Observations" (1593) of the famous English freebooter, Sir Richard Hawkins. The following extract on the chinchilla may serve as a specimen of Sir Richard's natural history notes:

> Amongst others [the Chileans] they have little beastes like unto a squirrell, but that he is gray; his skin is the most delicate soft and curious furre that I have seene, and of much estimation (as is of reason) in the Peru; few of them come into Spaine because it is difficult to be come by; for that the princes and nobles laie waite for them. They call this beast *chinchilla*, and of them they have great abundance.

More important from a scientific standpoint and more trustworthy than any of the minor writers just mentioned are the works of the two Spanish chroniclers José de Acosta and Antonio de Herrera, who wrote toward the end of the sixteenth and beginning of the seventeenth century respectively. The Jesuit historian de Acosta (1590) would seem to have been the first writer to notice the chinchilla, and he refers particularly, as do also Cieza de Leon and Garcilasso de la Vega, to the bones of fossil mammals found in the Campo de los Gigantes (Savanna of Bogota). Similar remains were also noted in Mexico by Francisco Hernandez, whose *Historiæ Animalium* (1628) remained for a long time in manuscript before being finally edited and published.



Barring the feet, which are crow-like, not a bad idea of a Brazilian toucan, Rhamphastus. [From Thevet's "Singularitez," 1558]

[Article to be concluded in December *Journal*]

A GLIMPSE AT THE MARVELOUS ARMOR COLLECTION IN THE METROPOLITAN MUSEUM OF ART

EVOLUTION OF ARMS AND ARMOR

By Bashford Dean

As is well known there is in progress a considerable agitation of the question of the use of armor in the present European war. Many military experts advocate it, as well as armor experts such as Dr. Bashford Dean. They have in mind of course the hand to hand conflicts of trench warfare and the similar duel character of the fighting now going on in the Balkans. Dr. Dean considers it fair to believe that suitable armor would save the lives of hundreds of soldiers and that a single soldier properly armored would be the equal of many unarmored soldiers in trench warfare. He advises not only the shield, headpiece and corselet suggested by Sir A. Conan Doyle, but also groin and hip plates to give additional protection from schrapnel and spent balls. Any armor to be efficient against the high explosives of to-day must be of hardened steel, smooth, highly polished and in form as roundly curved as possible. Thus more frequently the bullet will glance off instead of penetrating. Dr. Dean's article calls attention to the marvelous armor collection recently put on exhibition at the Metropolitan Museum of Art in New York City, which gives an opportunity for the study of armor historically, and for a comparative study relative to the fitness of armor for practical service at the present time.— THE EDITOR.

"HAPPY is the man," wrote Horace, "who can know the causes of things." We may to-day differ as to how the word "happy" is best defined, still we may each and all agree that there is a wholesome satisfaction in being able to apply widely and practically some "causal" principle of nature which we have discovered — often at the cost of labor and suffering. Let us take as an instance the principle which we call evolution. The zoölogists of the past half century have demonstrated the great truth that the beings of to-day have changed to a greater or less degree from their ancestral form and habit; and this "law" has already been the means of revising helpfully many of our ideas, not in biology alone but in various lines of human thought and enterprise, including science, theology and art. Thus in science we may now trace an evolution even of the solar system, in theology we can work out the genesis of a sect, and in art we are given the means of explaining step by step the development of an ornament or a style. And it is extraordinary how much Horatian satisfaction we get from being able to explain the causes or origin of things — even of everyday objects and the least of them, such as the position of buttons on our coat sleeve, or the colored lights in an apothecary's shop.

At first sight of course, one may say, how may we justly apply to all of these *things* the principle which prevails in *living creatures*. Creatures, says one, change because they vary in nature. Two fishes are never quite alike, nor even two peas in a pod, and in time these variations become more pronounced for some obscure cause or another, until the descendant in the thousandth generation is quite unlike his forebear. But in living beings the changes are *genetic*, passed along from father to son. How then may this principle be used to explain the happenings of *things* which are not kith or kin?

Truly this is a question not easy to answer. In certain cases however, the changes are all so clear that the objects have only to be placed in line to show that there has been happening a kind of evolution. When we turn the matter over in our minds we may explain the evolutional side of it all by showing that the things have developed because of real evolutional changes which took place in or were directed by neighboring organized beings. For instance we could certainly describe the evolution of the stomach in the series of backboned animals if we but knew what that organ had produced, secreted or excreted, from the beginning. Why therefore should we be surprised if, when we collect things

which arise from the age-long operation of brain and hand, we should find that these products are, so to say, genetic, and may be arranged in evolutional series? This is the thought, I believe, which explains why we may group objects in gradational lines which give us considerable satisfaction. For everyone dislikes confusion, and no little confusion can be dissipated by groupings of this kind.

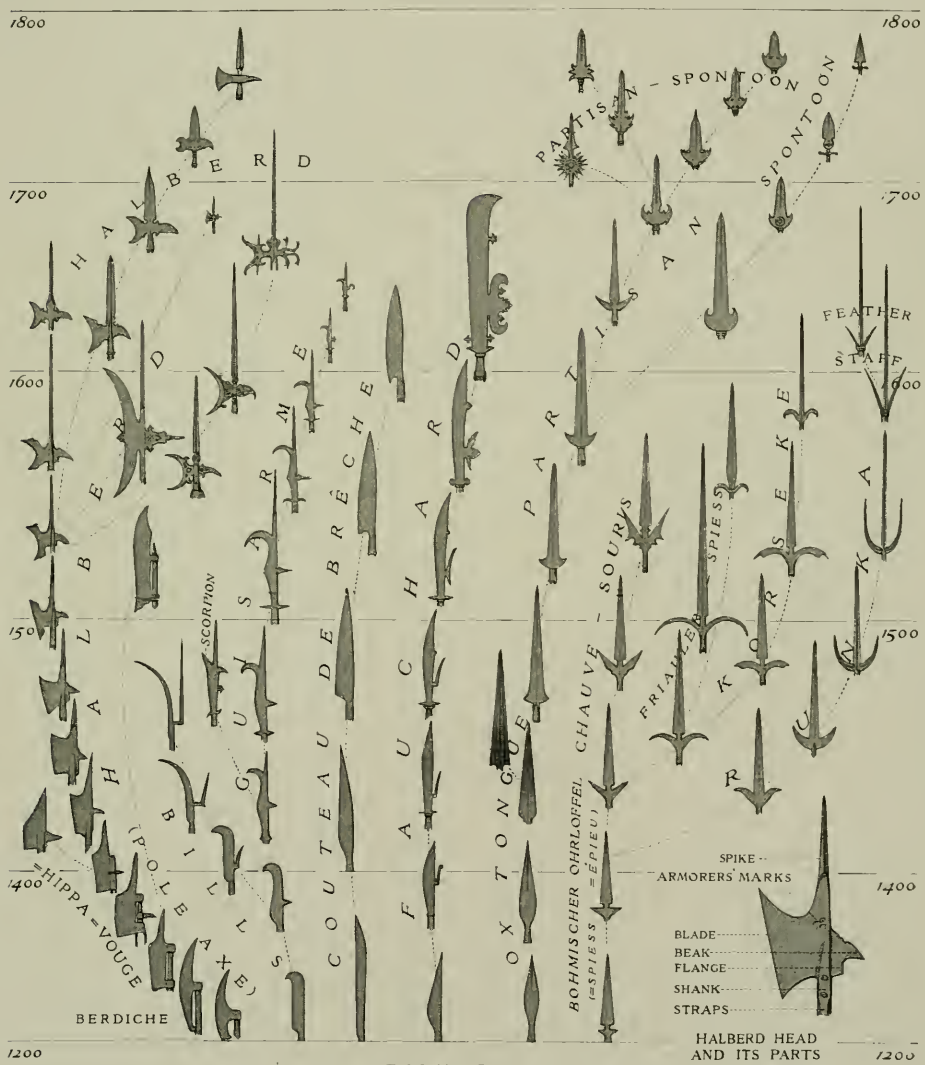
If, then, we examine among ancient arms a large collection of shafted weapons, with all their curiously outlined halberds and pikes, we find that they fall readily into series. If the collection contains specimens which date back throughout a number of centuries it becomes quite easy to arrange them in a "pedigree." In this, scores of kinds of these arms, which bristle at first sight in confusing array, can be reduced to half a dozen "types" which are clearly "ancestral." These picture in their earliest forms agricultural implements, such as axe, pruning-hook and scythe, suggesting the times when common soldiers were farmers and fought with whatever they had at hand. In these early times the only real pole-arm (*i. e.* both for hunting and warfare) was a spear.

Out of these simple types (*generalized* as we would call them in zoölogy) arose *advancing series,* with new structures appearing, culminating, disappearing, just as they occur in the history of shells or beasts. Note for example the advancing evolution of such a structure as the beak of a halberd. In the beginning it was not a part of the halberd blade, but a separate hook of metal, like the tongue of a buckle, which encircled the wooden handle of this arm. Then, too, in our series we find *decadent lines:* Thus the spontoons which sergeants carried in our War of Independence (and which our state law declares must still be carried!) were nothing but degenerate survivors of ox-tongue partisans; or the tiny guisarmes and dwarfed halberds of the seventeenth century were but the crudely made followers of the magnificent and serviceable arms of the preceding century. In these three cases degeneration was accompanied with reduction in size. In another case however, decadence was expressed in just the opposite way (as sometimes happens in animals) as in the doge's ceremonial fauchard of 1650–1700, a titanic arm, so large that it could hardly be carried comfortably, let alone be used — even when it was formed of a sheet of metal, instead of being a well-modeled and functional blade. These forms were "gerontic," as a naturalist would say.

It is interesting too, in such a series of forms to see how a structure changed its function and was thereby "stimulated" to great evolutional progress; just as we know that such a condition causes far-reaching effects in animals, as when a protective scale begins to function as a weapon, or a gill-cleft comes to help out the ear. As an example of this, observe the ancient spear with lappets at its base, which originally served to keep a wounded animal (or man) at a safe distance, so that it could not "run up" the spear. When these lappets were found of use for inflicting additional wounds they grew steadily in size (for about two hundred years) and developed all manner of unwholesome hooks and prongs, and in the latest types (feather-staves) could in fact be folded together and concealed within the handle, which thereupon masqueraded as a harmless walking staff, until the owner, swinging his "feather-staff," shot out again the long sharp points. Another example of change of function appears in the blade of a halberd. This was originally ax-shaped, with cutting margin long, heavy and convex; such a margin then became

steadily reduced in size during a couple of centuries. About 1500 it became uniformly concave and lost its chopping function. It was then simply a double beak which was used as a pick, or at need served as a grappling hook when lances were to be pulled down or when a wall was to be clambered up.

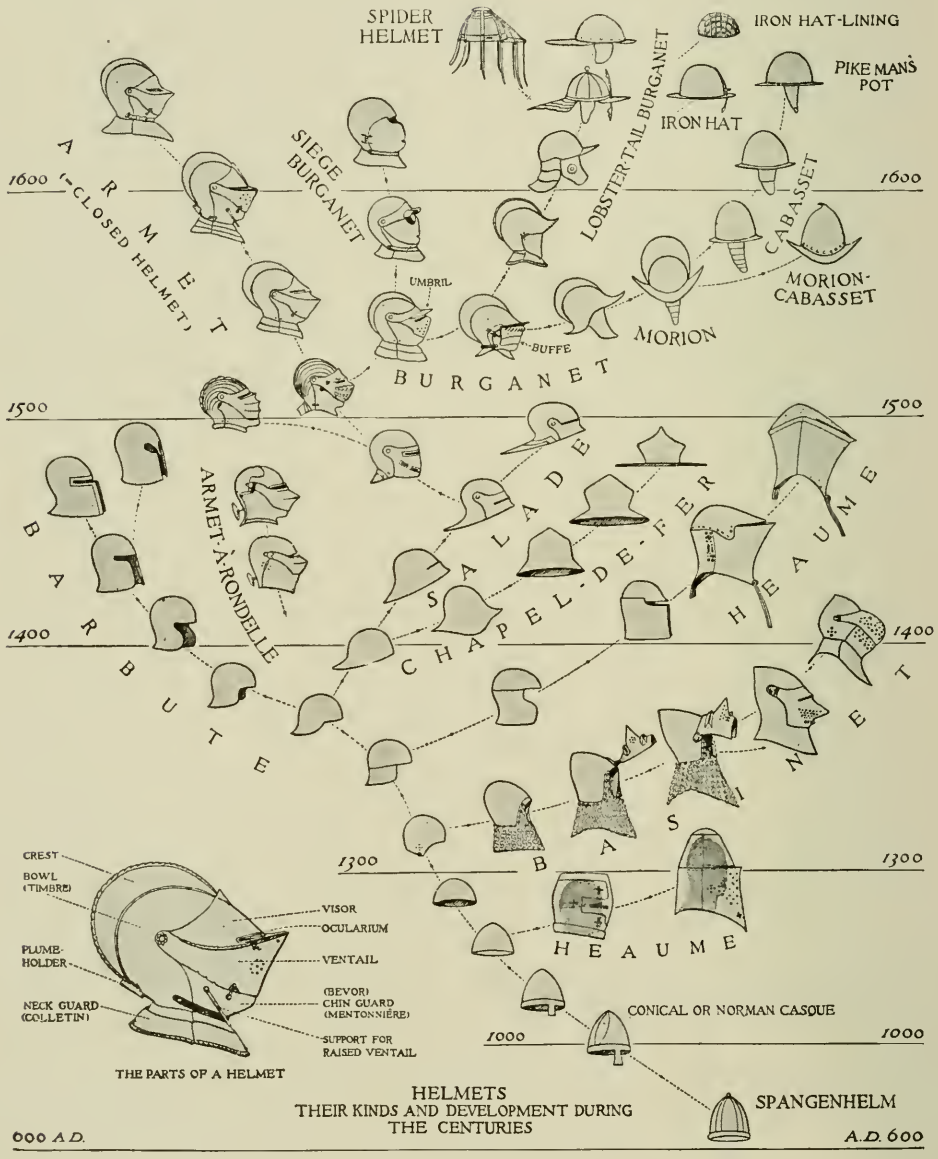
Again, among our arms, highly specialized forms were common, just as we find everywhere animals which were curiously developed in certain directions, as when their teeth were suited only for a special kind of food. Such forms, we find too, did not long survive, dying out just as our specialized animals do, *e. g.* when their particular kind of food gives out. As an instance of this we may note the billhooks which were common in England in the fifteenth century. In their



POLE ARMS
THE DEVELOPMENT OF THEIR COMMONER FORMS DURING THE CENTURIES

BASHFORD DEAN DIR. STANLEY J. ROWLAND DEL.

early form they were serviceable heavy axes with a hook-shaped end and a stout prong at the side. From this form were developed shapes which were very long and very narrow — the cutting blade suggesting a surgical knife and the prong at the side becoming a huge needle twenty inches in length. Now it is remarkable that this highly specialized type was used only toward the close of the Wars of the Roses when knights were armed "to the proof" with the most complete and efficient armor which the world has seen. Its plates could no longer be crushed, hence the heavy ax-head of our earlier pole-arm gave place to the long-bladed incurved knife which might be slipped neatly between the plates, say of shoulder, knee or elbow, and inflict a dangerous wound. So too this specialized billhook lost its stout beak or pick, for this could no longer be



HELMETS
THEIR KINDS AND DEVELOPMENT DURING THE CENTURIES

pounded through the plates of gothic armor, but became long and slender, needle-like in form. By such a point, chain mail could be pierced, that is, because of the length and shape of the weapon it was best equipped mechanically to break a single ring in the knight's collar of chain mail, which otherwise was "proof." The fact that this type of bill did not long survive is interestingly accounted for by the changes which soon took place in knightly armor, for the collar of mail was subordinated to plate, and the huge elbow and knee pieces of gothic armor, which were easily "caught" by the incurved and inslipping blade, appeared in use only for a few years.

If we study progressive changes in helmets, again we see generalized forms in the earliest times. Thus at the very beginning, the helmet was built of many pieces of iron and was a form much easier to make than a casque beaten out of a single piece of metal[1] — the latter type of headpiece appearing only after armorers' experiments had stretched through several hundred years. In our present series we see again highly specialized forms as in the terminal members of the "lines" of war hats (*chapel-de-fer*), barbutes and fifteenth century heaumes. In the first of these the brim of the hat became so wide that the headpiece could not be kept safely in place; in the second the expense of making it was extreme and it proved troublesome in the neck region; in the third the weight and size became excessive, and it disappeared as speedily as a highly developed variety in jousting went out of style.

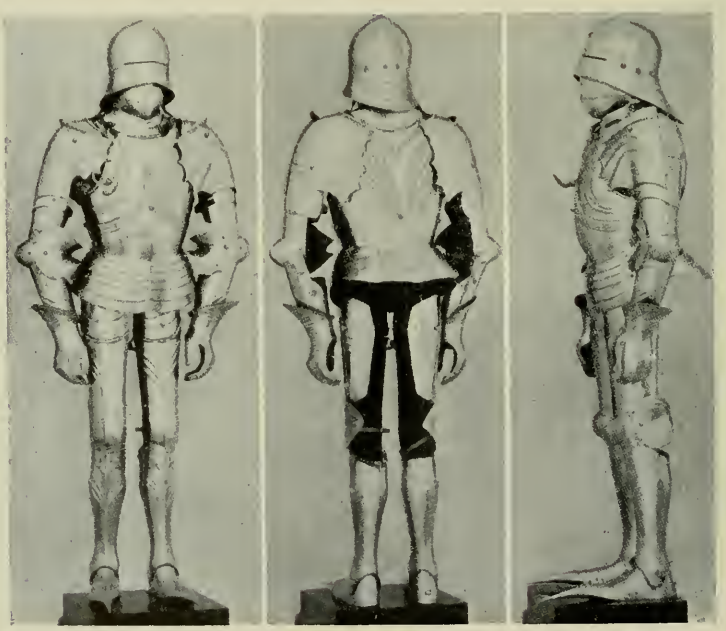
An advancing line in an evolutional series of helmets is seen in the closed helmet, or armet, which arose from the bowl-shaped helmet or salade and gave rise to many kinds of burganets, morions and cabassets. The evolutional fertility of the armet appears to have been based upon several factors, such as the close modeling of the helmet to the head, enabling it to be kept readily in place, coupled with the invention that a separate visor and a separate chinpiece could be made to rotate from single lateral pivots — the latter adjustment of a great advantage since it made the headpiece easy to put on and take off. As a case of "convergence," or "parallelism" in an evolutional series of helmets we may mention the form of closed helmet called *armet-à-rondelle* which suggests the usual armet but which was not closely kin to it, and did not survive because it lacked convenience in manipulation. Thus in order to remove this casque the visor had first to be raised, then the cheek plates had to be separated from a peg at the point of the chin. By the time the wearer, cumbered with his mitten-shaped gauntlets succeeded in detaching the cheek flaps below, he might find that his visor would fall and cause him annoying delay. Another parallel to the closed helmet of the sixteenth century was the basinet in the late fourteenth century. It never led directly to the armet however, and had evident defects in its mechanism which cause it to be ranked as a "terminal" rather than a progressive form.

In a series of helmets we have, again, decadent or degenerate forms. Thus in the line of closed helmets the latest examples have lost their tall crests, their modeling, the separate plates in the neck region, even the catch which clamps the chinpiece down (in the place of the last we find merely a strap and a buckle). Also in siege burganets one finds obvious cases of degeneration: crest vanishes, visor and umbrel disappear and their

[1] In all these cases we leave out of account armor and arms of Classical Antiquity: these were, with so much else of early culture, lost from the sight of the Middle Ages.

ancient pivot is replaced by a simple hinge. These casques are exceedingly heavy and admirably designed to protect the wearer from gunshot at close range. They could be used in the trenches in Flanders even to-day very much as they were used in the days of Marlboro. Their utility in fact is clearly shown in the present revival of armor-wearing. The helmets to be finally noted are numerous degenerate and "rudimentary" forms descended from the lobster-tailed burganets of Cromwell's times. Thus the ear defense in such a headpiece loses its lower portion, which was a part of the neck guard, and later becomes greatly reduced in size; also the neck-covering portion of the back of the casque develops either a great number of strips, or else, merging them all together, becomes a single plate — which finally may disappear altogether. Such a headpiece had an interesting series of degenerate successors.— One of them is hat-shaped, another becomes a skullcap enclosed within the crown of a felt hat, another persists as a lighter hat lining made of a few wide bands of metal, still another assumes the form of a grating made of light strips, and a final one appears as a light hat lining made of a few strips or bars of metal so hinged together that the whole defense can be folded and carried in one's pocket.

It is especially significant in the various instances noted above that the changes always take place *in order of time*, just as we find evolutional changes occurring in animals. Thus we are no more apt to meet the highly modified burganets of the seventeenth century among casques of the sixteenth century than we are likely to find fossil mammals in the old red sandstone. On the other hand, we may learn of archaic forms of helmets or halberds persisting for a long time, as we find the pearly nautilus or the gar pike, living to-day, which might well have died out with their kindred ages ago. Thus as an amusing case of survival, we read of knights from Ireland appearing in Queen Elizabeth's court armed in basinets and chain mail, nearly two centuries behind the English style.



TSIMSHIAN STORIES IN CARVED WOOD

By Lieutenant George T. Emmons

THE Kitksan as well as the other divisions of the Tsimshian possess neither letters nor hieroglyphics, yet through the plastic and graphic arts they have been enabled to preserve and illustrate their legends, traditions and much of their life history.

Carving in wood, bone and stone, weaving in the wool of the mountain goat, in maple and cedar bark and spruce root show a much higher degree of development than painting. The last has never advanced beyond simple outline with no sense of perspective and with four simple colors, consequently little variation in shade or tone.

Cruder and more primitive than either the Tsimshian proper or the Niska, the Kitksan nevertheless follow natural forms with wonderful accuracy, and besides portraying the typical features of their race, they express action in animal figures — born no doubt of that close study of nature upon which the hunter's life depends. Their art is more realistic than conventional, but as it has been developed slowly through generations a certain amount of usage prevails which is the more noticeable in the human, bear and mythical animal figures.

Without discussing the origin of the Kitksan, the fact that their art has been borrowed from the coast cannot be questioned, for the reason that there are found more than two hundred miles inland in the midst of birch and cottonwood forests, sea animal forms emblematic of the family crests that have come to them through intercourse and intermarriage with the seaward divisions of this people. Besides, all their folk-lore and traditions speak of a migration down the Skeena to salt water, and a further proof is that the contiguous Déné tribes are wholly wanting in any sense of art.

Some of the finest specimens of carving are said to have been executed by Tsimshian imported for the purpose, but the average work represents home talent, and while often archaic, is more realistic and original and interesting in the portrayal of local traditions and the fauna of the country than the finer carving.

At the village of the old Kitzegukla on the Skeena River, some thirteen miles below Hazelton, is a very interesting heraldic column of the Kish-hasht family. It is rather crude in its execution but it illustrates more than the usual number of stories. The tree is simply barked and brought to a dull point at the top. Below this occurs in order representations of, first, the mountain goat painted white and black; second, the sun within which is the figure of the moose hunter, Kuke-shan, carrying a small basket; third, the monkey woman Pighish, and at the base the big horned owl (gwuk-gwu-nooks).

These stories told in wood go back to the time when men and animals were supposed to be very close to one another; when they intermarried and saw each other under a spell of witchery that made all appear human, except that the animals wore coats of fur which they could at will remove and appear in human form, or put on and become as animals.

THE STORY OF THE MOUNTAIN GOAT

(These stories were told by John Malo, an old Kitksan at Hazelton, June 20, 1913. They are prosaic but typical native explanation of a totem pole, similar to the many on exhibition in the American Museum)

In the early days of life, before the great cold which caused the dispersion of the

Four stories illustrated in carved wood on a heraldic column

Kitksan, when the whole tribe lived at Tumlahalm on the upper Skeena River, there was a great hunter, Kit-um-gieldo (man of the outside or wilds). He was chief of the Kon-nah-da clan, whose hunting grounds included Sthe-yordan-lah (steep sides), the precipitous aggregation of jagged mountain peaks that rise directly from the comparatively level country beyond the mouth of the Buckley River. After the salmon season was over, when the animals had fattened on the abundance of the summer and had taken on their winter coats, he invited the most active hunters of the village to accompany him to the great mountain where the wild goats were abundant, for besides the flesh which was esteemed, the skins were used as bedding, the soft wool was twisted into yarn for weaving blankets, into cord for carrying bags and other household articles, while the leaf fat that had been taken on as a protection against the extreme cold of winter was run into cakes for later use.

The goats were hunted with bow, arrow and spear, the hunters lying in wait for them along their rock-worn trails, and many were taken each year and sent down the mountain side to the people who were encamped awaiting the hunters' return. Then the meat was carried across the river to the village and a great feast was held.

During one of these expeditions a young man put a bag of red paint in his wallet, to color his arrows for good luck, and after he had killed many goats he came across a kid which he caught and after painting its horns red and decorating its face in ceremonial design, he let it go. The following spring two strangers dressed in white blankets arrived in the village and as was the custom with guests, they were invited to the chief's house and offered food such as dried salmon, boiled dried goats' meat and dried berries, but they would not eat anything. They gave all the people an invitation to visit their village, not saying where it was, but offering themselves as guides. After leaving the house some children noticed the strangers on their hands and

knees eating grass like animals, but they did not mention this to the people at the time.

The following morning at an early hour the villagers assembled and led by the visitors, crossed the river and climbed the mountain until they reached what appeared to be a broad level expanse where stood a large feast house. This was a delusion, however, they were really on a narrow rock shelf — for the people were under the spell of the mountain. Around the house were platforms of broad planks which overhung steep precipices, and their hosts who appeared as human beings in their white blankets were in reality mountain goats.

The people were feasted and then the chief, their host, began to dance, singing a strange song of his people: "I am shaking my hoofs over the mountain side," and they saw the rock open and close again, which they could not understand.

When night came they were given sleeping places on the platforms around the house, the chiefs on the lower ones and the common people on those above. The hosts, however, took their places on the inner sides and placed the guests on the outer edges, except in the case of the hunter who the previous year had caught the kid and painted its horns red. To him came a young man whose face was decorated in red, who asked him to share his sleeping bench with him, and he alone was placed on the inner side of the platform.

In the night when all were sleeping, the goat hosts pushed the sleepers off into space and all were killed except the young hunter who had painted the horns of the kid, who in truth was his host and protector in human form.

When he awoke and found his friends gone he was very sad, for he saw that he was on a narrow rock shelf of the mountain side in a place inaccessible to man. But his protector took off his shoes which seemed to be hoofs and putting them on the hunter's feet he told him that with them he need have no fear, that he could jump from shelf to shelf with perfect safety. Also he told him to take them off when he reached the level ground and put them in a certain place where he could find them.

When the young hunter reached the base of the mountain he found the bruised dead bodies of all who had accompanied him to the feast and only those were left who had remained in the village.

THE STORY OF THE MOOSE HUNTER

The great moose hunter, Kuke-shan (expert in gambling with the sticks) traveled great distances in search of game but after hunting a moose and killing it, he took only the paunch which he filled with blood. This he boiled down into a thick soup which was considered a great luxury.

He was continually thirsty because he traveled far and fast and he cautioned his wife always to have water baskets filled when he was expected to return — and these he emptied at once.

During one of his trips the wife neglected to go for water, and when he was returning she heard him shouting for water. In her confusion she answered "No water!" as she grabbed the baskets and hurried to the spring. Then he was carried up to the Sun and his voice grew fainter and fainter until it was lost in the distance, for he was a child of the Sun and was always thirsty, and he could live on earth only as long as he could find plenty of water. He can be seen in the Sun, but no one must look at him because he may throw down blood from the paunch which he carries, and thus cause hemorrhage and fatal sickness.

THE MONKEY WOMAN, PIGHISH

Besides having a knowledge of the animals common to the country, the Kitksan held a general belief in mythical beings half human and half animal that lived in the depth of the forest, the inaccessible mountain tops and the waters. Such beings had been seen in early days by certain individuals, and in most instances the meetings had been productive of great good fortune. Representations of these beings had been assumed as crests and their supposed likenesses were displayed on heraldic columns, as well as upon ceremonial dress and paraphernalia.

Pighish, who was seen first by one of the Kish-hasht clan, was an animal closely associated with the land otter, although very human in appearance, and spoken of to-day as a monkey woman. The presence of Pighish was indicated by the cry of a child,

for she always carried on her back a small being much like herself.

Only one without fault could see this miraculous creature, and when the voice called, he was obliged to follow as the sun goes around four times; then he would come to Pighish. He then must take the child, which immediately appeared to be human. The mother then pleaded for her infant and it was returned to her, whereupon she agreed to grant any wish asked. In returning the child, the face of the person had to be turned away as he stepped back, lest Pighish kill him with her long claws.

This spirit is identical with the property women of the Haida and the Tlingit of the Coast.

AN OLD LEGEND OF THE GREAT HORNED OWL

There are many stories about the great horned owl (gwuk-gwu-nooks) but the one mentioned most often is in connection with the theft of children. One of the oldest of these legends, like that of the mountain goat, goes back to the days of Tumla-halm.

During the winter season of extreme cold when the great communal houses were untenantable, the people occupied very small log structures — low, shedlike and chinked with moss.

In one of these was a family including a little boy who cried continually. He was wrapped up in his rabbit-skin blanket and put to bed, but he would get up and crying go to one and another until the father said "If you do not stop the owl will take you." Finally he went to the grandmother sleeping near the door, and when she pushed him away, the door opened and in truth the owl came in and carried him off.

In the morning his family missed him, but they could hear his faint crying, so they searched far and wide but without any success. Then they commenced digging in the ground, and from this incident the collection of winter huts below the main village received the name "An wurghash" (place where they dig). Finally the father took down his bow and quiver and putting some goat's suet and red ochre in his bag, he set out through the woods. He had gone but a short distance when a grouse flew up from the trail and lit in a tree. Fitting an arrow to the bow the father was about to shoot, when the grouse cried, "Do not shoot for I will tell you of your lost boy, but first say if you have any goat's fat and red paint in your wallet and will you paint red on my eyes?" This he did and the grouse said, "How nice I look now! Go right ahead and you will see a big nest of twigs in a great spruce and in it is your boy." The father reached the tree and climbing up found the boy asleep wrapped in his rabbit-skin blanket. This was the owl's nest, and the owl had been feeding the child on live snakes, frogs and worms, telling him they were rabbits' entrails. These ate through the child's stomach and he finally died and his body was burned.

In the fall of the year when the water was low and the barricade and salmon traps bridged the river, the villagers heard someone calling from the opposite shore, and soon they saw the owl which appeared more like an old woman. As she came to the bridge, she sang, "Was it you that raised the child and took it away?" The father told some little boys playing about to pull out some of the foot boards and place dead sticks across so that any weight would break through. After doing this they called to the owl to come over knowing that she would press hard on the foot boards, and as she attempted to cross she broke through and fell into the river. As she floated downstream she came to a camping-place where children were hooking salmon. When they saw her they brought her to shore, but soon being frightened they ran away. Then she called, "Come back my grandchildren and dry me." They built a fire and wiped her feathers dry, when she became very vulgar in speech and they angrily threw her into the river and she was drowned.

EXPLORING A SPUR OF THE ANDES

By Leo E. Miller

THAT lofty spur of the Andes jutting out of the Western Range slightly below altitude 7° is known by the name Paramillo. To explore this section was the object of the expedition's leaving its base at Medellin on January 14, 1915, with equipment sufficient for about three weeks' actual field work.

The very good trail strikes toward the northwest, ascending the mountain side rapidly, so that four hours after starting we had reached the top of the range. A great cleft forms a natural pass, 8750 feet high, and saves a climb of at least an additional thousand feet. The slope on the other (western) side is more gentle.

We were immediately impressed with the barren nature of the country, for with the exception of a few patches of low brush and the clumps of withered grass, no vegetation was to be seen; and an occasional glimpse of the Cauca River far below suggested the picture of a broad yellow ribbon lying upon a brown rocky plain.

That night we reached a small town called San Geronimo (elevation 3200 feet). Near the town small patches of ground are irrigated with water brought from mountain brooks and distributed through a network of artificial ditches. In these spots rice, corn and pasturage grow, although rather scantily on account of the rocky nature of the soil.

Next morning we were on the road before six. A few hours later, on crossing the top of a small ridge, we came suddenly upon the town of Sopetrán completely hidden in a fertile little valley filled with palms, mangoes, and other beautiful trees. The cluster of some hundreds of neat white houses with red tile roofs, the well-kept streets, and the multitude of birds fluttering among the deep green foliage render Sopetrán quite the most attractive town of its size I have seen in tropical America.

At noon we reached the Cauca and crossed that sluggish, muddy stream on a well-built suspension bridge probably eight hundred feet long. Gravel banks flank the sides of the river, and bare sandy islands divide its waters. The elevation at this point is approximately two thousand feet. One league beyond the Cauca lies the town of Antioquia, altitude 2600 feet. The valley of the Cauca is here five to ten miles wide, rolling, and supports no vegetation except occasional clumps of mimosas and cacti which rather add to its desert-like appearance. The high ranges of the Western and Central Andes hem it in like huge walls of pink clay and sandstone.

We reached Buriticá January 16. Immediately after leaving Antioquia, a mere ledge of a trail begins the ascent of the Coast Range, and while a good deal of anxiety was felt for the safety of the two cargo animals, it was nevertheless a relief to escape from the intolerable heat of the low country. The altitude of Buriticá is 6200 feet.

On account of the jaded condition of the animals, we spent the morning of January 17 at Buriticá. Leaving at noon, we reached a small settlement known as Tabocal, altitude 5400 feet, at five o'clock. We could now no longer see the Cauca, our view having been shut off by a ridge of mountains several thousand feet in height which rises out of the valley between the ridge we were on and the river. A slight change was perceptible in the character of the country; extensive acres covered with low brush dotted the otherwise barren landscape, although far apart; and on the extreme tops of both ranges a thin fringe of green could be distinctly seen.

Beyond Tabocal the country is extremely broken, there being frequent rises and descents of two thousand feet. Several separate mountains, not connected with the main ranges, stand here and there like huge monuments, rising from a basal elevation of three thousand feet to eight or nine thousand feet, which naturally magnifies their already tremendous proportions.

Late in the afternoon of the eighteenth, we reached an altitude of eight thousand feet, and entered a fine strip of forest, the first we had seen since leaving Medellin. This is the beginning of the forested zone, which examination showed to be at an equal height on both the Central and Coast Ranges, and to continue to the tops, which appear to rise to an altitude of nine thousand feet or more.

The night was spent at an Indian hut called La Meseta, altitude 7900 feet just below the forest belt, and situated in the midst of an extensive strip of maize. Peque, the end of the

At one time on the way to the Paramillo, camp was made at an altitude of 10,000 feet after a climb of 5000 feet in eight hours. After leaving this camp the expedition was without water for two days

journey by mule, was reached at noon on the nineteenth. After leaving La Meseta the trail goes down abruptly; the town has an altitude of only five thousand feet. Peque boasts of about fifty decaying mud huts, and its population is mostly of Indian descent, including some pure-blooded Indians. One of the latter, Julian David, received us most cordially and rendered us every possible assistance in securing the porters for the ascent of the Paramillo.

Some of the country surrounding Peque once doubtless bore a light forest growth, with heavier forest in the ravines; but by far the greater part is naturally bare or covered with a dense growth of brush. I was told that at the time of the Spanish Invasion, forty thousand Indians inhabited this region; and as the several mountain streams supply an abundance of fresh water and its soil responds fairly well to cultivation, there seems to be no reason why it should not have supported an extensive population.

The forest zone, beginning at La Meseta at eight thousand feet, gradually extends its limits downward as we go farther north, until at Peque it reached as low as five thousand feet in the deeper and well-watered ravines; and as previously reported, at Puerto Valdivia, it reaches the very edge of the Cauca.

We secured four half-breed porters to carry the equipment and as there was no trail to the Paramillo, a fifth man was engaged to go in advance and clear an opening with his machete. On the twenty-first we started at six in the morning, following a short trail that led to a lonely hut known as El Madeiro. This three hours' walk took us through country covered with large areas of tall brush, blackberry briars and guavas, with occasional patches of forest, some of which had recently been burnt.

Arriving at El Madeiro (eight thousand feet), we plunged into the magnificent forest, going in a due westerly direction. It was our plan to follow along the top of an undulating ridge, which one of the men said was the shortest and easiest route. He knew from experience, having once visited that region some sixteen years before. It was during the course of a revolution; his father was pursued by the opposing forces and fled into the forest, taking his son, then a small boy with him, and eventually reaching the Paramillo where they spent some time.

At first the forest was fairly penetrable, but soon it assumed the character of the well-known San Antonio (above Cali) jungle, being composed of a solid wall of moss, ferns, creepers and epiphytes which burdened every tree-trunk and branch. Many birds, such as wood-hewers, yellow-headed tanagers, parrots and blue-throated jays were observed, among them a number of species common at Santa Elena.

On account of the long climb, we made camp at three o'clock, at an altitude of ten thousand feet, having ascended five thousand feet in eight hours' marching. Water was obtained in a ravine over one thousand feet lower down on one side of the ridge, and I may here add that this was the only water we had

until reaching the Paramillo, so that we went nearly two whole days without drinking.

The second day's march we had hoped would be over a gentler slope; but it was soon discovered that our ridge was composed of a succession of knolls rising from five hundred to one thousand feet above the mean level, and the forest grew denser constantly. We had to cut practically every foot of the way. In places we actually walked over the top of the masses of vegetation; the branches were a solid tangle of creepers, climbing bamboo, bromelias and mosses, and formed springy aërial bridges. More often it was easier to burrow through, and frequently "tunnels" many yards long were cut, through which the carriers crawled on hands and knees. The tops of some of the hills were void of trees, their place being taken by a dense growth of grasslike bamboo, wild oleanders, thick-leaved shrubs, and thickets of a tall, coarse grass with leaves eight feet tall and six inches wide.

Half-breed porters to carry the expedition's equipment. It was the duty of one to go in advance and clear an opening through the forest with his machete. In some places every foot of the way had to be cut; in others the party actually walked over the tops of the vegetation, a solid tangle of creepers, climbing bamboo, bromelias and mosses, which formed springy aërial bridges

A LOFTY SPUR OF THE ANDES

The Paramillo (Antioquia, Colombia) is composed of a series of sharply inclined peaks, the highest reaching an elevation of 13,000 feet, interspersed with ravines and deep fissures. The mountain sides are covered with typical paramo vegetation, frailejones, blueberry bushes and tough grass, with moss-grown bushes and stunted trees in the ravines. Birds were scarce and extremely wary — finches, honey creepers, tapacolos, cotingas and flycatchers, hummers, towhees and tanagers

We camped this night at 11,350 feet up. The men eagerly cut down clumps of bromelias hoping to obtain water, but all that the leaves contained were a few drops of a liquid mud, utterly unfit for use. Although we traveled steadily for ten hours, I doubt if we covered more than three miles.

A few hours after starting on the morning of January 23, we emerged suddenly from the dark forest. Instead of the tall, overburdened trees, there were extensive areas of bushes, evergreens, stunted pines, and plants with thick, round rubbery leaves, interspersed with clumps of tall rank ferns. Beyond stretched the bleak, wind-swept surface of the Garam.

The Paramillo region is composed of a series of sharply inclined peaks, the highest of which attains an elevation of thirteen thousand feet, interspersed with ravines and deep fissures. The surface consists mainly of dark sandstone which in many places has been shattered so that a thin litter of the particles covers the fundamental rock. Occasionally a thin vein of white quartz crops out, especially where, as often occurs, the strata stand in a perpendicular position. Water is scarce. We discovered but one small, trickling brooklet; but at the bottom of one of the crevices several potholes were found, each containing several hundred gallons.

At night the temperature fell to 28°, and ice formed in our pails half an inch thick; in the morning the ground was white with frost. The vegetation is of a typical paramo character, consisting of low clumps of frailejones, blueberry bushes and tough grass. In the ravines grow thick bushes and stunted trees, all heavily moss-covered.

Birds were extremely scarce and, strange to say, exceedingly wary. The typical slaty finch of Santa Isabel and two species of honey creepers were by far the commonest, followed by a small, slaty tapacolo. Then there were white-throated hummers and flycatchers. The finches (including goldfinches), honey creepers, tapacolos, cotingas and flycatchers, seem to belong strictly to the paramo; the hummers, towhees and tanagers it seems come only from the forests below.

It is difficult to guess just where this typical paramo bird fauna originated. On all sides excepting a break toward the west, Paramillo is surrounded by ridges, some reaching an elevation of 12,000 feet, the tops of which are covered with dense forest, so that it stands like a mountainous brown island amid the sea of green.

MUSEUM NOTES

Since the last issue of the Journal the following persons have become members of the Museum:

Patron, Mr. John H. Prentice;

Life members, Mrs. Adrian Hoffman Joline, Mrs. John Magee, Dr. J. V. Lauderdale and Messrs. George D. Barron, Russell J. Coles, Alfred M. Collins, Lee Garnett Day, John W. Mercer and R. G. Packard, Jr.;

Sustaining member, Mrs. N. M. Pond;

Annual members, Mrs. W. H. Button, Mrs. E. Brunswick, Mrs. Lillian M. Charles, Mrs. K. D. Cheney, Jr., Mrs. Charles Douglass, Mrs. Joseph Herzig, Mrs. George Leary, Mrs. Joseph Loewi, Mrs. William Mitchell, Mrs. C. W. Pierson, Mrs. Horace F. Poor, Mrs. Eleanor Atkinson Read, Mrs. George S. Ring, Mrs. Howard C. Smith, Misses Constance Griggs and Anna L. Slater, Dr. José D. Alfonseca, Dr. George H. Semken, Dr. Jules A. Vuilleumier, Dr. B. W. Weinberger and Messrs. John Aitken, Albert B. Ashforth, Frederic D. Barstow, Henry G. Bartol, Paul Baumgarten, Richard A. Carden, Albert Heymann, George S. Hoyt, Vincent Loeser, M. R. Mayer, Philip Ainsworth Means, Carl Schurz Petrasch, Henry M. Rau, Max Rosenberg, Charles Salomon, Francis Upham Stearns, S. H. Stone, C. J. Stubner, Lambert Suydam. Jr., Herbert Syrett, Harry Tipper and a membership in memoriam to Mr. André C. Champollion.

In accordance with resolutions taken by the First Pan-American Scientific Congress, meeting in 1908 at Santiago, Chile, a Second Pan-American Congress will be held in Washington, D. C., in December, 1915, under the auspices of the United States Government. Through the courtesy of the Pan-American Union the offices and sessions of the Congress will be located in the Pan-American building and the Director-General of this organization will act as Secretary-General of the Congress. The purpose of the Congress is to foster the cordial relations existing between Pan-American countries and to give a broader acquaintance with current progress in education, public health, international law, antiquity of man, conservation of natural resources and all branches of scientific research. At the recent invitation of the Secretary-General, the American Museum appointed as official representatives, Dr. Frank M. Chapman, delegate and Dr. Herbert J. Spinden, alternate.

The one hundred and third meeting of the National Academy of Sciences of the United States of America will be held in New York City, at the American Museum of Natural History for three days in November beginning the fifteenth.

On Monday, the first day, a lecture will be given in the auditorium by Dr. Michael Idvorsky Pupin, of Columbia University, on "The Problem of Aërial Transmission," to be followed by a general reception in the hall of the Age of Man. On Tuesday morning, Tuesday afternoon and Wednesday morning, public scientific sessions will be held in the west assembly hall of the Museum at which various short papers will be read. Among those scheduled are: — "The Nature of Cell Polarity," by Prof. Edwin G. Conklin of Princeton University; "Heredity of Stature," by Dr. Chas. B. Davenport of the Carnegie Institute, Cold Spring Harbor, New York; "Origin of the Gall Midges," by Prof. E. P. Felt of the Geological Hall, Albany; "Fossil Calcareous Algæ from the Panama Canal Zone," by Prof. Marshall A. Howe ot the New York Botanical Garden; "Recent Explorations in the Cactus Deserts of South America," by Dr. J. N. Rose of the Smithsonian Institution; "Can we observe Organic Evolution in Progress?" by Dr. Herbert Spencer Jennings of John Hopkins University; "A Suggested Explanation of Orthogenesis in Plants," by Prof. John M. Coulter of the University of Chicago; "The Life of Radium," by Dr. Bertram B. Boltwood of Yale; "The Colorimeter as an Interpreter of Life Processes," by Prof. Graham Lusk of the Russell Sage Institute of Pathology; "The Solar Radiation and its Variability," by Charles G. Abbot of the Smithsonian Astrophysics Observatory; "Interference of Light Waves of Slightly Different Length," by Prof. Carl Barus of Brown University; "The Influence of Certain Minerals on the Development of Schists and Gneisses," by Dr. Charles R. Leith of Wisconsin University; "Glacial Sculpture of the Mission

Range, Montana," by Prof. W. M. Davis of Harvard; "Crystallization of Quartz Veins," by Waldemar Lindgren of the United States Geological Survey.

President Henry Fairfield Osborn of the American Museum, will speak on "The recently mounted skeletons of Tyrannosaurus and Ornithomimus in the American Museum of Natural History." He will describe the two extremes of carnivorous dinosaur adaptation which these specimens respectively represent. Dr. Frank M. Chapman, curator of ornithology at the American Museum, will read a paper on "The Distribution of Bird Life in Colombia: a Contribution to a Biological Survey of South America," and Mr. C. William Beebe, curator of birds, New York Zoölogical Park, on "The Origin of Flight in Birds."

Since Mr. Donald B. Macmillan has not returned from the Arctic in time to present to the members this fall an account of the Crocker Land expedition which he led North in 1913, arrangements have been made to show to members of the Museum on the evening of December 9 the motion pictures secured by Sir Douglas Mawson on the Australasian-Antarctic expedition. A brief account of the expedition and a description of the action of the films, will be given by Mr. George H. Sherwood, curator of education at the American Museum of Natural History. These films give a wonderful picture of the coastal animal life of the Antarctic: penguins, seals, sea-elephants, sea-leopards, snow petrels, cormorants, giant petrels and many other little-known species in apparently limitless number. The violent windstorms and blizzards so common in the Antarctic, and the giant icebergs and towering ice cliffs of that region are strikingly shown in the pictures.

A restoration of the dodo has been presented to the Museum by Walter Winans, of Surrenden Park, England, and is now on exhibition in the bird hall of the second floor. It has been suggested that this bird should properly find a place in the Metropolitan Museum of Art, among the representations of figures of ancient mythology; but although there appertains to the restoration no actual relic of any dodo, it is not a work of imagination only, having been prepared in the taxidermy studio of Rowland Ward in London, from existing paintings of an actual dodo, the skull and legs of the restoration being cast from relics in the British and Oxford museums. The accuracy of the representation of the dodo presented by Mr. Winans is vouched for by Ogilvie Grant of the Zoölogical Society of London.

At a recent meeting of the Executive Committee of the American Museum the new position of research associate was created on the scientific staff of the institution. Dr. C. R. Eastman was appointed research associate in vertebrate palæontology, and Mr. M. C. D. Crawford, research associate in textiles.

The Board of Supervisors of the County of Los Angeles has acknowledged the receipt from the American Museum of a gift of casts of Charles R. Knight's restorations of the imperial mammoth, the northern mammoth and the American mastodon. These casts have been placed in the Museum of History, Science and Art of Los Angeles, associated with the skeletons of these animals found in the La Brea asphalt beds.

The American Museum has recently purchased a fine mastodon skull found on the farm of Mrs. V. Frye at Fulton, Indiana. With it were another incomplete skull, two lower jaws, and a considerable part of a skeleton. Both skulls are of females, distinguished by small size and short and slender tusks. The three fine specimens of *Mastodon americanus* in the Quaternary hall, the Warren skeleton, the Shawangunk skull and the Ashley skull are all males. The new acquisition enables us to compare male and female skulls in the mastodon as well as in the mammoth, in which there was a similar difference in size of tusks. These tusks, about three feet long and three inches in diameter, are well worn at the tips, and would seem to have been much more useful weapons or tools than the huge tusks of the male mastodon. One can scarcely avoid the conclusion that the massive tusks of the males were chiefly ornamental and of very little service to their owners — detrimental indeed rather than useful in fighting, in digging, or in traveling through woods or brushland. These and various other specimens of the mastodon and its Tertiary ancestors will shortly be arranged in the northwest corner of the Quaternary hall on the fourth floor of the Museum.

At a meeting of the Section of Biology of the New York Academy of Sciences in the American Museum on October 11, Dr. A. J. Goldfarb, of the College of the City of New York demonstrated his theory of the physiochemical origin of certain abnormal forms. Dr. Goldfarb showed on the screen his production of double sea-urchin embryos by placing their eggs in certain chemical solutions, which dissolved the fertilization membrane and permitted the eggs to adhere to one another. His experiments would indicate that metabolic derangements may be the cause of the occurrence of similar abnormalities in higher species. He found that the extent of the derangements following partial or complete fusion of eggs was roughly proportional to the area of the surfaces brought into contact.

In the death of Dr. Charles F. Holder, in Pasadena, California, on October 11, this country loses one of its older marine naturalists. Born in Lynn, Massachusetts, August 5, 1851, he early evinced an interest in natural history, and in 1871 was appointed assistant curator at the American Museum of Natural History, to assist his father, who had been associated with the Museum since its inception. Dr. Holder in speaking of his work there said a few years ago: "I remember the opening of the Museum distinctly. I had been on the Florida reefs with my father for years, and had a practical knowledge of marine zoölogy which had whetted my appetite for science, and the gradual unfolding of the collections was a delight." Dr. Holder resigned his position in the Museum in 1875 and soon afterward accepted the chair of zoölogy at Throop College, Pasadena. At the time of his death he was honorary curator of its museum. Dr. Holder was the author of many books and a member of many distinguished scientific societies.

The annual Autumn show of the Horticultural Society of New York was held in the American Museum of Natural History November 4 to 7 inclusive. Chrysanthemums were the feature of the exhibition and among them the enormous bush plants shown by Mr. Adolph Lewisohn of Ardsley, New York, made a striking appearance. One of these, a yellow R. F. Felton seventeen feet in diameter and with fifteen hundred blooms, is the largest ever grown.

Mr. George C. Longley has presented to the Museum the collections of his last winter's archæological work on the Island of Jamaica. They contain two human skulls from limestone caves, and a large number of stone celts, potsherds, and bird, fish, and animal bones. This gift has been added to the very large collection previously presented by Mr. Longley, and will be found on exhibition in the South American gallery.

The collection of fossil mammals, obtained in Alberta by Mr. Barnum Brown, associate curator of vertebrate palæontology at the American Museum, was shipped from Sweetgrass, Montana, on October 27 and is expected to reach New York in November.

A Moriori skull, recently purchased by the Museum, has just arrived from Australia. The Morioris are an aboriginal race from the Chatham Islands, and are spoken of as ancestors of the Maoris.

Miss Mary Cynthia Dickerson, curator of woods and forestry and associate curator of herpetology at the American Museum, attended the celebration of the fiftieth anniversary of the opening of Vassar College as the delegate of the Museum. The inauguration of Henry Noble MacCracken, Ph.D., L. H. D., as President of the College was the occasion for notable addresses by Dr. John Huston Finley, commissioner of education for New York, Dr. George Lyman Kittredge, of Harvard University and President Henry Noble MacCracken. The Pageant of Athena, composed by students of the College and presented under the direction of Miss Hazel Mackaye in Vassar's new out-of-door theatre, represented a very high standard of achievement. A series of moving tableaux pictured phases of the development of woman's intellectual life in the past, "the web of Athena's weaving," from Sappho in the sixth century before Christ to Eleva Lucrezia Cornaro of the seventeenth century after Christ, who was elected to the doctorate of the University of Padua. At the close, after the procession across the stage of the several hundred actors representing the past, there followed many hundred Vassar girls of to-day — presaging woman's intellectual life of the future.

Professor C.-E. A. Winslow has taken up his new work as professor of public health

at the Yale Medical School, New Haven, but in his capacity as curator of public health at the American Museum he will be in New York regularly on Tuesdays.

Dr. George F. Kunz, honorary curator of gems in the American Museum, has been awarded a gold medal at the Panama Pacific Exposition for his collection of publications on gems. Tiffany and Company, with whose firm Dr. Kunz has long been identified as gem expert, have been awarded the grand prize for their collection illustrating the formation of gems under changing mineralogical and geological conditions. The books and monographs by Dr. Kunz occupy one case of the Tiffany exhibit.

Mrs. Adrian Hoffman Joline has recently been elected a life member of the Museum in acknowledgment of her generous contributions to the funds of the Asiatic expedition for the collection of mammals. Major John V. Lauderdale, Surgeon United States Army has also been made a life member in appreciation of his gift to the Museum of a collection of ethnological specimens.

Messrs. Frank E. Lutz and A. J. Mutchler spent six weeks of the past summer studying and collecting insects and spiders in Porto Rico. The work was a part of the insular survey being made under the auspices of the New York Academy of Sciences. Considerable territory was covered, especially in the western portion of the island. More than fifteen thousand specimens were obtained.

On Friday evening, November 19, Dr. G. Clyde Fisher, assistant curator of public education at the American Museum, will lecture to the adult blind of New York City and Brooklyn on "Bird Neighbors and their Homes." The procedure at this and subsequent lectures will differ from that at previous lectures, in that small habitat groups of the birds and their nests will be placed in the entrance hall that the blind may handle them and thus have a definite idea of the birds as they are mentioned in the lecture. The doors will be open for the inspection of birds and their nests at 7.45, the lecture following at 8.15. On December 17, Mr. Ernest Harold Baynes will lecture to the blind on animal life.

The twentieth free exhibition in the art gallery of the Washington Irving high school, Irving Place, New York, consisted of primitive American textiles loaned by the American Museum of Natural History. Peruvian cloth and weaving implements, and Navajo, Chilkat, Saltillo and Chimayo blankets comprised the exhibit.

A course of lectures open to school children will be given at the American Museum on Monday afternoons at four o'clock, beginning November 1 and lasting through December 6; Wednesday afternoons, beginning November 3 and lasting through December 8; and Friday afternoons beginning October 2 up to and including December 10. A people's course will be given on Tuesday and Saturday evenings in conjunction with the department of education at 8.15 and will continue through December 21.

Dr. L. P. Gratacap, curator of mineralogy at the American Museum, has just returned from a recreative trip of two months over Canada. Traveling from east to west, he enjoyed a rapid survey of the plains of Manitoba, Saskatchewan and Alberta, with some examination of the commercial and economic features of Winnipeg, Medicine-Hat, Calgary and Sudbury, also impressions of the geological developments of the Rockies and the Selkirks.

During the past year Mr. Roy C. Andrews has been preparing a monograph on the sei whale (*Balenoptera borealis* Lesson), a fine skeleton of which he secured in Japan during the summer of 1910. Although the sei whale has formed the basis of the summer fishery of the Japanese for some fifteen years, it had never reached the attention of a scientific observer and was supposed not to occur in the Pacific. The forthcoming monograph is the result of collaboration with Professor Hermon von W. Schulte of the department of comparative anatomy of the College of Physicians and Surgeons, New York City, who has made an elaborate study of the soft anatomy of a sei whale fœtus which Mr. Andrews brought from Japan in 1910. This is the first time that the anatomy of any species of large whale has been treated in a monographic form.

The Garner African Film Company has recently been organized for the purpose of

sending Mr. Richard L. Garner to Africa to get motion pictures of the native and animal life of that part of the country which he knows so well. He will make especial effort to secure motion pictures of gorillas and chimpanzees. Mr. Garner is well known to the public as the man who years ago made a study in Africa of the language of the gorilla and chimpanzee. The directors of the new company are Mr. Carl E. Akeley of the American Museum, Messrs. Raymond L. Ditmars and H. R. Mitchell of the New York Zoölogical Society and Mr. William C. Glass.

Dr. Robert H. Lowie, leaving the Museum early in June, visited the Kiowa to ascertain the character of their military societies, and spent the remainder of June and the month of July with the Hopi of Arizona paying particular attention to their clan and family relationships. He attended the meetings of the American Association for the Advancement of Science and of the American Anthropological Association at Berkeley during August, and was official delegate at the Panama Pacific Exposition, representing the Borough of Manhattan on Manhattan Day.

Among important recent additions to the hall of public health in the Museum is a model showing the increased efficiency of the present hospital service at Panama over that of the French period. This model shows a hospital in the French period in care of a Sister of Mercy. Puddles of water were allowed to gather about the ground, and the legs of the beds were placed in cans of water to prevent ants from crawling up. As we now know, yellow fever and malarial fever mosquitoes bred in such accumulations of stagnant water and helped to keep the hospitals well filled. Screens were not used and the ventilation was not of the best. The companion part of the model shows a French hospital, altered to conform to our most modern ideas and knowledge of the relation of insect and disease. A clean, dry cellar, well-kept grounds, screens, increased ventilation and the care of trained nurses serve to change an insanitary, disease-breeding building into the acme of sanitation.

Through the generosity of Mr. Ogden Mills the Museum library has received a copy of the colored edition of the famous *Antiquities of Mexico* by Lord Kingsborough. This monumental work in nine folio volumes, published 1831–48, was originally undertaken by Lord Kingsborough in order to test the theory, then prevalent, that the American Indians were the lost tribes of Israel. He made facsimile reproductions of all native manuscripts from Mexico and Central America then known, including many famous codices of the Maya and the Mexicans; republished many valuable government reports and collected all available evidence bearing upon Mexican civilization. The work contains one thousand plates, colored by hand from the originals, embracing the remains of Mexican picture-writing, architecture and sculpture, thus giving to the world a record of one of the most wonderful civilizations ever known. There are facsimilies of the ancient paintings and hieroglyphics preserved in the royal libraries of Paris, Berlin, Dresden and Vienna; the Vatican Library; the Borgian Museum at Rome; the library of the Institute at Bologna and the famous Bodleian Library at Oxford. To-day this work, containing as it does the only reproductions ever issued of a number of very important native manuscripts, is absolutely indispensable to students of Mexican archæology.

During the past summer Messrs. Roy W. Miner and Herman O. Mueller of the department of invertebrate zoölogy of the Museum, investigated the marine coastal fauna of Porto Rico, as a part of the biological survey of that island being made by the New York Academy of Sciences. Headquarters were established at Ensenada on Guanica Harbor through the courtesy of the Guanica Sugar Centrale which furnished many facilities to the expedition. Collecting was carried on in Guanica Harbor and the adjacent portions of the coast, including the outlying coral reefs from Guayanilla Bay westward to Cabo Rojo. This summer's work together with that of last season completes the survey of the entire western half of the south coast of Porto Rico, besides the work already done at San Juan on the northern coast and Mayaguez on the western coast.

The classification of the shore fishes collected by the Townsend "Albatross" Expedition to Lower California in 1911 is now nearing completion. This work has been done by Dr. Raymond C. Osburn of the New York Aquarium assisted by the Museum's department of ichthyology. The collection includes sixteen new species besides several others which were very little known.

The American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

Open free to the public on every day in the year.

The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people. It is dependent upon private subscriptions and the fees from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world. The membership fees are,

Annual Members	$ 10	Patrons	$1,000
Sustaining Members (annually)	25	Associate Benefactors	10,000
Life Members	100	Associate Founders	25,000
Fellows	500	Benefactors	50,000

Guides for Study of Exhibits are provided on request to members and teachers by the department of public education. Teachers wishing to bring classes should write or telephone the department for an appointment, specifying the collection to be studied. Lectures to classes may also be arranged for. In all cases the best results are obtained with small groups of children.

The Museum Library contains more than 60,000 volumes with a good working collection of publications issued by scientific institutions and societies in this country and abroad. The library is open to the public for reference daily — Sundays and holidays excepted — from 9 A. M. to 5 P. M.

The Technical Publications of the Museum comprise the *Memoirs*, *Bulletin* and *Anthropological Papers*, the *Memoirs* and *Bulletin* edited by J. A. Allen, the *Anthropological Papers* by Clark Wissler. These publications cover the field and laboratory researches of the institution.

The Popular Publications of the Museum comprise the JOURNAL, edited by Mary Cynthia Dickerson, the *Handbooks*, *Leaflets* and *General Guide*. The following list gives some of the popular publications; complete lists, of both technical and popular publications, may be obtained from the Librarian.

POPULAR PUBLICATIONS

HANDBOOKS

NORTH AMERICAN INDIANS OF THE PLAINS. By Clark Wissler, Ph.D. *Paper, 25 cents; cloth, 50 cents.*

INDIANS OF THE SOUTHWEST. By Pliny Earle Goddard, Ph.D. *Paper, 25 cents; cloth, 50 cents.*

ANIMALS OF THE PAST. By Frederic A. Lucas, Sc.D. *Paper, 35 cents.*

ILLUSTRATED GUIDE LEAFLETS

GENERAL GUIDE TO THE COLLECTIONS. New edition issued December, 1914. *Price, 25 cents.*

THE COLLECTION OF MINERALS. By Louis P. Gratacap, A.M. *Price, 5 cents.*

NORTH AMERICAN RUMINANTS. By J. A. Allen, Ph.D. *Price, 10 cents.*

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH. By George H. Pepper. *Price, 10 cents.*

PRIMITIVE ART. *Price, 15 cents.*

THE BIRDS OF THE VICINITY OF NEW YORK CITY. By Frank M. Chapman, Sc.D. *Price, 15 cents.*

PERUVIAN MUMMIES. By Charles W. Mead. *Price, 10 cents.*

THE METEORITES IN THE FOYER OF THE AMERICAN MUSEUM OF NATURAL HISTORY. By Edmund Otis Hovey, Ph.D. *Price, 10 cents.*

THE HABITAT GROUPS OF NORTH AMERICAN BIRDS. By Frank M. Chapman, Sc.D. *Price, 15 cents.*

THE INDIANS OF MANHATTAN ISLAND AND VICINITY. By Alanson Skinner. *In preparation.*

THE STOKES PAINTINGS REPRESENTING GREENLAND ESKIMO. *Price, 5 cents.*

BRIEF HISTORY OF ANTARCTIC EXPLORATIONS. *Price, 10 cents.*

TREES AND FORESTRY. By Mary Cynthia Dickerson, B.S. *A new edition in course of preparation.*

THE PROTECTION OF RIVER AND HARBOR WATERS FROM MUNICIPAL WASTES. By Charles-Edward Amory Winslow, M.S. *Price, 10 cents.*

PLANT FORMS IN WAX. By E. C. B. Fassett. *Price, 10 cents.*

THE EVOLUTION OF THE HORSE. By W. D Matthew, Ph.D. *Price, 20 cents.*

REPRINTS

THE GROUND SLOTH GROUP. By W. D. Matthew, Ph.D. *Price, 5 cents.*

METHODS AND RESULTS IN HERPETOLOGY. By Mary Cynthia Dickerson, B.S. *Price, 5 cents.*

THE WHARF PILE GROUP. By Roy W. Miner, A.B. *Price, 5 cents.*

THE SEA WORM GROUP. By Roy W. Miner, A.B. *Price, 10 cents.*

THE ANCESTRY OF THE EDENTATES. By W. D. Matthew, Ph.D. *Price, 5 cents.*

THE AMERICAN MUSEUM
OF
NATURAL HISTORY

FOR THE PEOPLE
FOR EDVCATION
FOR SCIENCE

THE AMERICAN MUSEUM JOURNAL

THE CONGO UNDER BELGIAN RULE
OLD RUINS OF NEW MEXICO
NEWS FROM THE ARCTIC
HUNTING IN THE ADIRONDACKS

The American Museum of Natural History

THE AMERICAN MUSEUM JOURNAL

VOLUME XV DECEMBER, 1915 NUMBER 8

CONTENTS

MARY CYNTHIA DICKERSON, *Editor*

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Photo by DeWitt C. Ward

MR. HERBERT LANG, LEADER OF THE
AMERICAN MUSEUM'S CONGO EXPEDITION, 1909–1915

THE AMERICAN MUSEUM JOURNAL

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AN EXPLORER'S VIEW OF THE CONGO

By Herbert Lang

Illustrations from photographs by the Author

The history of the Museum's work in the Congo is well-known to JOURNAL readers.[1] Mr. Herbert Lang, leader, and Mr. James P. Chapin, assistant, have carried the Congo expedition successfully through more than six years' work in Central Africa. The expedition was organized in 1909 on a tentative basis of three years' work and was supported by the contributions of the following men of New York: Messrs. John B. Trevor, Charles Lanier, Cleveland H. Dodge, J. P. Morgan, Jr., William K. Vanderbilt, A. D. Juilliard, Robert W. Goelet and William Rockefeller. An extension of time for the work, in order to complete a zoölogical survey of the unexplored territory, was made possible through the Jesup Fund of the Museum.

Mr. Lang and Mr. Chapin have now returned, and the large and splendidly preserved collections with their valuable data, ready for extensive scientific research as well as for the construction of habitat groups for exhibition, have reached America and are safely housed in the Museum buildings. The following article by Mr. Lang on the natives of the Congo, is authortative in that it is based on a six-years' intimate acquaintance with natives of many tribes and a six-years' first-hand knowledge of conditions in the Congo.— THE EDITOR

GREAT progress in civilization unfortunately often seems to be accompanied by incidents which throw some gloom on the result. At the time of the Belgian occupation of the Congo Basin no other power coveted this particular piece of territory. Practically all of its inhabitants were cannibals, a large portion had been laid waste by Arab slave-traders and by the Mahdists, and the country certainly deserved its reputation of being one of the most unhealthful regions.

Other European nations had had plenty of opportunity to carry the torch of progress into the swampy regions of darkest Africa, but the possession already by these colonizing powers of really prosperous colonies seems to show that political, financial and commercial advantages were preferred by them to what they probably considered a glorious but venturesome task. The Congo was therefore left to the King of the Belgians. Nor would it have been advantageous to continue to abandon its natives to the Arab slavers with their indescribable atrocities; to the Mahdists, who had already left a large and once prosperous section of Africa in a nearly desert condition, and to the horrors of the internecine warfare which is the inevitable sequel of cannibalism. It was well that some power should undertake the civilization of the natives even though difficulties and misunderstandings might ensue.

If there had been (as some critics of the government seem to infer there were)

[1] The full story of the aims of the expedition and its start from New York on May 8, 1909, is told in the JOURNAL for October, 1910; various brief articles regarding the work in progress have appeared at intervals between that date and the present.

vast numbers of noble-minded and well-equipped men available for this task, progress would undoubtedly have been easier; but most men were deterred by the dangers and discomforts, and those offering their services were naturally of an adventurous and independent character. In many cases it proved to be a question as to whether the King of the Belgians could accept the responsibilities that naturally were connected with the services of such people, because positions in the Congo in those early periods often meant full autocratic power, with very little immediate control by superior officers. In the greater part of what has been written however, about the Congo and its administration, these initial difficulties are overlooked and more criticism than praise has been bestowed. Men of high distinction and indubitably noble sentiments have enrolled themselves in the campaign against this administration, in perfect good faith and in the belief that they were rendering a service to humanity.

The greatest reproach — the matter which seemed to arouse unlimited criticism — was the collecting of rubber by natives in payment of their taxes, and the stories of the horrors connected therewith. There is no doubt at all that the sale of this rubber netted some very handsome financial gains, and certainly honest criticism was much needed at one time in order to correct the methods employed by some of the administrative officers, who were naturally anxious to show what they considered high ability in administrating their territories; or to put it correctly in just these faulty cases, in ruling what they considered their own little kingdoms.

What was needed however was not a campaign against atrocities, but an honest effort toward improving certain conditions so as to induce a larger number of men of a higher type to live in the Congo. These might have devoted themselves actively to civilizing efforts, and by their very presence a change in defective conditions would have been brought about without causing embitterment. As a matter of fact, if the well-being and civilization of the natives alone are to be considered as the ultimate object of conquest, there are few portions of Africa which have a higher record for truly remarkable advance than the Belgian Congo itself; but the impetuosity of the unfortunate campaign of the reformers is responsible for producing a number of laws of such great leniency that the strong and successfully guiding hand is often stayed by inappropriate measures, which positively injure the general welfare of the natives. Some of these laws actually seem systematically to encourage degradation by openly encouraging idleness, although the negro would be perfectly willing to contribute his share to the progress and elevation of his race, which will probably never be attained except by giving him a fair chance for useful work and by establishing correct compensation.

This unsatisfactory legislation indeed, seems to have been the chief result achieved by the agitators, whereas if we consider the Belgian Congo as a whole, with a view to determining what great reforms have benefited the natives, we find that it is to the Belgian government that they are essentially due.

The natives of the Congo like meat, and from all we saw they enjoy a marvelous digestion. They have been called by opponents of the government "poor defenseless children." As a matter of fact there were eleven millions of cannibals, who in a single day probably killed for mere food purposes more of their unfortunate fellow-men than the number laid by these critics at the doors of all

COLLECTIONS OF THE CONGO EXPEDITION STARTING THEIR LONG JOURNEY TO NEW YORK

Caravan of a hundred porters leaving the post of Faradje. Government officials courteously arranged for transportation of the loads from post to post by relays of black porters in charge only of a native assistant. They walk ten to fifteen miles a day carrying a load of sixty pounds each. It is a fact of much interest that out of the 1287 loads carried over a distance of fifty days' porterage with only occasional supervision by white men not a single load disappeared or met injury. This is suggestive of the satisfactory government administration and of the state of contentment among the natives

Old Mobali man. The hair is allowed to grow long in age; the young men wear it shaven or short

the trespassing government officials together. Even their dead were often sold to neighbors to satisfy the hunger for meat. Incidentally this horrible practice produced some fairly good results in eugenics, as in many tribes weakened people or crippled children helped to nourish their more sturdy brothers.

Azande woman. The headdress is made of human hair, woven upon a framework of rattan and decorated with cowrie shells

From the very start the government stopped internecine war and cannibalism; invited professional reformers; made traveling through these regions practically safe; established a system of river navigation; drove out slave-traders and Mahdists; introduced an elaborate judiciary system, and built in spite of apparently insurmountable difficulties, a two-hundred-and-forty-mile railroad near the coast belt, which really meant the opening of the Congo to the world at large.

For over two years we lived in a district where, at that time, probably greater quantities of rubber were being collected by the natives than in any other region of the Congo. We often received specimens for our zoölogical collections from these rubber caravans which entered the forest for a week or a fortnight. In fact they considered us rather as friends and thus we had ample opportunity of seeing them at work. Only a few remarks are necessary to throw light on the general conditions as we observed them.

Long ago, when cannibalism was still flourishing, these negroes always left between the localities of the principal tribes large, uninhabited belts in the forest, so that the chance of continued or immediate invasion by their ever-hungry neighbors might be slightly reduced. This belt was naturally also the hunting ground, as in such a reservation game was fairly abundant, and not many natives would dare to venture alone into this wilderness. At certain periods however, two or three times a year, the great chiefs would collect their natives and would enter this uninhabited forest-belt, either to gather household necessities

or with the intention of organizing a raid upon the villages beyond. They often formed caravans of several hundred individuals — men, women and children — carrying everything for the necessities of life with them, most of the men of course being armed with spears and arrows. No halfway respectable negro would leave his wife in the village. Even the chief's more important women would have considered it a disgrace if they had been compelled to stay at home. Naturally the children were only too glad of an outing and no mother would leave her youngster behind. The forest supplies these negroes with everything their small plantations are unable to provide: building and household material; meat to be dried over the fire; the hides of game; plants for medicines; a great many charms; in fact everything they cannot find in the neighborhood of their villages, where they have usually cut down the forest.

A "Parisienne" of the Mangbetu tribe. The head is bound with a fine cord made of raffia, banana fibre or hair, while the natural hair is woven into a frame of rattan fibre. This toilet takes two days to perform

Rubber collecting is exactly the same kind of occupation as this other collecting, only it excludes all raids. There is not the slightest change, except that the natives add rubber to all the other things they gathered before. The remuneration given by the state at the time we entered the Congo was still in trade goods of excellent quality. In 1910 the natives, in spite of delivering this rubber as taxes, received more for it than later in 1914 after the introduction of currency, as the price of this commodity had then dropped in the European market. When we passed through the same region again the natives openly complained that the commercial agents paid even less than the government officials formerly.

Before the advent of the government these natives had to work much harder, as a result of the continued destruction brought about by internecine war. Villages were burnt down and plantations destroyed and the men had to rebuild and replant and always to keep them-

Makere woman. The concha of the ear is cut out as a tribal mark, and a bone pin is worn through the nasal septum

selves fit for fighting. After the pacification of these regions, which actually contained so many able-bodied men, it was surely better that they should be intelligently organized so that their unemployed energies might serve the progress of civilization, than that they should be left to drunkenness and sloth. In most of the districts there was nothing of value but rubber and ivory, and the natives were put to work to collect some of the rubber. They prefer this work to porterage or road-making, which latter they consider a woman's occupation.

The freedom of trade and the introduction of currency could hardly have been brought about more rapidly. In many districts however, the first arrivals representing this freedom of trade were of the most ordinary class of adventurers, who considered the native but an object for their greed. The wisdom of withholding these people so long was abundantly apparent, for only the confidence which the government officers enjoyed among the natives saved the lives of some of them. These natives are rather independent in their decisions and rash in action.

To-day the country is well policed; the natives are — or at least were before the war — perfectly peaceful, and in our six years among them we never saw a single atrocity. Fortunately the position of the lower administrative officers has been rendered much more attractive,

Pygmies from Nala, in the Uele District. They live by hunting, and exchange their spoils with the agricultural tribes for vegetables. Two hundred of them visited the expedition and many allowed plaster casts to be made of their faces

The pieces of iron in the shape of spearheads represent currency and, together with the dog and lumps of crude iron, constitute the man's offering to the parents for his bride. The chief of the tribe, in public palaver, decides as to the justice of the bargain

and now most of the men engaged look upon their more stable position with satisfaction. This alone does away with irresponsible actions and the increased comfort and security tends greatly to minimize the dangers of the dreaded Congo climate. Many of the local disturbances in administrating the native population have been due to the temporary illness or general indisposition of European officers, who on this account were unable to show that high degree of patience and firmness which the successful handling of these natives requires.

The latter express themselves as fairly content, comparing past times with the present. Only one blessing they still covet, "The remedy to avoid ultimate death." They have not the slightest tendency toward philosophic speculation, nor are they capable of attaching themselves readily to purely spiritual beliefs. Their happiness or safety depends, according to their idea, upon all sorts of conditions or objects which, like a talisman, are supposed to possess powers of preventing mischief or disaster. So imbued are they with these superstitions that death, with all of them, is not the final and natural destruction of life but the result of witchcraft.

Those who know the natives well never doubt that their faith is infinitely stronger than that of many Christians. Their superstitions are more than a belief. These superstitions often represent stern laws the very cruelty of which frightens them away from wrong-doing. This is the rock of salvation for reform.

These natives sometimes kill their fellow-men without what may be called a trial, but it is only a few hundred years since white men killed thousands of their brethren simply because they had a dif-

ferent faith or conviction, and it is only to-day that they recognize that the defective organization of society is responsible for many criminals. None of the natives indulge any longer in cannibalism; yet those most anxious to help them, and many of the professional reformers, speak even now about their "degraded condition," "shameless manners," and "behaviour like animals," perhaps because the warm climate allows them to walk about in just the state that seems, from all accounts, to have been the most satisfactory in Paradise.

Makere women and children watching a dance. The children's heads are wrapped to lengthen the occipital region, this elongation being considered a mark of beauty. The dancing costume of the women consists of a green banana leaf slit into ribbons

They are not necessarily degraded because they enjoy life according to their own standards, which in essentials do not differ so very widely from those of civilized people; nor because they are capable of living well on native food without silverware or china. It is true that they are born and die in the densest superstition, but this latter is their religion, their code of morals, their own very rigid set of laws, which binds them together in spite of all savage feeling in true democratic spirit. The negroes we saw displayed a most admirable spirit of fellowship, cordially assisting one another in any difficulty. They might be hungry themselves but they unselfishly divided their food, and this so naturally that anyone could see that the contrary would have constituted a breach of the generally accepted standards. The greatest fallacy in judging natives is the common habit of travelers and many residents of basing their judgment about them upon information received from workmen, servants or half-civilized negroes. Even the most truthful individuals among these natives generally try to speak from the white man's point of view, displaying in this great shrewdness, so that any question asked is answered with the desire of pleasing the inquirer. This really ac-

MAKERE NATIVES, BACK FROM A HUNT

The nets they carry are fastened together and supported vertically by sticks so as just to touch the ground. The animal is tracked and driven toward the nets by the aid of the hunting dog with its wooden bell

counts for the many contradictory statements as to what would benefit these tribes most and what might be their greatest grievances.

The missionary societies in many cases receive special subsidies and are teaching mainly elementary classes in principal centers such as Boma and Stanleyville, some extending facilities for certain branches of industrial training. A really unified system of education can be introduced only when the facilities of communication lead to a greater centralization of the now widely scattered population.

It is probable that the present warfare in Central Africa, and especially in the Congo Basin, will prove relatively more disastrous to the black race of these regions than the European war to the different nations engaged therein; in spite of the fact that the belligerents on both sides have given out orders to the native soldiery to direct their principal aim to the destruction of the commanding white officers, so that it is not remarkable that only very few black men have been killed in the various engagements. Neither firearms nor explosives will play havoc among the natives, but unfortunately the greater part of the territory in which this warfare is waged includes the districts most affected by the terrible sleeping-sickness, such as the Uganda, Tanganyika, Katanga and Sanga frontiers. Thousands of armed natives will certainly be infected before their dispersal at the conclusion of the war. They will carry this dread disease into nearly every region. Since the tsetse flies, the carriers of the sleeping-sickness germs, are widely distributed they will cause the rapid spread of this plague, for if they have an opportunity to suck the blood of only one infected person they may cause disaster by transmitting the disease to others living nearby. Once a region is thoroughly infected the natives are simply wiped out. This condition is the more hopeless since the usual prophylactic measures are considerably weakened as a result of the war and there is thus practically no hope of checking the scourge; for it needs the most exacting efforts of a well-equipped medical service, which entails an enormous expenditure. Most authorities believe that after the conclusion of peace there will be no large funds available for the benefit of African colonies.

Logo women dancing in thanksgiving for a good harvest

REPRODUCTIONS IN DUOTONE OF PHOTOGRAPHS GIVING GLIMPSES OF THE LIFE OF THE NATIVES IN THE CONGO

Photographed in Africa between 1909 and 1915 by Mr. Herbert Lang

LOGO HUNTERS OF FARADJE, UELE DISTRICT

They use these large bows and arrows for the bigger game, as antelopes and wild pigs. In war they pull the string with a twang which startles the foe, causing him to stop or turn, when a quickly fitted arrow brings him down. The small bells attached to the bow each indicate a particularly fine shot; during a hunt the bells are stopped with leaves but at a dance they jingle merrily. The man in front is a famous elephant hunter, the most famous in his tribe

THE RIVER ATUA, NEAR FARADJE, IN THE DRY SEASON

In May Mr. Lang's party crossed this stream on one of the long, damlike ridges of rock, but coming back in July was obliged to wade almost shoulder-deep at the same spot, balancing on the rock to avoid the water, sometimes fifteen feet deep, on either hand

AZANDE SPEARMEN "SHOWING OFF" IN MANZIGA'S VILLAGE, NEAR NIANGARA

The Azande, or "Niam-Niam," are famous as warriors, and during the latter half of the nineteenth century were continually making war on their neighbors to the southward, pushing their way from the Sudan down into the more fertile Bomokandi, where they are now firmly established, and where they have learned and adopted much in the way of material culture from their neighbors the Mangbetu, Makere and other tribes

MANZIGA, A CHIEF OF THE AZANDE

All important Azande chiefs in this region belong to the Avungura, the reigning clan. Most of the Azande believe that after death they will be reincarnated as animals, and the Avungura will then become lions. Manziga is one of the most important native chiefs around Niangara, ruling a large territory. He is unusually intelligent and exhibits much tact and diplomacy in dealings with the Belgian administration

HEAD WIFE OF CHIEF ABIEMBALI: MAYOGO TRIBE, ITURI DISTRICT

Beneath the small, square-topped hat of woven vegetable fiber, she wears a sort of skull-cap adorned with hundreds of dogs' teeth, mostly canines. The crown of the hat is decorated with the red tail-feathers of the African gray parrot, which bird is often kept in captivity so that the much prized feathers can be pulled out as fast as they grow. The larger hatpin is made entirely of ivory, while the smaller consists of a thin, pointed bone from the forearm of a monkey

IVORY HORNS AND WOODEN TOM-TOMS OF THE MANGBETU

These are carried after a chief to enliven a journey or used to beat time for dances in the village. Small boys make especially expert drummers and most of the noise is produced by the two small tom-toms in the center, a single beat from the larger ones being interposed only at intervals. Note in background the regularity of the designs painted in red, black and white on the walls of the houses

DANCE OF THE MAKERE, CELEBRATING A SUCCESSFUL HUNT

These are forest people and were formerly preyed upon by the Azande, but now are free from oppression and ruled by their own chiefs. The small aluminum medals, worn by two of the men, are government receipts for taxes

SCENE IN A MANGBETU VILLAGE NEAR RUNGU

The walls of the houses are covered with strips of bark, and the roofs made water-tight with broad, flat leaves attached by their stems to the rafters and bound with bark cords. In the foreground is a large signal gong, hewn from the trunk of a tree and shaped like an animal, the head and tail providing handles. It is used to signal from village to village or to summon for feast or dance

DANGA, A PROMINENT MANGBETU CHIEF

Beside him stand two female body servants and behind are some of his people. The large medal hanging from his neck is the official sign of his rank as recognized by the Belgian administration. Of this he is very proud. His village is shown above

NATIVE BRIDGE ACROSS THE BIMA, NEAR NIAPU

It consists of many slender poles bound together by strong vines and capable of great resistance to the current when the stream is swollen by rains. The building of such bridges is encouraged now, together with the opening of roads through the forest, but before the advent of Europeans intertribal war prevented most native travel

MALELE CHILDREN AS THEY GATHER TO PLAY IN THE VILLAGES

There are no orphans in the Congo, in the sense of homeless children. Food is plentiful and bringing up children involves little labor or expense; thus an orphan child is always taken into another family. These children lead happy, carefree lives and, by helping in village and garden, learn without special training the domestic and other arts of their parents

DANCE OF AZANDE WOMEN, NEAR FARADJE

Though dances have often religious significance, they are also indulged in for pastime. Dances of this circular, slowly-rotating type, with drums beaten inside the circle and singing, are to be seen in widely separated districts, and are favorites with native workmen in government stations on Sunday afternoons

Mexican laborers at work clearing a part of the oldest eastern section of the ruin at San Pedro Viejo. The debris thrown out is a mixture of ashes and lumps of adobe from the fallen walls, in and under which are buried numerous human skeletons; also various implements, pottery, charred maize, and animal bones. View looking northwest

ANCIENT CITIES OF NEW MEXICO[1]

By N. C. Nelson

LONG before Columbus and his Norse predecessors set foot on American soil there had arisen a peculiar type of town-building people in the southwestern part of the United States. This is a fact which at first strikes the observer as paradoxical. To the modern traveler who hastens across New Mexico and Arizona by train or auto, the country seems foreign, being apparently devoid of all the forms of life familiar to him in the East. He sees mostly bare, tawny-colored plains and rockbound mesas, interspersed with black lava-sheets and flying sand. The beds of nearly all of the tortuous streams winding through the landscape are dry and lifeless and he consequently deems the whole region a desert waste incapable of supporting human existence.

This estimate is only partially correct however, for while the southwest is arid and desert-like it is nevertheless far from infertile. Natural oases exist in this, as in other deserts, and artificial oases can be and have been created and maintained, from early aboriginal days to the present. In this region the ruins indicative of former life number tens of thousands. Not only this but the particular environmental conditions obtaining here, and which appear so unfavorable, have produced, in a certain sense, the highest type of native American culture that we have within the limits of the United States. In speaking of the Southwest therefore, two outstanding factors, viz., aridity and fertility, must always be mentioned in conjunction. These two factors have wrought

[1] This article was written by Mr. Nelson on November 2, out-of-doors, as he sat on the ruin under process of excavation and watched the men work. It was despatched to New York the day following from Camp Pueblo Pasko, Sante Fé, the expedition's immediate base of operations in New Mexico. The illustrations in this article and the following are from photographs by Mr. Nelson.—The Editor.

Excavated rooms in another of the oldest sections of the San Pedro Viejo ruins. Directly beyond the excavations is the ancient cornfield and farther on the Arroyo San Pedro. In the distance are the San Pedro Mountains. View looking east

themselves deeply into the life and character of the native people and have largely made them what they are.

Town-building in the Southwest had its beginning in the distant past and reached its climax before the arrival of the white man. The first native settlers (at least in the northeastern section of the pueblo area) who have left definite traces of themselves, appear to have lived in more or less thickly scattered small houses of one or two rooms. Just what relation these small-house dwellers bore to later village dwellers is not yet clear, except in so far as their general mode of life appears to have been identical. The question as to what brought about town-building is not easily answered. One may be strongly inclined to say that the Indian village (of which there are several types) had its origin in bare economic necessity. This assertion cannot however entirely preclude social and defensive considerations, and so, if we are to be on safe ground, we must allow credit to all three factors — economic, defensive and social.

The particular type of pueblo studied

during the past three or four years by the Museum's expedition to the Rio Grande valley of New Mexico includes some of the largest ancient towns known in the Southwest. The ruins vary in size to be sure but several of them contain, or contained, from five hundred to three thousand five hundred rooms and more. The number of their inhabitants cannot be definitely estimated, but judging from the present-day Indian villages, some of which show a population ranging from one hundred to one thousand seven hundred, these ruins must in their day have sheltered even larger groups. These towns-people were not, as in our own modern cities, great masses of unorganized humanity, continually competing for a living at multifarious pursuits. They were rather closely organized coöperative societies, essentially communistic.

Excavated section across a communal building at Pueblo Tunque, showing the full width of six rooms. The walls are of adobe and in good condition, but the rooms do not ordinarily show such regularity in size and arrangement

The Indian's needs were few but those few were imperative. In consequence of this his activities were limited and correspondingly intense. Agriculture was his mainstay and good crops generally depended on artificial watering. Under such circumstances, one man being unable single-handed to maintain an irrigation system, the natural outcome was coöperation. Coöperation was similarly necessary for purposes of defense against the inroads of less provident neighbors; for as there is no reason for supposing these permanently settled agriculturists to have been aggressive warriors, we

IN THE SAN PEDRO VIEJO RUINS

Excavated series of rooms in one of the oldest sections. The space to the right and beyond is a mass of collapsed adobe buildings. View looking south

CAVE AT THE BASE OF POTRERO VIEJO, NEAR COCHITI

Artificially enlarged cave in the volcanic tufa. Hundreds of such caves exist in the locality and all were once inhabited by Indians. This one served also as camp for members of the Museum expedition while a ruin on the top of the towering mesa was being excavated

must think that their safety lay in well-organized defense. What more natural therefore, than that they should have coöperated in the planning and construction of large houses, capable of sheltering every family or household of the group and especially adapted for defense? Large communal houses are frequently found which must have been two to five or more stories high and which contained several hundred rooms. The majority of the ruined villages contain a series of these large houses, arranged on a quadrangular plan; this arrangement being also, clearly, an element of defense.

In other words the typical village finally evolved in the area under investigation by the Museum is suggestive of our modern apartment-house cities but differed from them in this fundamental respect; that the Indian built his houses where our streets are and left intervening blocks open, not for the sake of light and air perhaps, but as places for industrial and social activities.

That type of village is now practically extinct. The Indian need no longer guard himself against marauding neighbors and the government stands ready to help him with his irrigation projects. Schooling has also had its effect on the younger generation. The compact communal settlements are breaking up and the Pueblo Indian is returning once more to the life in separate and scattered houses like his ancient forefathers.

Excavated room in the San Pedro Viejo ruin, showing two bins and one fireplace — the latter set into the floor; also some of the mealing stones and cooking slabs found in the debris

Excavated rooms at San Pedro Viejo, showing a human burial, also two pottery vessels set into the floor for storage purposes

EXPLORATIONS IN THE SOUTHWEST BY THE AMERICAN MUSEUM

By Clark Wissler

THE Museum began in 1909 a systematic investigation of the native inhabitants in the great romantic area known as the Southwest. Of all localities in the United States this is the richest in archæological remains and the most conservative and aboriginal tribes are found within its borders. In the past, enough research had been carried on in the Southwest to make it clear that the magnitude and complexity of the problems to be solved were beyond the limits of the regular resources of the Museum, and that it would be unwise to take up work in that part of the country until substantial outside support could be found. In 1909 Mr. Archer M. Huntington offered to give support to the undertaking. Accordingly, the curator of anthropology worked out a general plan, in conformity with which the work has proceeded until now.

In the main this plan was to take up the historical problem in the Southwest to determine if possible the relations between the prehistoric and historic peoples. It was decided to concentrate the Museum's energies upon the Upper Rio Grande Valley, because that seemed

Excavated rooms in Pueblo Tunque, showing connecting doorways, also a corner bin and a human burial accompanied by two broken pottery vessels

Cross-section of an artificial dam at Pueblo San Cristobal. The Tano villages that were not by nature supplied with sufficient water, possessed large reservoirs constructed by throwing a dam across a shallow ravine in order to catch the rain and melting snow

Corrugated jar found in the corner of a room in the oldest section of the San Pedro Viejo ruin. Note the solid adobe floor on level with the top of the vessel but dug away except at the rear

most likely to have been the chief center of Pueblo culture as we now know it, and because there were to be found there numerous ruins which according to Bandelier, belonged to the immediate ancestors of the living people. The studies of the living races were to include not only the sedentary natives of the Rio Grande Valley, but also the less sedentary people of the same area, in particular the various groups of Apache and the Navajo. It was contemplated that when the historical problem in this particular area had been brought to a fair completion, the work would be extended westward into Arizona so as gradually to unravel the historical puzzle of the Southwest. While this was a very ambitious undertaking, the reports of our several field parties [1] show that

Excavated room at Pueblo Tunque, showing a small enclosure framed with stone slabs and within which a *metate* is fixed in place for grinding maize

[1] Schedule of Field-Work, 1909–1915:

1909 — Dr. P. E. Goddard first began work among the Apache of Arizona and New Mexico and Dr. H. J. Spinden began his investigation of the Rio Grande Pueblo peoples. Dr. Clark Wissler spent a considerable part of this year and 1910 in a general survey of the field to the end that more systematic detailed plans might be developed.

1910 — Dr. Goddard continued work among the Apache tribes and the Navajo and Dr. Spinden continued the investigation of the Rio Grande pueblos. Miss M. L. Kissell made a special investigation of the textile arts among the Papago and Pima tribes.

1911 — Dr. Goddard made a special investigation of the Kiowa-Apache; Dr. Spinden continued his work among the Rio Grande pueblos.

1912 — Dr. Wissler made a second general survey of the field especially in connection with the contemplated archæological work by Mr. N. C. Nelson. Mr. Nelson made a general surface survey of the whole Rio Grande Valley from El Paso north, and later in the season began the systematic investigation of pueblos in the Galisteo Basin. This included the thorough excavation of Pueblo Kotyiti, a site whose history was fully known but which had been in ruins for more than two hundred years. Dr. Spinden continued his work among the Rio Grande pueblos.

1913 — Dr. Spinden completed his work among the Rio Grande pueblos. Mr. Nelson continued his archæological work in the Galisteo Basin.

1914 — Dr. Goddard was again investigating the Apache and was accompanied by Mr. Howard McCormick to secure sketches and photographic material for exhibition purposes. Mr. Nelson continued excavations in the Galisteo Basin.

1915 — Professor A. L. Kroeber of the University of California volunteered to spend the summer at Zuni Pueblo where he secured a large collection for our exhibition halls and made a special study of Zuni social organization, and in addition gathered data on the ruins in the vicinity

very substantial progress has been made in the solution of the problem, and that in so far as the Rio Grande Basin is concerned, a definite conclusion has been attained.

As the work now stands the ethnological survey of the Rio Grande villages (by Dr. Herbert J. Spinden) has been nearly completed. In this work especial attention was given to material culture and art, since these are the two phases of culture that survive and leave their indices in archæological collections. Investigation of the less sedentary peoples (by Dr. Pliny E. Goddard) has progressed satisfactorily so that we now have fairly complete studies for several divisions of the Apache. It remains for the future to extend the work to the Navajo. The archæological work (by Mr. N. C. Nelson) was begun in 1912 and as far as the northern part of the Rio Grande Valley is concerned is now nearly complete. The net result of this work has been to make clear the chronological relations of the various ruins in the vicinity, which in turn enables us to determine their historic relation to the living peoples.

It is planned that the work shall continue more intensively during the next few years than heretofore, since the way is now clear to a chronological classification of many groups of ruins. Thousands of dollars have been contributed to unearth the ancient civilizations of Egypt and the East, while here within our very borders are crumbling ruins of a past that has an intimate relation to our national history.

from which a chronological or historical classification of them can be made. Dr. Robert L. Lowie visited the Hopi pueblos to study their social organization and relationship systems. The specific problem here is to see whether any important Shoshonean traits of culture still survive among the Hopi, since they are a Shoshone-speaking people. Mr. Nelson again worked in the Galisteo Basin and made surface surveys southwestward to the vicinity of Zuni. In coöperation with the University of Colorado an expedition among the cliff ruins of Southern Colorado was carried on.

Image of a "panther," sculptured in volcanic tufa, found lying in the center of a ruined circular shrine on top of Potrero de los Idolos, a short distance west of the Rio Grande and the Tano habitat proper. The shrine is said to be still visited by the Indians of Pueblo Cochiti whose ancestors are supposed to have built the place

ANIMALS OF BLOWN GLASS

By Herman O. Mueller

THE technique of glass-blowing is many sided and allows construction of intricate and truthful models from life, of animals as well as of plants such as the famed Harvard glass flowers. The invention of the blowpipe at the early date of the first century before Christ, opened up an era for glass-modeling. In the process previous to that time molten glass or "glass paste" had been molded free-hand over a clay form, which could be easily removed after the glass cooled.

The blowpipe consists of an iron tube about one and one-half inches long and one and one-fifth inches in diameter, with the aid of which the glass paste is blown to the desired shape. The mechanical tools which the glass-blower uses have always been very simple and relatively unimportant, but the natural instruments — the eye and the hand of the worker — are of the greatest significance.

The blast lamp is an essential part of the equipment, but the trained eye and hand of the worker are his most important tools

The most important instrument in glass-blowing is the blast lamp. This is a very simple affair and consists of a brass tube about three-quarters of an inch in diameter and three to four inches long, into which a smaller tube is inserted. The larger tube supplies the gas and the smaller one the air. The relative quantity of gas and air is regulated by means of cocks attached to the tubes. A steady air pressure to increase the heat intensity of the flame is created by means of bellows, or still better by a compressed-air pump.

In early times an oil lamp was used in this apparatus, and the name "lampen arbeiter" was applied to the users to distinguish them from the workers in the glass factories. In some of the European glass-blowing districts the oil lamp is still used for glass-blowing. The gas lamp however is of course far superior. It naturally produces a considerably more powerful flame, and this makes possible the modeling of much larger objects. Other tools for glass-modeling are forceps of various shapes, scissors, carbon and iron pencils of different sizes and forms, and files. The forceps are used for handling the separate pieces of glass while being welded; the scissors are used for cutting away the superfluous glass; the carbon and iron

pencils for widening the openings in glass tubes or finished parts, and the files for cutting glass tubes and rods. No iron molds of any kind are used for preparing glass models in the American Museum, but all parts are shaped freehand from glass tubes and rods. Colored glass is frequently used for the colored parts, but if the desired tints and shades of glass are not available, plain crystal glass is molded into shape and the colors applied later with the brush or with an air-brush.

The process of using glass as a medium for representing animals will be realized in some degree if we follow the construction of a glass model — for example, that of a colony of the protozoan *Gonium*. From a glass tube of about one-half inch diameter, a piece about two inches long is separated by means of the blast lamp, blown in the flame to a cuplike shape and opened out to its whole width at one end. The gas flame is brought into action on the opening and the force of the flame will by itself enlarge the opening; but if the carbon pencil is rotated inside the heated area at the top of the cup this will flange it out more quickly.

Stages illustrating the modeling in glass of the microscopic animal *Gonium*.

These little, single-celled creatures live in colonies of sixteen together, and there may be very many such colonies in a drop of water

To imitate the coloring seen in the living *Gonium* individual, which seems to shade from a deep green below to a light, almost transparent tint above, hundreds of little green glass particles are welded to the inner surface of the glass cup before it is widened out, until the desired tints are secured. To do this a green-colored glass rod is broken up into small pieces and these are further ground in a mortar to the desired grain. A small quantity of these particles is strewn inside the cup which is then rotated in the gas flame until the green parts begin to fuse and adhere to the wall of the cup. This process is repeated until the desired intensity of the color is secured. When the green particles are applied thickly the color is more intense; when scattered, a lighter tint results.

After this the other parts of the animal such as nu-

cleus, vacuoles and chromatophores, are fashioned separately from small tubes or solid rods of colored glass and fastened within the cup. The nucleus is blown from a small green glass tube into a hollow ball about one-quarter inch in diameter. One end is cut open for inserting the nucleolus which has been previously shaped from a green rod into a little solid bead. This is of a darker color than the tube used for the nucleus. To the solid bead, or the nucleolus, a short glass stem is attached by which it is to be supported within the hollow ball. When the nucleolus is inserted into the ball, a little spot of the shell of this ball is heated and the support of the nucleolus is fused to the wall of this shell. Then the opening of the shell is covered with enough hot glass to close it, and the nucleus is completed. The vacuoles are blown in the same manner as the nucleus, only they are of crystal glass and consist of only one shell. Nucleus and vacuoles have little stems attached to them by which they are fastened in the cup. The supports are placed where they will show least.

After all the parts are ready to be inserted in the cup, one after the other, they are held in place by the forceps, a small area of the outer wall of the cup is heated and the supports of the parts are fused to the inner cup wall. When this is done, the cup is closed by heating the glass around the rim opening and drawing it together until a rough closing is obtained. The superfluous glass which forms in this manipulation, is pulled away little by little, and the resulting unevenness of the surface is smoothed out by reheating the closed portion and blowing several times through the hol-

Early stage in the modeling of a simple radiolarian [1]

[1] Radiolaria are tiny, one-celled animals which possess the faculty of extracting silica from sea water and forming with it skeletal structures to protect their soft, jelly-like body. They are found in both fresh and salt water, particularly the latter, and are usually microscopic, but giants among them may attain the size of a pin's head. There may be very many in a single drop of sea water, especially in the warmer seas, and they exhibit great variety of form

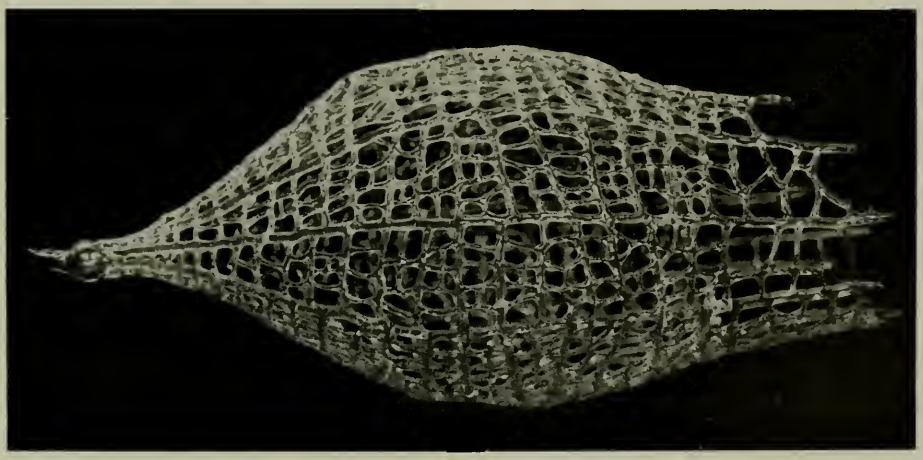
low handle at the base of the cup. The air blown through the handle expands the heated glass and rounds off the cup. Then two short glass stumps (to which later flagellæ are to be attached) are fused to the top. Finally the point at the lower end where the cup was attached to the original tube, is melted off and a short glass stem to serve later for the concealed attachment is fastened in its place, but a little to one side of the axis. Following this a somewhat larger cup is made and the finished closed cup is inserted into it, the outer cup is in

Model representing a highly magnified specimen of the hydrozoan [2] *Tubularia harrimani.* Welding the fine, threadlike cilia involves great difficulty; a very little careless manipulation will cause the blast lamp to mow down whole areas of them

[2] Hydrozoa are stationary, jelly-like animals which attach themselves to fixed or floating objects and feed on the marine organisms which come within reach of their waving tentacles. Many of these creatures are microscopic and many live attached to one another in colonies. Many of these latter may be seen in the wharf-pile group at the American Museum

Glass model of a jelly fish forming part of the wharf-pile group in the Darwin Hall of the American Museum. The two squids shown in the picture and the colonial hydrozoa attached to the wharf-pile are also fashioned in glass

Usually the glass models are made with constant reference to the actual animal under the microscope, but in the case of this rare specimen of radiolarian very carefully made drawings, plates and diagrams only were available. A complicated model sometimes takes two or three months to construct



Model of another radiolarian, highly magnified. When these minute organisms die their skeletons collect on the sea bottom forming a siliceous ooze. The island of Barbados, an elevation of the sea bottom, consists very largely of this radiolarian ooze and Barbados earth is used by jewellers for grinding and polishing

its turn closed and rounded off, and to this finally the two whiplike flagellæ are attached. These are first drawn out from a glass rod into straight threads about the thickness of a fine needle, and then are curved by passing the glass threads through the flame several times in different directions. Now the glass stem retained at the lower end of the outside cup for a handle, is cut off short to serve as a concealed support for attachment to the final mount. Models for the other fifteen individuals composing the colony are now constructed in the same way and arranged on the mount in their proper places — and the model is complete.

The model of the radiolarian further illustrates methods of glass-modeling. From a solid glass rod one-quarter inch in diameter, nine smaller rods are fashioned each about one-eighth inch in diameter and about four inches long. These are somewhat bent and attached at equal distances to the rim of a perforated cup previously blown to represent the skeleton of the central capsule. In this way the principal framework of the skeleton is prepared. In order to give it greater stability during the work, slender glass supports are welded temporarily to the lower ends of the rods. Then beginning at the central capsule small glass rods are welded horizontally to connect the larger elements of the skeleton, until finally the whole network is completed as shown in the figure of the finished model.

Many protozoa are beset with countless hairs or cilia, and in representing these the welding of such closely set, fine structures on the models involves great difficulty. Even on models representing great magnification these cilia are often so fine that a little careless manipulation with the blast lamp will cause whole areas of the heated cilia to collapse, mowed down like grass before the mower's scythe.

Although molten glass may be brought into hundreds of different shapes, nevertheless the methods of blowing are always practically the same. It is the setting together of the separate parts however which requires great care and alertness, for when once the parts are wrongly joined they can be corrected only with difficulty or not at all, and it is usually necessary to reconstruct the entire piece from the beginning.

In many cases, where several parts are welded together, the finished structure must be thoroughly annealed. This is best done by greatly diminishing the air pressure in the blast lamp, when the glass parts are rotated steadily for some time in the smoke and flame of the weakened jet. This is necessary because in working the glass for a long time, alternately thinner and thicker places will occur. These produce an uneven tension and the glass will break if it is not carefully annealed.

As mentioned above the methods of glass blowing are very simple. Only skill in the worker is necessary to produce the most diverse shapes from the molten material. In order to attain this skill, years of training for hand and eye are necessary. The calling of the glass-blower so to speak is an inheritance from antiquity. The sons grow up to the father's trade and devote themselves from early youth to the acquisition of the all-important feeling and skill.

THE AMERICAN MUSEUM'S REPTILE GROUPS IN RELATION TO HIGH SCHOOL BIOLOGY

By George W. Hunter

Chief of Biology, DeWitt Clinton High School, New York City

THE concept of "adaptation to environment" is one of the most difficult to teach pupils of high school age, whereas it is one of the most valuable from the civic standpoint.[1] Particularly is this true of New York City boys and girls, because of their lack of previous knowledge of the

[1] The DeWitt Clinton High School of New York City has classes in biology each year containing between two and three thousand young men. The American Book Company has recently published a small volume by Mr. Hunter on civic biology for high schools, from which the following is quoted. The quotation gives a glimpse of the aim of the work: "Field [and Museum] trips, when properly organized and later used as a basis for discussion in the class room, make a firm foundation on which to build the superstructure of a course in biology. The normal environment, its relation to the artificial environment of the city, the relations of mutual give and take existing between plants and animals, are better shown by field and museum trips than in any other way." ...."Many of us live in the city, where the crowded streets, the closely packed apartments and the city playgrounds form our environment. It is very artificial at best....We must remember that in learning something of the natural environment of other living creatures we may better understand our own environment and our relation to it."...."The physiological functions of plants and animals, the hygiene of the individual within the community, conservation and the betterment of existing plant and animal products, the big underlying biological concepts [such as adaptation] on which society is built, have all been used [in the book] to the end that the pupil will become a better, stronger and more unselfish citizen."— Editor.

factors of the normal outdoor environment of plants and animals. This, it seems, is true to a degree of any city child, but it is especially noticeable in the children of the lower congested portions of our great city, with its complex artificial environment and its absolute lack of normal relations existing between plants and animals in nature.

To an increasing degree therefore, the American Museum has come to play an important part in filling in and rounding out certain biological concepts as taught in our secondary school courses in this city. Not only is the Museum fulfilling its "big brother" capacity through sending out its loan collections of hygiene charts, its bird and insect collections, but also within its walls it has several valuable collections and groups which are of very great direct service to those of us who are near enough to use them for laboratory exercises. The hygiene exhibit, with its striking moral of public and private sanitation and hygiene, applies directly and indeed constantly, in its many-sided relationship, to the biological problems as taught in a city high school. The Darwin hall, with its synoptic collections, enables the older pupils in advanced high school courses to obtain the meaning of evolutionary series, variation and the struggle for existence. The bird, reptile and amphibian groups are of especial value to the high school pupil and teacher because of the clear text illustrating adaptations.

All the readers of the JOURNAL are doubtless familiar with the habitat bird groups and the no less beautiful bullfrog group. But not all perhaps, are aware of the new toad group, which with its neighbors, the bullfrog, giant salamander and desert lizard groups, lies modestly hidden in the black recesses of the alcove on the second floor. Those of us who know Miss Dickerson's *Frog Book* and its value, recognize at once the authoritative effectiveness of this series of groups.

The new toad group breathes the very atmosphere of spring, with its opening buds and apple blooms. A tiny pool, spring-fed, close to the broken-down stone wall, the tangle of shrubs, undergrowth and cat brier, the spring flowers — violets, adder's-tongue, cowslip — and the warblers perched on shrub and tree, mark the time of year. The chief value of the group, from the standpoint of the teacher of biology, lies in the amphibian life that it contains, and the usefulness of these types in demonstrating the idea of adaptation to environment.

In the right-hand corner of the group may be found numerous specimens of our common tree frog (*Hyla versicolor*). I say numerous with intention, because at each successive visit to this group I have found at least one more specimen, tucked away in some inconspicuous place and blending perfectly with its surroundings. What better material could we ask for the study of the adaptation illustrated by protective coloration? (And this in spite of the Neo-Darwinians!) Toward the back and at the left are found examples of Fowler's toad, one of our two common toads. Its life history is suggested in the egg strings, fresh laid at the first of May, and the adults, which we know in connection with gardens and dry land, also in the water. On the opposite side of the group is seen the larger and browner American toad and its tiny black tadpoles; for this toad lays its eggs about two weeks earlier than the Fowler's toad.

It is unnecessary to tell a teacher that in order to have a successful field or museum trip, he must first visit the locality, pick out the salient points of interest and work out a series of con-

nected questions. These questions must be so arranged that the groups of students taking the trip will be scattered with the focus of work at several centers. The reptile and frog alcove is quite an ideal place for a laboratory exercise because the children taken there may be scattered at work on the several groups and at the same time be near enough to come under the direct supervision of the teacher in charge. The outline which follows will serve to indicate the use that one teacher has made of this alcove and will also illustrate one of the several perhaps equally good methods of working out such a museum trip for the large classes found in the high schools of this city.

Museum Trip to visit the Frog and Toad Groups in the American Museum of Natural History

Purpose of the trip — To study adaptations to environment.

Directions — Begin work at one of the two groups on which questions follow. Read the labels in front of each group and learn all you can about what the group contains before you begin to answer the questions. Then answer the following, making the answers tell a connected story for your notebook. Ask questions of your teacher only when you cannot find the answer yourself.

Questions for Study of the Toad Group

1 — What time of year does it seem to be? How do you know?

2 — What wild flowers are most abundant at this time in this locality?

3 — What animals are found living in the water? On the land or in the trees? Is any kind of animal living both on land and in the water? What are such animals called? (*Amphi = both*)

4 — Look for specimens of the tree frog (*Hyla versicolor*) at the right-hand side of the group. Describe three different phases of color in these frogs. How are changes of color in the nature of adaptations?

5 — Describe where and tell when toads lay their eggs. (Look in the right-center of the group.)

6 — Compare the egg masses of the toad with those of the frogs. (Note left center of the toad group for eggs of the green frog.) How are the eggs protected?

7 — Enumerate all the enemies of a toad seen in this group and tell how the toad is fitted (adapted) to escape from each of these enemies.

8 — Mention three structural adaptations found in a toad or frog which fit it for the life it leads. Explain exactly how each structure you have described is an adaptation.

Questions for Study of the Bullfrog Group

1 — Show three ways not mentioned in the last question in which the bullfrog is fitted or adapted to its environment.

2 — How do you account for the large size of the tadpoles in the frog group? How is this long life of the tadpole of interest to the man raising frogs for market?

3 — What are some of the enemies of the bullfrog? How might it escape from its enemies?

4 — Explain exactly how a frog catches an insect. (See left-hand side of group.)

5 — Compare the habitat of the bullfrog with that of other amphibians found in the groups in this alcove. How is it fundamentally like the others and how does it differ?

Similar questions might be worked out for the lizard and salamander groups. Doubtless other teachers have worked out questions; a collection and compilation of such questions would be of value to those of us visiting the Museum frequently. All of us who now work in the Museum with our classes agree that the work we do there is yet in its very beginning. Its possibilities are almost limitless and with the splendid coöperation of the Museum authorities which we have had in the past, the future scope of Museum use by high school pupils and teachers will only be limited by the proximity of the Museum to the classroom or the willingness of the teacher to coöperate with the Museum authorities.

BACKGROUND STUDY FOR DEER GROUP

The painting, made by Mr. Courtenay Brandreth to form the background of the Museum's group, represents a spot on Shingle Shanty stream in the Adirondacks much frequented by the Virginia deer of that region, which like to wade in the stream and feed on the succulent lily pads and alder leaves

Leaving camp on the way to the salt-lick. [From motion-picture film]

HUNTING DEER IN THE ADIRONDACKS [1]

By Roy Chapman Andrews

FOR eight miles through the Brandreth Preserve in the Adirondacks, Shingle Shanty stream follows a winding, twisting course, at last losing itself in Lake Lila. Everywhere the stream is beautiful, its dark water, as a perfect mirror, reflecting the balsams, pines and feathery tamaracks of the virgin forest. Dark green alders form a thick curtain on either bank, sometimes giving place to small, grassy meadows but closing in again as the stream narrows, to lock hands across the water.

The "blind" at the salt-lick. A huge, green bag, kept open by a spread umbrella supported in the ground. This is where Mr. Andrews lay in wait with the camera. [From motion-picture film]

During midsummer when the blazing sun has dried the woods and the air is fragrant with the scent of balsam, deer wade into the stream to feed upon the succulent lily pads and grass which choke its course.

Our tents were pitched on a curve of the stream in a grove of spruce and balsams, where we had a clear view for two hundred yards up the broad path of water to a ragged sky line cut by the pointed summits of pines and tamaracks. I shall never forget the first night in camp at the close of a perfect day. When the yellow rays of the lowering sun shot deeply into the forest the hermit thrushes began their evening song, every liquid, flutelike note clear-cut and wonderfully musical against the background of perfect stillness. As the light dimmed, one by one the thrushes ceased, leaving only the voices of a few "whitethroats" sleepily calling to one another from the alders across the stream. Then the stars came out, low and brilliant in the clear air, and in the night our tent glowed from the light within like a great golden pumpkin in the forest.

The next morning work began. At daylight we were in the canoe, stealing

[1] Through the courtesy of Colonel Franklin Brandreth and Mr. Frederick Potter, the Museum was granted the privilege of securing on their preserve at Brandreth Lake the specimens and accessories for a group of Virginia Deer. The Museum is also indebted to Mr. Courtenay Brandreth for the background study, a photograph of which is here reproduced.

Flashlight picture of two does at the salt-lick in the forest. The salt was placed in an old tree trunk a month before the advent of the hunters, so that the deer had become accustomed to going there

Our camp on Shingle Shanty stream in the Adirondacks

noiselessly down the stream, hugging the bank on the open stretches and shooting swiftly around the narrow curves, hoping to catch a deer in the water feeding on the lily pads. I sat in front with the motion-picture camera on the very bow and a rifle by my side, but the work was not very evenly divided for my wife in the stern was responsible for all the paddling.

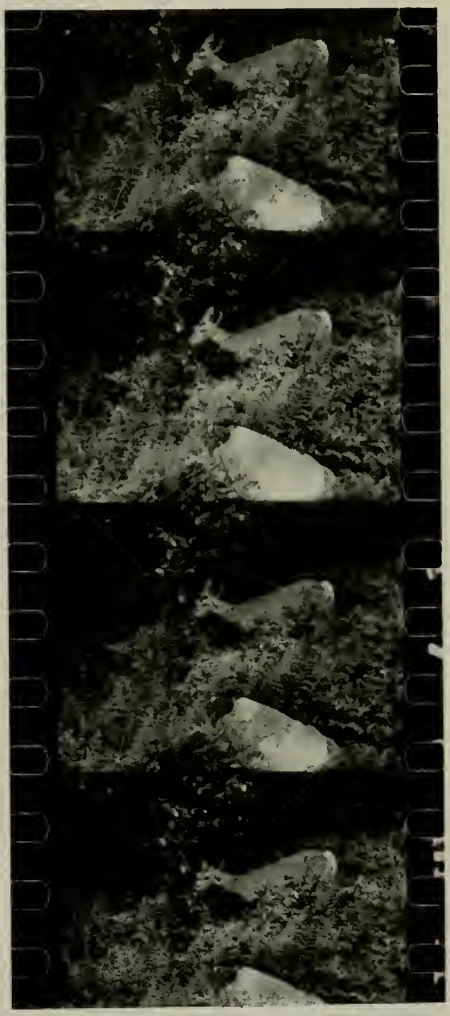
We were out seven hours but it was a morning of disappointments for, from a heavy rain two days before, the water everywhere covered the grass and other vegetation growing in the stream. Several times deer crashed in the bushes

beside us but we could not see through the leafy wall of alders. It was evident that, until the water lowered, work on the stream was useless, so we next tried a "salt lick" above camp. A month before we came, Courtenay Brandreth had filled an old log half full of salt and it was now so torn and pawed that the story was there for all to read.

The lick lay in a lovely spot beside the water under two splendid pine trees, veritable castles in the air. In the bushes across the stream we concealed one of Dr. Chapman's bird blinds, which consists of a huge green bag kept open by a spread umbrella supported in the ground. Inside we placed the motion-picture camera and settled ourselves on two camp stools with books and a rifle.

All the afternoon we waited, kept in a fever of excitement by a deer which snorted and stamped in the forest behind

This little doe returned again and again, insatiably curious to solve the mystery of the camera. She was always easily frightened however, and it took ten hours of crouching in the blind to obtain the film



Young doe feeding among the alders. Startled by the whir of the hidden motion-picture camera, she stood for only a few seconds. [From motion-picture film]

Off to cover. This series of five photographs from the motion-picture film represents only one-sixth of a second in action

the lick but was too suspicious to come to the water. The next day there was better luck and for ten hot, breathless hours we sat in the bushes, fighting mosquitoes and "punkies" but thrilled by the picture before us.

We had reached the "blind" at six o'clock in the morning and it was eight before anything happened; then suddenly there came a soft swashing in the water below. A deer was wading slowly up the stream and as its head appeared around a clump of alders, not ten feet away, I started the camera. With a snort of surprise the animal dashed up the bank into the woods. It was a two year old doe out on an early morning ramble, and I was sure she had been so badly frightened that we would not see her again that day. Her curiosity, however, counterbalanced her fear and half an hour later, with a few nervous snorts and much stamping of her pretty feet, she ventured down the hill toward the old log. When the whir of the camera sounded like an angry rattlesnake from the bushes she stood for a few seconds, but suddenly lost heart and whirled away into the forest, her white tail frantically waving in the air.

Again and again she returned, drawn by insatiable curiosity, but never to stand longer than twenty or thirty seconds. We sat in the blind for ten hours, cramped and hot and fly-bitten, and at the end had not more than sixty feet of film, but the excitement of the day had been immeasurable; I learned too that it would be pretty hard to kill a deer, for watching the little doe had suddenly made it sickening to think of snuffing out its life with a bullet.

Several more days were spent at the blind with success only from the picture standpoint, but every day the stream was becoming more nearly normal and we hoped for results within a week. Then on the night of July 20 the heavens opened and for three hours the rain fell

in torrents. The sheer weight of pounding water threatened to tear our tent in shreds, but the silk had withstood tropical storms of equal violence and we spent a comfortable night when the roar outside had ceased. The next morning the stream was almost in our camp, which the guides had said was well beyond the reach of summer freshets. All day the water rose, but we had carried our food and blankets to higher ground and for a week remained in an open camp a few hundred yards away.

It was useless to think of work upon the streams or ponds for at least a fortnight, because the woods were so soaked with water that the deer had moved to higher ground. We hunted diligently but the never-ceasing rain was a serious handicap and not until mid-August did I shoot a buck suitable for the group; a doe and fawn were secured a week later.

It was a labor of love to select a spot for the background of the group, for almost any curve of the stream was a picture in itself. With Mr. Courtenay Brandreth who had volunteered to make the field painting, we paddled up and down discussing the possibilities of every portion and, as the artist, he finally selected an open stretch, where on one side the alders gave place to a grassy meadow with the blue summit of Albany mountain far in the distance. At this very spot a few days later as the canoe slipped around the curve, we surprised three does feeding in the stream and a fourth upon the bank. For a moment they stared at us but, as the camera began to whir, in great leaps they dashed for the friendly cover of the alders only to stop a few yards within the forest to blow and stamp in protest at the interruption of their breakfast.

September was ushered in by the dry, hot weather we had hoped for all summer — just when our work had been completed and it was time to start for home.

Doe, startled by the sound of the camera, plunging frantically into the forest. [From motion-picture film]

But the last few days were full of feverish excitement, for the stream swarmed with deer driven to the water by the heat and the flies.

One morning we "jumped" five does in almost as many minutes. The first was at the end of a long lane of water, all but her head submerged, feeding on the tender alder leaves which dipped low toward the surface. We were in full view before it was possible to swing in toward the shore, but my wife sent the canoe forward so noiselessly that the deer continued to feed undisturbed. Suddenly she saw us and dashed in great leaps down the stream and around the bend.

A few hundred yards farther on there was a deep pool enclosed by alders, but edged with succulent grass. As we neared the spot, I saw a circle of ripples spreading out beneath the bushes and knew that a deer must be on the other side. At a signal my wife dug her paddle into the mud sending us spinning around the curve. There was the deer sure enough, a big doe with her mouth full of lilies. I started the camera just as she snorted and plunged forward into the pool. In a second she was beyond her depth and swimming frantically, her big ears waving back and forth and a long streamer of grass from her mouth trailing astern. It was only a moment before she struck the soft bank on the other side and with two or three mad plunges threw her dripping body into the alders.

The week was full of incidents such as these, and it was with a good deal of regret that we broke camp on a hot Thursday to spend our last three days at the Lake with Colonel Brandreth. We had been there many times during the summer, often wet and tired and discouraged, but always to find a warm welcome from every inmate of "Camp Good-Enough."

NEWS FROM THE CROCKER LAND EXPEDITION

THE EXPEDITION AT ETAH AND THE "CLUETT" AT NORTH STAR BAY BOTH TO WINTER IN THE ARCTIC

[With quotations from letters from the Arctic]

As announced at the time in the New York City papers a cablegram was received at the Museum on November 10, from Mr. Knud Rasmussen, Copenhagen, regarding the Crocker Land expedition. This gave the news of the failure of the "Cluett" to reach Etah where she was to have taken on the members of the expedition for return to civilization. The Museum did not give up hope of the return of the "Cluett" and the expedition to New York this fall until the very end of November. It is now believed however that both the original expedition under Mr. Donald B. MacMillan and the ship with Dr. E. O. Hovey and Captain George Comer sent to bring this expedition home, have been forced to winter in the Arctic, the expedition staff at Etah, the "Cluett" in North Star Bay. Both parties are well equipped with supplies and with every convenience for scientific work, so there can be no fear as to the safety of the parties, their comparative comfort and profitable scientific results from the enforced stay. The cablegram is given below:

Mail from Crocker Land expedition arrived and delivered your [American] Embassy. "Cluett" arrived North Star Bay twelfth September after thirty-five days ice hindrances and motor damage Melville Bay. Dared not go to Etah account autumn ice but kept near our station, while our missionary motor boat left for Etah to fetch expedition members to "Cluett." All well.

[Signed] Knud Rasmussen.

A letter supplementing this cable arrived later from Mr. Rasmussen in which he says:

Our own ship "Kap-York" has not yet arrived [at Copenhagen]. When it arrives, probably early in December, I expect to be able to supplement this letter with details obtained from my captain. The "Kap-York" being obliged to proceed southward [from North Star Bay] under sail only, had to be tugged out of the harbor before our motor boat could be sent northward, and so we have no recent news of your expedition.

The following is a quotation from a letter written by Mr. Donald B. MacMillan at Etah, North Greenland, on April 6, 1915, and received in New York on December 3, forwarded from Copenhagen by the American Embassy:

Mail received a few days ago tells of the European war and the terrible loss of life. It is said communication with Denmark is uncertain so you may not receive this letter for some time. We realize that affairs at home must be very unsettled making it doubly hard to secure a suitable ship at a reasonable price to transport the expedition to America. Naturally the boys are very anxious to get home and would be disappointed if a ship failed to arrive, but if such should happen, do not be a bit alarmed over our safety; we can pull through all right.

The season is a very hard one here for the Eskimo. Within the memory of the oldest there has never been such a year. They have eaten their dogs as the only food available and burned their sledges for fuel. It is possible to sledge even to the Cary Islands, something which has never been done before.

The expedition will put in caches at six different points on the Greenland coast for the return of Ekblaw [1] from his trip of the next two months. The last cache will be at Cape Constitution, two hundred and twenty-five miles north of Etah. This work will lead us over Dr. Kane's whole trail and will yield some unusually interesting photo-

[1] Mr. W. Elmer Ekblaw, geologist and botanist.

graphs such as of Humboldt Glacier. I am confident that there are many records at Kane's winter quarters at Rensselear Harbor. We shall also do bird work one hundred and thirty miles south of Etah on Saunders Island, one of the most interesting spots of the world to the ornithologist.

We are mainly O. K. in health. Green and Allen[1] built a little shack last fall for wireless at one of the islands in the outer harbor. Conditions out there were so favorable for reading and study that they preferred to remain through the winter, both claiming they had lots of work to do and that was the place to do it. When they came into the house however the first of February, both were in poor health. Later Green started out to cross the channel to go to our big cache in Hayes Sound and broke down completely. He returned, went to bed and was put on a diet under doctor's orders. He is apparently all right now but not yet fit for a long trip. Allen is wholly recovered. Tanquary[2] had the misfortune to freeze both big toes on his Melville Bay trip during the winter. The doctor hopes that an operation will not be necessary. If a ship reaches us and Ekblaw does not stay with me, I may be landed over in Jones Sound with one Eskimo. Here I shall remain one year for ethnological work, and sledge from here to the northern coast of America.

Mr. W. Elmer Ekblaw writes on March 20, 1915, also from Etah, as follows:

On the eve of my departure on a trip across Ellesmere Land and back across Grant and Grinnell lands by way of Greely Fjord and Lake Hazen, I am writing you briefly of my hopes and plans. Since last winter I have been arranging to take this trip this spring. I shall leave to-morrow fully and splendidly equipped, not able to think of a single additional article or preparation which would further insure my safety and success. I have the best sledge we have yet made; I have a fine team of dogs; my clothes are all first-class; I have all the food and fuel I can carry; I am in the best of health and best condition for Arctic work; I have two of the best men in the tribe, Esayoo and Etukashoo, to accompany me. I can conceive of nothing except a most untoward accident that could prevent the successful execution of my plans and my safe return.

I shall proceed leisurely enough to take advantage of every likelihood of scientific investigation; to hunt food for dogs and ourselves in every favorable locality; to explore the unknown reaches of Greely Fjord. I am depending so largely upon the game of the country over which we travel for the chief food supply, that I am taking across the Ellesmere Land glacier but twelve days' pemmican. I feel that I am quite justified in doing so, for on a 1100-mile circuitous route, it is impossible to carry food for the entire way.

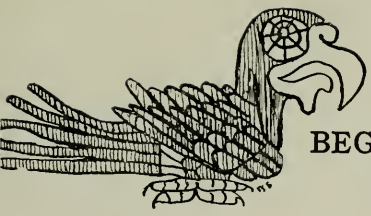
I expect to study the geology of Bay Fjord very carefully. The Eskimo tell me of numerous coal seams of great thickness and rocks rich in fossils. Green saw a coal seam eighteen feet thick on his trip of last year, and from the point from which I was forced to return I saw great ledges and cliffs of limestones, shales and sandstones. The physiography, structural geology, and I hope palæontological and stratigraphical geology will merit all the attention I can give them. The early part of my trip will of necessity be confined largely to geology, for the snow covers the vegetation and no birds have yet arrived. From the first of May onward, I expect to get some work in botany and ornithology. I find that I have more than one hundred and ten different species of plants in the collections I made last year.

I wish to say of Tanquary, who had an unfortunate trip on Melville Bay, that he is made of the stuff heroes grow from, and that for sheer grit, unfailing good nature, and cheerfulness in pain, he measures up to the highest. The Universities of Illinois and Harvard may well be proud of him.

It is possible that I may remain in the North another year after this season, if it seems that the results which I can reasonably expect to achieve would justify my doing so. Two good fields of work in botany tempt me—that about the valley of the Mary Minturn River, and the other at Kaugerdluksuah, at the head of Inglefield Gulf.

[1] Ensign Fitzhugh Green, engineer and physicist; Mr. Jerome Lee Allen, electrician and wireless operator.

[2] Mr. Maurice C. Tanquary, zoölogist.



BEGINNINGS OF AMERICAN NATURAL HISTORY[1]

By Charles R. Eastman

UNDER the native appellation of Tlacaxolotl, Hernandez gives an account of the tapir, its characters being fused, however, with those of another mammalian species. Jonston, in his *Natural History of the Fourfooted Beasts* (1678) has a chapter on "Certaine Outlandish Creatures of a doubtfull kind," wherein are included an English rendering of Hernandez on the tapir, and also one taken from Nieremberg and Lery, under the caption of the "Danta", or "Cappa." The former version reads in part as follows:

"Of the Tlacaxolotl"

"Having through Gods grace finished the History of the Fourfooted Beasts, as many sorts as are, as yet knowen, I thought good to adde this appendix about forreigne doubtfull Creatures, which I am yet thinking to what head, or kind to referre. As first: The *Tlacaxolotl*, it is roundish-faced, bigger then a Bull, great-headed, long muzzle, broad eares, cruell teeth, faced almost like a man, whence it hath the name: the neck thick, the nails like the Bulls, but larger: the buttocks great, and broad, tayl thick and long; skin thick, hair yellowish, and bristly. It is seldome found, living among stones, and in desolate places.... The flesh is eateable. It fears not the face of man; Arrows cannot pearce the hide; therefore they catch them in pitfalls, and holes covered with leaves, as the Indians doe Elephants."

"Of the Danta, or Cappa"

The Danta, or Capa, or Tapiroussu, or Doueanar, resembles the Mule, having such ears, a Calves lips; the upper-lips hangs a handfull over the lower, which he lifts up, when angred, in the rest like other beast, but a Calf most; he hath no harme....He is reddish-haired, and that hanging down, and resembles a Cow in bulk, and shape. But that he is not horned, and hath a short neck, and long dangling ears; by his dry, and slender legs, whole hoof, a man may take him to be of the breed of the Cow, or Asse, yet differs much from both, having a very short tail, (though in America many beasts are bred, without tails) and hath much keener teeth, yet none need feare him, he trusting more in flight, then fight. The wilds shoot them, or catch them in pits, or grins, and have handsome devices to hunt them. They value him highly for his skin, which they cut round, and lay a sunning to make targets as big as a reasonable tun, which they use in warre, as being hardly to be pearced.

For his descriptions of the opossum the compiler whom we have just quoted draws upon Marcgrav (1648), and this author figures and describes two species. The same animal is also shown, together with the peccary, agouti and rare three-banded armadillo in César de Rochefort's work (1658) on the natural history

Peruvian llamas. One of the earliest figures of the American camel found in printed books, although there are much older designs of the animal in maps and native works of art. [From the Antwerp edition of *Cieza de León*, 1558].

[1] Concluded from the last issue of the JOURNAL.

of the Antilles.[1] An animal thought by Eduard Seler[2] to be the opossum, by

[1] It is charged by J. B. Dutertre that the bulk of this work was taken, errors included, from his own book on the Antilles, which appeared in 1654. Le Père Labat (*Voyage*, 1722) also refers to the Sieur de Rochefort as a plagiarist from Dutertre. One of the rare edentates (*Dasypus novemcinctus hoplites*, G. M. Allen) figured by these writers has been rediscovered, in the island of Grenada within the last few years by Glover M. Allen. See *Bull. Mus. Comp. Zool.* vol. liv, no. 6, 1911.

[2] Die Tierbilder der mexicanischen und der Maya-Handschriften. *Zeitschr. für Ethnologie*, Jahrg. xli, 1909.

Big game and other animal likenesses from the first encyclopædia printed in our tongue, that of Bartholomew Anglicus, 1494. Some of the same animals are much better drawn in the Album of Villard de Honnecourt, a thirteenth century artist and architect

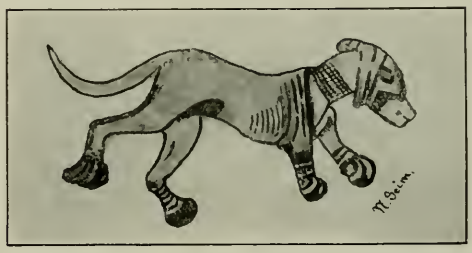
Allen and Tozzer,[1] however, interpreted as a spotted dog, is depicted in several of the Maya codices that have come down to us from pre-conquistorial times.

Interesting in connection with the aboriginal spotted dog of Mexico, and the *perro mudo*[2] of the West Indies (first observed by Columbus in Cuba and Jamaica) is the race of hunting dog which we find depicted in the minor arts of pre-Homeric civilization bordering the Aegean, and continuing until historic times. One of the earliest naturalistic paintings of a spotted dog, dating from at least the thirteenth century B. C., is found in a colored frieze from the palace of Tiryns, discovered in 1911. The subject is a boar hunt, and the boar is shown driven by dogs on to the spears of the hunters. In the background is a marsh with weeds. The original of this painting is preserved in the Museum at Athens, and copies exist in the British and various American Museums.

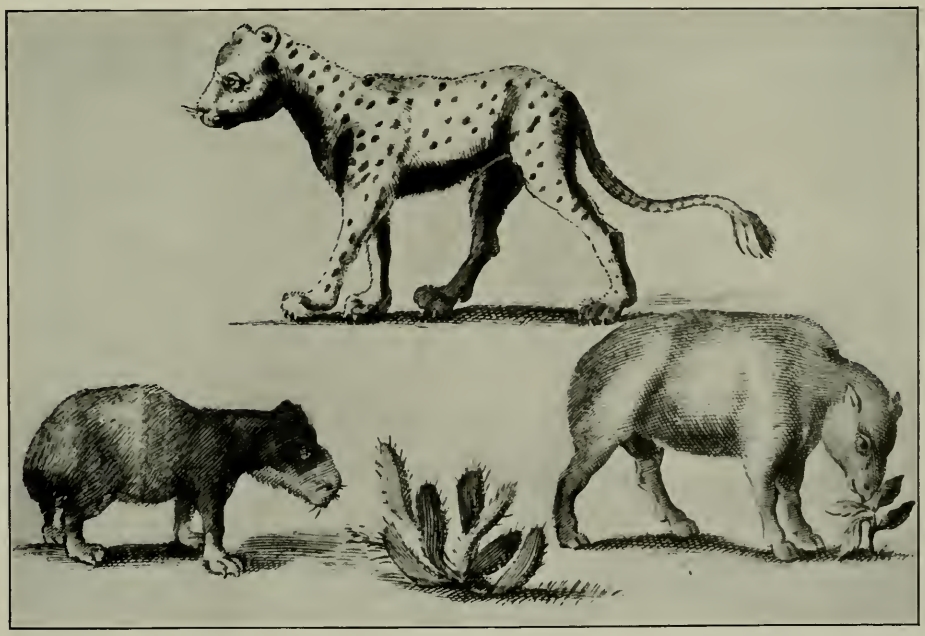
The *Letters* of Hernando Cortes to the Emperor Charles V. are recognized as "an historical monument of the greatest authenticity and value," forming, with the *True Relation* of Bernal Diaz, the original source of our information regard-

[1] Animal Figures of the Maya Codices. *Papers of Peabody Museum, Amer. Arch.*, vol. iv, 1910.

[2] A particular description of the native West Indian dumb dog is given by Oviedo (1535), who is also the earliest to describe in detail the hutia (*Capromys fournieri* Desm.). See W. S. MacLeay's "Notes on Capromys," in Zool. Journ. vol. iv, 1829.



Egyptian hunting-dog, from an early dynastic (5000 ? B. C.) Stone palette found by Quibell at Hierakonpolis



Brazilian quadrupeds, the jaguar, capybara and tapir, after colored drawings introduced in Blaeus' map of Brazil, 1605

ing Mexico. The five *Letters* have recently been published by F. A. MacNutt (1908) in English translation, and are not without interest from a purely natural history standpoint. Very valuable for the student are the bibliographical notes contained in this latest edition of the *Letters,* and also those given by the same translator in his new (1912) version of *The Eight Decades of Peter Martyr D'Anghera.* Critical notes on the chief Spanish sources for Central and South American archæology on natural history are interspersed throughout A. F. Bandelier's work on *The Islands of Titicaca and Koati* (1910).

English translations exist also of the narratives of two early expeditions across the southern part of the North American continent, those led by Panfilo Narvaez and Hernando de Soto. In the relation of the former of these expeditions, by Cabeza de Vaca, is found the earliest account (1537) of the American bison. A few years later, in 1540, herds were next seen by white men accompanying the Coronado expedition.[1] Probably the earliest picture of the animal in question is one given in the *Idrography* of Rotz (1542), and this was copied in the maps of Hondius, (1630 edition of *Mercator*) Blaeu (*World Atlas,* 1664–65) and other geographers. It may be remarked in passing that one of Blaeu's maps of Brazil (vol. viii) is ornamented by colored figures of the tapir, jaguar and capybara, and early American cartography in general abounds in interesting portrayals of physical, animal and vegetal features of the New World.

Among North American fur-bearing animals the beaver holds first place in historical importance, and has given rise to voluminous literature. The first public seal of the province of New Netherlands, in use from 1623 to 1664, carries the beaver as an armorial device. It is represented also in Vischer's "Map of Novi Belgii" (1656), together with the fox, marten, bear, deer, wild turkey, heron, etc. Probably the earliest printed illustration is one occurring in a plate given by Arnold Montanus (1671), in his work already mentioned.

The Old World beaver (*Castor fiber*) engaged in felling a tree, as shown in one of the earliest printed works on natural history, the 15th century *Ortus Sanitatis* of J. von Cuba

A much better figure of the beaver, together with hunting scenes of the bison and other animals, is to be found in Baron La Hontan's *Nouveaux Voyages* (1715). Horace T. Martin, in his work on the Canadian Beaver (1892), and also Dr. F. A. Lucas in his interesting recent

[1] Annotated translations of the narrative of the Hernando de Soto expedition, and of the Relation of Alvar Nuñez Cabeza de Vaca, were published by Buckingham Smith in 1866 and 1871. A new translation of the journey of Cabeza de Vaca, by F. Bandelier is included in the Trail Makers Series (1905).

There are several English versions of the narrative of the Coronado expedition; one edited by G. P. Winship is found in the 14th Report of the U. S. Bureau of Ethnology. Thevet's figure of the bison and Cieza de Leon's rough woodcut of one of the llama group, are reproduced in Winsor's *Narrative and Critical History of America.* A great deal of historical matter relating to the bison has been brought together by Dr. J. A. Allen.

article,[1] reproduce a "Figure of a Beaver from the earliest known Monograph — 1685." But the animal there shown is the European beaver, and this species, *Castor fiber,* was first figured by Johannis von Cube at the end of the fifteenth century in his curious "*Hortus Sanitatis,*" whose illustration is reproduced herewith, and next after him by Rondelet in 1553. Rondelet's figure is copied by Conrad Gesner in the various editions and translations of his encyclopedic works.[2]

Prior to the 18th century no single work anywhere appeared on North American plants and animals, corresponding in character to the monumental achievement of Marcgrav and Piso (1648) on Brazil. A search among the writings of early voyagers and travelers, however, both French and English, is rewarded by the discovery of many surprisingly accurate observations. Numerous authors might be mentioned in this connection, but it will suffice to name but one or two: Captain John Smith's *Description of Virginia* (in *Purchas his Pilgrimes,* vol. iv, 1625–26), and John Josselyn's *New England's Rarities Discovered* (1672). The latter has been twice reprinted. From the former we may give in closing a short specimen extract, selected at random:

"Of beasts the chiefe are Deare, nothing differing from ours. In the Desarts towards the heads of the Rivers, there are many, but amongst the Rivers few. There is a beast they call *Aronghcum,* much like a Badger, but useth to live on trees as Squirrels doe. Their Squirrels, some are neere as great as our smallest sort of wilde Rabbits, some blackish or blacke and white, but the most are gray. A small beast they have, they call *Assapanick,* but we will call them flying Squirrels, because spreading their legs, and so stretching the largenesse of their skinnes, they that have been seene to flie thirtie or fortie yards. An Opossum hath head like a Swine, and a taile like a Rat, and is of the bignesse of a Cat. Under her belly she hath a bag, wherein she lodgeth, carrieth, and suckleth her young. Mussascus, is a beast of the forme and nature of our water Rats, but many of them smell exceedingly strongly of Muske. Their Hares are no bigger than our Conies, and few of them to be found.

Their Beares are verie little in comparison of those of Muscouin and Tartaris. The Beaver is as big as an ordinarie great Dog, but his legs exceeding short. His fore feet like a Dogs, his hinder feet like a Swans. His taile somewhat like the forme of a Racket bare without haire, which to eate the Sauages esteeme a great delicate. They have many Otters, which as the Beauers they take with snares, and esteeme the skins great ornaments and of all those beasts they use to feede when they catch them.

Of Fish, we are best acquainted with Sturgeon, Grampus, Porpus, Seales, Stingraies, whose tailes are very dangerous, Bretts, Mullets, white Salmonds, Trowts, Soles, Plaice, Herrings, Conyfish, Rockfish, Eels, Lampreys, Catfish, Shades, Perch of three sorts, Crabs, Shrimps, Creuises, Oysters, Cocles and Muscles. But the most strange Fish is a small one, so like the picture of Saint *George* his Dragon, as possible can be, except his legges and wings, and the Todefish, which will swell till it be like to burst, when it cometh into the aire.

[1] *Amer. Mus. Journal,* March, 1913. The "earliest known Monograph" therein referred to is one entitled *Castorologia,* written by Johann Marius, a physician of Ulm, and republished by Johann Francus in 1685. It is reviewed in the *Philos. Trans. Roy. Soc.* for the same year, vol. xv, p. 1249.

[2] Among Old World animals figured by Gesner it may be noted that the one given of the ichenumon is taken from an ancient manuscript of Oppian. The earliest printed figure of the giraffe is found in the *Opusculum* of Bernard de Breydenbach (Mainz, 1486 and 1502). This and other African mammals are shown in maps of much earlier date, as for instance, the Hereford and Ebstorf maps of 1280. Otto Keller, in his "*Antike Tierwelt*" (1999), gives an outline figure of the giraffe after a mural painting in the Villa Pamfili, Rome. Far more ancient, dating back to the very dawn of history, is the Egyptian hunting scene showing the giraffe, lop-eared hound and other animals, which is reproduced by Quibell in his memoir on the Exploration of Hierakonpolis (1902).

Through courtesy of
E. P. Dutton and Company

THE AUTHOR OF "WILD BIRD GUESTS" ENTERTAINING
A FRIENDLY CHICKADEE

A VALUABLE NEW BIRD BOOK[1]

By T. Gilbert Pearson

THIS is one of those books, too rare in our libraries and always noteworthy, in which the author writes from actual experience. It tells us what he has really done, and what he knows because he has tested his knowledge — a practical book in the strictest definition of the term. Mr. Baynes for many years has been celebrated among bird lovers for his extraordinary ability in making friends with wild birds, and for the ingenious and highly successful devices by which he has induced them to become his guests at his home in a New Hampshire village. Birds not only visit his garden as they do other places where they have ordinary privileges, but they also stay there, get acquainted with the owner and his family, and acquire and exhibit a confidence that seems marvelous to outsiders. Everyone who sees this desires to know how he does it; and the book is in large measure devoted to such explanation, and to a description of the various best ways to invite and to entertain his "guests." Hence it abounds in practical descriptions, with diagrams and photographs as helpful illustrations of the various forms of nesting-boxes, shelters, feeding-stations, drinking-fountains, bird baths and the like, that he has found most successful. His success however implies an intimate acquaintance with the nature and habits of his winged visitors — their several temperaments, foods, breeding habits, enemies and prejudices; and these he communicates freely for the reader's aid.

One feels as he reads the successively interesting pages, that Mr. Baynes is also communicating somewhat of the affection, and the untiring enthusiasm, with which he has studied and wooed the birds. This enthusiasm is well known to the thousands of persons who have heard him lecture on birds, and it is not surprising to learn that he has long conducted a model bird club in his home town, at Meriden, New Hampshire, and has been the founder of scores of bird-study and bird-protection clubs in all parts of the country. This matter forms an important part of his book. He tells us why every community should have a bird club and how to set it going and keep it going.

The bird club he considers very important because the most serious enemy of the birds is man, and the most serious factor of man's enmity is ignorance. If it were known more widely and generally what this country has already lost and is yearly losing in losing its birds, what the people themselves and their children are daily losing, there is hardly a man, woman or child in the United States who would not be coöperating eagerly in the movement for bird conservation. How many people know that a conservative estimate of the birds killed by domestic cats each year, in Massachusetts only, is 700,000; that there is much more "sport" to be had in gaining the friendship of the birds than in hunting them, and that the actual need of our wild birds for suitable nesting places and for food in winter, is very imperative and very easily supplied? Mr. Baynes tells of these things in interesting detail, and then he says to his readers in big letters, "If there is not already a bird club in your neighborhood, organize a bird club!"

Altogether *Wild Bird Guests* is a book that should be in the hands of every ornithologist and conservationist; as well as on the shelves of every school library.

[1] WILD BIRD GUESTS, HOW TO ENTERTAIN THEM. By Ernest Harold Baynes. E. P. Dutton and Company, New York City.

FRAGMENTS OF SPIDER LORE

By Frank E. Lutz

ARACHNIDA, the scientific name of spiders and their relatives is derived from that of a character in Grecian mythology. According to Ovid, Arachne was a mortal who was so skilled in weaving that she ventured to challenge Athena. When Athena saw that Arachne's work was without blemish she destroyed it. Arachne was driven by grief to hang herself, whereupon Athena changed her into a spider and the rope became a cobweb.

Origin of Spiders

It is said in the sacred writings of ancient India, that a large spider was the originator of the universe. From her glands she wove the web of which we inhabit a part and even now she sits in its center directing its motion. At her pleasure she will consume it, as many of the spiders about us do their webs, and may then spin a new universe. It is worth noting that the same idea occurred in the folk lore of certain American Indian tribes and is also found in that of Guinea.

Spiders did not hold so exalted a station with all people. The idea was current in many parts of the world that they have their origin in putrefaction. Moufet proved this as follows: "It is manifest that spiders are bred of some aëreal seeds putrefied, from filth and corruption, because that the newest houses the first day they are whited will have both spiders and cobwebs in them." His daughter was doubtless the heroine of the nursery rhyme:

> Little Miss Moufet sat on a tuffet
> Eating her curds and whey
> There came a great spider
> And sat down beside her
> And frightened Miss Moufet away.

Spiders in the Bible

There are three fairly well-known Biblical passages concerning spiders. Agur (Proverbs XXX, 28) includes the spider that "taketh hold with her hands and is in kings' palaces" among the four things which are little but exceeding wise, and the frail spider's web is a symbol of the hypocrite's hope (Job VIII, 14) as well as of the disobedient Jews' works (Isaiah LIX, 5).

Spiders in History

If we may believe legends, Mohammed, St. Felix of Nola and other victims of pursuit have been saved by spiders spinning webs over the entrances to their hiding places. The pursuers, seeing the webs, decided that no one had passed that way and neglected to look.

The fortunes of Robert Bruce were at low ebb and he lay, discouraged, gazing at the cobwebs on the rafters. A spider, after vainly trying twelve times to swing itself by its thread from one beam to another, succeeded on the thirteenth attempt. "The thirteenth time," shouted Bruce, "I accept it as a lesson not to despond under difficulties, and shall once more venture my life in the struggle for the independence of my country." He won.

Perhaps not much more legendary than these is the story that the spiders in the temple of Ceres Thesmophoros wove white webs when the Theban army was to be victorious, but black ones, signifying defeat, when Alexander made his attack.

Spiders as Weather Prophets

During his imprisonment at Utrecht, Quatremer Disjonval observed the relation between changes in the weather and the habits of spiders. When the French invaded Holland in 1794 by crossing the water barriers on ice, Disjonval hoped to be released. An unexpected thaw came in December and the French were about to withdraw but, as Disjonval's spiders predicted a return of cold weather he got word to the French general to wait. This was done; the cold came and the French were able to move even their heaviest artillery and to take Utrecht.

Some of the ideas on this subject are as follows: if the weather is to be rough the threads which support the web are unusually short. Before a rain spiders are indolent. If they are active during a rain fair weather will quickly follow. If spiders make changes in their webs before 7 P. M. the night will be clear and pleasant.

Spiders as Omens of Luck

In Maryland it is said that if you kill a spider which gets on your clothing you destroy

the presents it is weaving for you. A seventeenth century writer puts it as follows: "When a spider is found upon your clothes, we used to say some money is coming toward us. The moral is this: such who imitate the industry of that contemptible creature may, by God's blessing, weave themselves into wealth and procure a plentiful estate."

Instead of killing them you may throw them over your left shoulder if you wish good luck. If you feel that you must kill a spider that has taken up its abode in your house, carry it outside for its execution; otherwise you will be "pulling down your house." If you kill a spider crossing your path you will have bad luck. If a white spider drops in front of you, you will soon see a dear friend; if a black one does the same, you will meet an enemy. In the Netherlands a spider seen in the morning forebodes good luck; in the afternoon bad luck.

Spiders and Music

The following is from the Anthologia Borealis et Australis

I hailed thee, friendly spider, who hadst wove,
  Thy mazy net on yonder mouldering raft;
Would that the cleanlie housemaid's foot had left
  Thee tarrying here, nor took thy life away;
For thou, from out this seare old ceiling's cleft,
  Came down each morn to hede my plaintive lay;
Joying like me to heare sweete musick play,
  Werwith I'd fein beguile the dull, dark, lingering day.

It is said that when the young ladies in a certain English school sang at morning and evening prayers spiders always came out of their hiding places and ran about the floor or suspended themselves from the ceiling.

Before the French author, Pellisson, was converted to Catholicism he was imprisoned in the Bastille. There he fed a spider while his cell-mate played a bagpipe. The spider came to associate the music with food and finally could be called to any part of the cell by blowing on the bagpipe. The sequel to the story is that the governor of the Bastille, hearing that his prisoners had found a pleasure in their confinement asked for a demonstration. When the spider came out he crushed it with his foot.

There are several similar stories. Another from the time of Louis XIV is that Lanzun, during one of his imprisonments trained a spider to come for food when he called it. The interesting part here is that the spider not only associated sound with food but distinguished between sounds, for when others tried to imitate Lanzun's voice the spider refused to come.

Poisonous Spiders

All spiders are poisonous but there are very few which injure man. This is partly due to lack of inclination and partly to inability to pierce the human skin. However, fear of spiders is almost universal. Sometimes this fear amounts to a mania, the victim going into hysterics at the mere sight of one of them.

The fumes from burning spiders are alleged to cause faintness, cold sweats, vomiting and finally death. Some monks in Florence are reported to have died from drinking wine in which a spider had fallen. Of course the tragedy was attributed to the spider. On the other hand, Conradus, Bishop of Constance, swallowed a spider which had fallen into sacramental wine and suffered no ill effects.

The bite of a large spider — any large spider is commonly called a tarantula — is said to cause the victim to "make a thousand different gestures in a moment; for they weep, dance, tremble, laugh, grow pale, cry, swoon away and after a few days of torment expire, if they be not assisted in time." Music is considered to be an antidote.

From the Treasvrie of Avncient and Moderne Times (1619) we learn that "Alexander Alexandrinus proceedeth farther, affirming that he beheld one wounded by this Spider, to dance and leape about incessantly, and the Musitians (finding themselves wearied) gave over playing; whereupon, the poore offended dancer, hauing vtterly lost all his forces, fell downe on the ground, as if he had bene dead. The Musitians no sooner began to play againe, but hee returned to himselfe, and mounting vp vpon his feet, danced againe as lustily as formerly hee had done, and so continued dancing still, til hee found the harme asswaged, and himselfe entirely recovered."

It has also been said that if a wasp has been bitten by a spider and lively music be played, both the wasp and the spider will begin to dance. The same has been said of a bitten chicken. On the other hand if the spider concerned be killed, dancing will stop even in the case of human beings.

On account of these ideas a certain kind of hysterical dance is called the Tarantula.

Italian beggars sometimes claim to have been bitten and solicit alms while in a dancing fit.

Spiders as Medicine

Cobwebs are still used to stop bleeding, a thing which Bottom had in mind when he said to the fairy Cobweb "I shall desire of you more acquaintance, good master Cobweb. If I cut my finger, I shall make bold with you." Ben Jonson said that a certain penurious individual "sweeps down no cobwebs here but sells 'em for cut fingers."

Spiders' webs have been taken internally for ague. Chapman's *Materia Medica* (1824) recommends doses of five grains of spiders' web, repeated every fourth or fifth hour for "obstinate intermittents, paroxysms of hectic, morbid vigilance from excessive nervous mobility, irritations of the system from many causes especially when connected with protracted coughs and other chronic pectoral affections."

If cobwebs be burned on a wart it will be rooted out and never grow again. Pliny states that cobwebs, especially the part which forms the spider's retreat is useful when applied to the forehead as a cure for watery eyes. The web must be taken and put on by a boy who has not reached puberty, who must not show himself to the patient for three days, and, furthermore, neither he nor the patient may touch the ground with bare feet during this time. He also recommends cobwebs moistened with oil and vinegar for cranial fractures.

The spiders themselves seem to have been very efficacious. One sewed up in a rag or enclosed between two nutshells and worn around the neck will charm away ague. It should also be applied to the wrist or temples in the case of bad fevers. If a spider be taken when neither sun nor moon is shining and the hind legs be pulled off and wrapped in deer's skin, the combination will, according to some, relieve gout. Moufet remarked that "we finde those people to be free from the gowt of hands or feet (which few medicaments can doe) in whose houses the Spiders breed much, and doth beautifie them with her tapestry and hangings."

Pliny gives uses for spiders as well as for their webs. The thick pulp of a spider's body, mixed with oil of roses, makes an ear lotion. Among the best remedies for spider bites are spiders left to putrify in oil.

Homeopathic treatment seems to have been much favored in cases of spider bites. Collections of dead spiders have been made because if a person bitten by a spider look at another specimen of the same species he will be cured. Dried spiders have been taken internally for the same purpose.

Spiders as Food

It seems that not every one is afraid of spiders. Lande, the French astronomer, proved by eating spiders as delicacies that he could raise himself above dislikes and prejudices. Spiders were eaten by the aborigines of America and Australia. A quotation from Molien's Travels in Africa says that the people of Maniana "eat spiders, beetles and old men."

Doubtless quite a list could be made of uncivilized tribes that eat spiders and there is a number of recorded instances of more advanced persons who, like Lande have acquired the habit. One is given in verse:

How early Genius shows itself at times,
Thus Pope, the prince of poets, lisped in rhymes,
And our Sir Joshua Banks, most strange to utter,
To whom each cockroach-eater is a fool,
Did, when a very little boy at school,
Eat Spiders, spread upon his bread and butter.

Economic Value of Spiders

It is undoubtedly true that spiders catch and kill many injurious insects. In the fields good insects suffer with the bad, but as few good insects find their way into our houses the house spiders are almost entirely beneficial. However, since spiders are not encouraged to live in our houses it is doubtful whether the group as a whole helps us greatly in our fight against injurious insects.

The strong supporting threads of cobwebs have been much used in telescopes for the purpose of making fine lines appear in the field of vision.

Silk spun by spiders to cover their eggs has been woven into cloth. It is said that the fabric is so transparent that a young lady was once reproved by her father for the immodesty of her costume although she wore seven thicknesses of it. Since it requires more than half a million egg-masses to yield a pound of silk the industry does not promise to become commercially profitable.

CORYTHOSAURUS, THE NEW DUCK-BILLED DINOSAUR

By W. D. Matthew and Barnum Brown

THE American Museum of Natural History has recently added a remarkable specimen to the series of skeletons in the Dinosaur hall. It is a crested, duck-billed dinosaur, unusually complete and in many ways unique; for not only is the bony skeleton and the skin impression surrounding the body preserved, but underneath the skin may be traced at least four distinct sets of muscles, showing definite origin and insertion of each series.

Evidently the body had floated along some prehistoric beach where, caught in quiet water, it was stranded lying on its left side on a bed of plants the carbonaceous remains of which may still be seen, accounting for the indefinite impression of a large part of the skin on the left side. *Unio* shells were scattered all about; other trachodont bones and a water turtle lay on the top of the tail, and over the body were deposited three large folds of sandstone, the cross-bedded layers showing deposits by water currents from different directions. On this upper right side the fine sandy silt preserved a better impression of the skin, where it was not torn away, and the outline of the underlying bony skeleton is distinct.

This skeleton is complete except for the fore limbs, most of which are missing, but the bones are mostly concealed under the skin. The texture of the skin is not as well preserved as in the "dinosaur mummy" also exhibited in this hall, but shows a similar pattern of small, tesselated scales, not overlapping like those of a lizard or snake, but grouped in patterns and of various sizes and arrangement in different parts of the body. The double series of slender, rodlike, calcified tendons along the back are very clearly shown; these are tendons of part of the great muscles that moved the backbone in a vertical plane.

It is very rarely that any portion of an extinct animal other than the skeleton is preserved. The softer parts almost always decay and disappear without leaving a trace behind, long before petrefaction sets in. Usually all that we know of an extinct animal is derived from the study of its skeleton and of its bony armor, if it had any. Any trace of skin or other soft parts is naturally a great help in attempting to reconstruct its external form and in determining its habits. Such evidence is especially welcome in connection with dinosaurs, animals millions of years old and very different from any now living. Delicate and often obscure as are the skin impressions, they have been noticed and recorded on various fossil skeletons; but it is only within the last few years that the development of the technique of excavating and preparing such specimens has made it possible to save them entire. The two dinosaur skeletons in this hall are believed to be the only ones with the skin extensively preserved shown in any museum. A third specimen has been secured by the Senckenberg Museum, Frankfurt-am-Main, but is not yet completely prepared for exhibition.

The new acquisition in the American Museum was found in 1912 by a Museum expedition in charge of Mr. Barnum Brown, in the Belly River cretaceous rocks exposed at Steveville, on the fossil-famous Red Deer River of Alberta, Canada. It was taken up in large blocks, united in the laboratory just as found, and raised to a vertical position so that both sides may be seen, thus assuming a pose the animal may well have taken while swimming. The missing parts of the front limbs have been painted on the matrix from a second skeleton of the same size found last year, as also the tip of the tail, which was weathered out and partly missing.

The preparation of the skeleton was a slow and difficult process, requiring great skill and patience on the part both of collector and preparator. It was so fragile and heavy in some parts that it was necessary to support it by a perfect network of steel rods perforating the blocks in every direction, and in other parts so extremely thin and delicate that the least pressure would have shattered or damaged it beyond repair. Add to this the difficulty of removing the rock matrix, often quite hard, from the delicate film which represents the skin, and cleaning it so as to show the structure; of cleaning and mending the innumerable breaks and joints caused by the earth-jars and movements in the rocks during the millions of years since it was buried; and it will not appear surprising that two years

time was taken by the preparators before the work was completed. The preparation work was done chiefly by Mr. Otto Falkenbach.

The animal is a new kind of duck-billed dinosaur, related to the *Trachodon* and *Saurolophus* of which skeletons are shown elsewhere in the hall, but the distinguishing and striking feature of this new animal is the skull, on account of which it is given the name *Corythosaurus* (meaning Corinthian-helmeted saurian). The remarkable crest on the top of the skull probably supported a flexible, ornamental membrane as seen in some modern lizards. The rest of the skeleton is in a general way like that of *Trachodon* and other members of the family of dinosaurs, the distinctive feature being the development of the pelvis and the proportion of the limbs.

The trachodonts were a great family of herbivorous dinosaurs numerous in genera and species and represented by great numbers of individuals in late Upper Cretaceous times. The body was covered by tuberculated skin of distinct pattern in the different genera and all of these duck-billed dinosaurs seem to have been good swimmers, if we may judge by the vertically flattened tail characteristic of swimming reptiles. Probably they escaped from their enemies in that way, for they were without means of offense or defense, bearing neither horns nor armor plates like their contemporaries the ceratopsians and ankylosaurs.

The limbs and feet were adapted for walking or running, and in swimming would probably be trailed behind or pressed closely against the sides. The modern iguanas of the Galapagos Islands swim in this way, and the position in which the *Corythosaurus* skeleton lies in the rock is strikingly suggestive of a swimming pose; although it must be remembered that when discovered the specimen lay flat on its side, the carcass crushed to a thin plate by the overwhelming weight of thousands of feet of mud and sand sediment which, during the millions of years since it was deposited, had turned into rock. The length of the specimen is eighteen feet, and startling indeed must have been the appearance of *Corythosaurus* as it rose from the water to its full height with helmet raised cap-a-pie like a knight of old.

MUSEUM NOTES

Since the last issue of the Journal the following persons have become members of the Museum:

Life Members, Mrs. E. C. Converse, Professor Raymond C. Osburn and Messrs. B. Preston Clark, Alfred Hafner and Henry C. Kelsey;

Annual Members, Mrs. Louis Ansbacher, Mrs. Leo Arnstein, Mrs. F. O. Ayres, Mrs. A. Battin, Mrs. Janet Burchell, Mrs. F. S. Coolidge, Mrs. Jonathan H. Crane, Mrs. J. C. DeSola, Mrs. Rose Fisher, Mrs. Samuel Floersheimer, Mrs. Thomas B. M. Gates, Mrs. James Grosvenor, Mrs. Benjamin Guinness, Mrs. Victor Guinzburg, Mrs. Frederick C. Hicks, Mrs. Augustus Jay, Mrs. Harry T. Johnson, Mrs. W. N. Kernan, Mrs. John B. Mott, Mrs. John W. Nute, Mrs. Wheeler H. Peckham, Mrs. Clarence Porter, Mrs. Samuel Stiefel, Mrs. Samuel Swift, Misses Alice H. Annan, Mary T. Bradley, Gladys Cromwell, Madeleine Gelshenen, Augusta Borland Greene, Elizabeth Hanna, H. Maud Henry and Nina Rhoades, Dr. T. Passmore Berens, Dr. Fenton B. Turck, Dr. Alvin M. Pappenheimer and Messrs. George D. Arthur, William B. Bristow, W. H. Chesebrough, William Dette, Harris Fahnestock, Robert Edison Fulton, Abraham L. Goldstone, Ogden H. Hammond, Frederick W. Herz, Max Herzog, M. B. Hillegas, H. M. Kaufmann, Maurice Marks, Hoffman Nickerson, J. Parmly Paret, Frederick Snare, J. E. Sterrett, Felix A. Vogel, George A. Vondermuhll, Louis T. Watson and Master Eugene DuBois.

At a meeting of the Executive Committee of the American Museum on November 17, Mr. B. Preston Clark was elected a life member in consideration of his generosity in bearing the expense of Mr. F. A. Watson's entomological field trip to Santo Domingo last spring. Mr. Clark is himself an entomologist and has presented to the Museum numerous rare species of *Sphingidæ*. Dr. Raymond C. Osburn, formerly of the New

Ancient gold work from Panama recently purchased for the Museum

York Aquarium, and now professor of biology at the Connecticut College for Women, New London, has also been made a life member in appreciation of his gratuitous services to the Museum in connection with the collections of the Townsend "Albatross" expedition.

Five pieces of ancient gold work from the district of Alange, province of Chiriqui, western Panama, have been recently purchased for the Museum. The objects are similar to those in Mr. Keith's collection described in the October number of the Journal, and are all amulets, used as breast ornaments. The finest specimen, illustrated above, is in almost complete relief, and represents a human skeleton, from the arms and head of which project profile heads of the deified crocodile, indicating that the figure is probably that of a god. Another of the specimens represents a deer, and is a characteristic example of the skill in animal modeling attained by the ancient peoples of Panama. The specimens will be found on exhibition in the Mexican hall.

The Hitchcock Lectures on "Men of the Old Stone Age, Their Environment, Life and Art," delivered by Prof. Henry Fairfield Osborn at the University of California in February, 1914, have just been published in book form by Charles Scribner's Sons, and constitute a notable addition to the literature of palæolithic times. The book is lavishly illustrated with numerous reproductions of palæolithic engravings, carvings, and paintings from caves and rock shelters; original drawings by Messrs. Charles R. Knight and Erwin S. Christman, and charts and cross sections by Dr. Chester A. Reeds. Of special interest are the restorations of the *Pithecanthropus*, Piltdown, La Chapelle, and Crô-Magnon men, modeled by Professor J. H. McGregor upon casts of the original fossils. The book will be reviewed in a forthcoming issue of the Journal.

Mr. Amos F. Eno who died on October 21, bequeathed to the American Museum the sum of $250,000. Mr. Eno was an annual member of the Museum since 1881, and a life member since June, 1905. With the exception of the Jesup bequest this is the largest ever received by the Museum.

A NEW BIRD GROUP IN THE AMERICAN MUSEUM

King penguins on South Georgia Island. In the background is Lucas Glacier, named for the director of the Museum by Mr. Robert C. Murphy on the expedition to South Georgia Island in 1911–12. The birds for the group were mounted by Messrs. Lang and Engel; the background was painted by Mr. Albert Operti

A GROUP of king penguins recently installed in the Museum (central pavilion, second floor) is the first of a series of habitat bird groups of the world, planned by Dr. Chapman to round out the systematic series of birds shown in the adjoining hall. The plan contemplates flooring over the central section to insure the necessary darkness and permit these habitat groups, like those of the birds of North America, to be illuminated entirely by controlled artificial light. This construction at the same time makes provision for groups of monkeys and lemurs on the floor above. The heterogeneous assemblage of animals now in this central section of the second floor is to be variously provided for: the groups of reptiles in a hall in the projected east wing; the seals and sea elephants with other marine mammals in the attached court building, and the Asiatic mammals in a hall of their own. Unfortunately these improvements and changes, long contemplated and planned for, require extensive funds, and the resources of the city for the past three years have not been sufficient to permit the erection of the much needed new wing. Meanwhile, the unsatisfactory condition of the central pavilion is keenly felt by the Museum and it has been necessary to announce by means of labels that various groups are "placed here awaiting the construction of a new wing."

DURING the last six months an entirely new process in taxidermy has been invented and tried out by Mr. Carl E. Akeley of the American Museum. Mr. Akeley's previously worked out processes have hitherto represented the high water mark of attainment in this direction, and although they did not reach his own ideal they came as near it as he thought practice would ever permit. The new idea which came to him last summer however, and which has now been thoroughly tested, produces results which for softness of modeling, accuracy in reproducing the individual animal and degree of permanence, are far ahead of anything heretofore possible, and which are achieved at infinitely less cost of labor, money and time. It is a conservative statement to say that this invention will reduce the cost of the projected new African hall of the Museum by at least one hundred thousand dollars, while the value of the exhibits will be increased to an inestimable degree. Not only so, but the infinite trouble, worry, and necessity for some compromise involved in the mounting of specimens hitherto is reduced by this method quite eighty-five per cent. Two buffalo heads have already been mounted by the new process and a lion's head is now in hand.

IN addition to the splendid collection of 20,000 vertebrate and 140,000 invertebrate specimens brought from Africa by the Lang-Chapin expedition, the evidence in the shape of photographs by Mr. Lang and accurate colored drawings by Mr. Chapin is unusually varied and complete. No less than 7000 photographs help to set forth the animal life of the Congo, as well as the industries, customs, art, ceremonies, amusements and mode of life of the natives; while the ethnological value of the work is further supplemented by some seventy casts of heads which Mr. Lang was able to make through the consent of a tribe of Pygmies.

ON Friday evening, December 17, Mr. Ernest Harold Baynes will lecture at the American Museum to the adult blind of New York City and Brooklyn on "Wild Animal Friends of Mine." Mr. Baynes is widely known as a friend of the birds; this lecture will tell how he has improved acquaintance also with the fox, skunk, bear, wolf and other creatures. Doors will be open at 7.30, to permit of inspection by the blind of specimens of the animals, the lecture following at 8.15, P. M.

The lecture to the blind on November 19, attracted over three hundred blind persons and their attendants and acknowledgment is due to the excellent work of the boy scouts in this connection, who for some time past have convoyed to and from the lectures such of the blind as were in need of an attendant.

ONE of the interesting papers read at the recent meeting of the National Academy of Sciences at the Museum was by Professor Herbert S. Jennings on "Can we Observe Organic Evolution in Progress?"

In most breeding experiments the original stock is usually not a "pure line," but a mixture containing various strains due to the fact that each individual is the offspring of two parents, each with more or less different hereditary tendencies. Breeding experiments on such "biparental" organisms

having failed to yield a rigid theoretical proof of evolution by selection, many similar experiments had been made with the same object on certain organisms which have only one parent; but in most cases these "uniparental" strains are just as resistant to the process of selection with reference to given characters as are biparental races. Professor Jennings had succeeded however, in getting positive results from selective processes in the case of certain kinds of *Difflugia*, uniparental amœba-like animals. Starting with a single individual, he had by selecting for large size, been able in the course of many generations to increase materially the size of the individuals; and similarly by segregating in each generation the individuals having the largest number of spines, he had succeeded in materially increasing the number of spines. Even after selection ceased the progeny of the modified races retained the effects of the selective process.

A LARGE and representative collection of invertebrate fossils from Porto Rico was secured by Messrs. Chester A. Reeds and Prentice B. Hill in the work carried on by them the past summer in connection with the Porto Rico survey. In addition Dr. Reeds brought back a fairly well-preserved jaw and several parts of ribs representative of fossil mammals of the Tertiary formations. Tertiary mammals are almost unknown in the West Indies. The only described specimen is the skull of a very interesting primitive Sirenian, related to the manatee and dugong found in Jamaica and named Prorastomus by Professor Owen many years ago. Dr. Reed's specimens are probably Sirenian — the jaw certainly is — but differ from Prorastomus. It may help to clear up some of the puzzling problems in the evolution of the original group, an offshoot, as now appears, of the same primitive stock that gave rise to the elephants and mastodons. It is of interest also to note that certain bones from the Porto Rico Tertiary in the collection of Signor Narcisso Rabell Cabrero, San Sebastian, appear also to be Sirenian. No land mammals have been found in any Tertiary formation in the West Indies; this however is to be expected since these formations are all marine or littoral, and the discovery of land animals in them would not be expected unless as a rare accident.

THE large collection of prehistoric pottery collected by Mr. Algot Lange on the island of Marajo has been acquired by the American Museum. Marajo Island in the mouth of the Amazon River is 165 miles long by 120 wide, or considerably larger than the island of Jamaica, and belongs to Brazil. A collection of some two thousand pieces comes from Pacoval Island in Lake Arary, the source of the Arary River. Mr. Lange described the little island of Pacoval as a veritable archæological mine. Fragments of pottery cover the ground and everywhere the earth is mixed with pottery ranging in size from minute pieces to vessels weighing as much as twenty-five pounds. Nothing is known of the makers of this ware. Who they were or where they came from is at present a mystery, but it is hoped that a study of the unique and beautiful decorations on the pottery will afford some information on the point.

DR. CLARK WISSLER and Dr. Robert H. Lowie, of the American Museum of Natural History, have been appointed delegates from the New York Academy of Sciences to the Nineteenth International Congress of Americanists which meets in Washington at the end of December.

DR. HENRY E. CRAMPTON, curator of invertebrate zoölogy at the American Museum, delivered the oration before the Phi Beta Kappa Association of Pennsylvania on December 4. Dr. Crampton took for his subject "Science, Culture and Human Duty."

THE annual meeting and dinner of the New York Academy of Sciences will be held December 20. The retiring president, Dr. George F. Kunz, will deliver the address of the occasion.

MR. M. P. SKINNER, a member of the American Museum, has presented to the institution some valuable motion-picture films and photographs of animals of the Yellowstone Park, obtained during his twenty years experience in that region.

The American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

Open free to the public on every day in the year.

The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people. It is dependent upon private subscriptions and the fees from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world. The membership fees are,

Annual Members	$ 10	Patrons	$1,000
Sustaining Members (annually)	25	Associate Benefactors	10,000
Life Members	100	Associate Founders	25,000
Fellows	500	Benefactors	50,000

Guides for Study of Exhibits are provided on request to members and teachers by the department of public education. Teachers wishing to bring classes should write or telephone the department for an appointment, specifying the collection to be studied. Lectures to classes may also be arranged for. In all cases the best results are obtained with small groups of children.

The Museum Library contains more than 60,000 volumes with a good working collection of publications issued by scientific institutions and societies in this country and abroad. The library is open to the public for reference daily — Sundays and holidays excepted — from 9 A. M. to 5 P. M.

The Technical Publications of the Museum comprise the *Memoirs*, *Bulletin* and *Anthropological Papers*, the *Memoirs* and *Bulletin* edited by J. A. Allen, the *Anthropological Papers* by Clark Wissler. These publications cover the field and laboratory researches of the institution.

The Popular Publications of the Museum comprise the JOURNAL, edited by Mary Cynthia Dickerson, the *Handbooks*, *Leaflets* and *General Guide*. The following list gives some of the popular publications; complete lists, of both technical and popular publications, may be obtained from the Librarian.

POPULAR PUBLICATIONS

HANDBOOKS

NORTH AMERICAN INDIANS OF THE PLAINS. By Clark Wissler, Ph.D. *Paper, 25 cents; cloth, 50 cents.*

INDIANS OF THE SOUTHWEST. By Pliny Earle Goddard, Ph.D. *Paper, 25 cents; cloth, 50 cents.*

ANIMALS OF THE PAST. By Frederic A. Lucas, Sc.D. *Paper, 35 cents.*

ILLUSTRATED GUIDE LEAFLETS

GENERAL GUIDE TO THE COLLECTIONS. New edition issued December, 1914. *Price, 25 cents.*

THE COLLECTION OF MINERALS. By Louis P. Gratacap, A.M. *Price, 5 cents.*

NORTH AMERICAN RUMINANTS. By J. A. Allen, Ph.D. *Price, 10 cents.*

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH. By George H. Pepper. *Price, 10 cents.*

PRIMITIVE ART. *Price, 15 cents.*

THE BIRDS OF THE VICINITY OF NEW YORK CITY. By Frank M. Chapman, Sc.D. *Price, 15 cents.*

PERUVIAN MUMMIES. By Charles W. Mead. *Price, 10 cents.*

THE METEORITES IN THE FOYER OF THE AMERICAN MUSEUM OF NATURAL HISTORY. By Edmund Otis Hovey, Ph.D. *Price, 10 cents.*

THE HABITAT GROUPS OF NORTH AMERICAN BIRDS. By Frank M. Chapman, Sc.D. *Price, 15 cents.*

THE INDIANS OF MANHATTAN ISLAND AND VICINITY. By Alanson Skinner.

THE STOKES PAINTINGS REPRESENTING GREENLAND ESKIMO. *Price, 5 cents.*

BRIEF HISTORY OF ANTARCTIC EXPLORATIONS. *Price, 10 cents.*

TREES AND FORESTRY. By Mary Cynthia Dickerson, B.S. *A new edition in course of preparation.*

THE PROTECTION OF RIVER AND HARBOR WATERS FROM MUNICIPAL WASTES. By Charles-Edward Amory Winslow, M.S. *Price, 10 cents.*

PLANT FORMS IN WAX. By E. C. B. Fassett. *Price, 10 cents.*

THE EVOLUTION OF THE HORSE. By W. D Matthew, Ph.D. *Price, 20 cents.*

MAMMOTHS AND MASTODONS. By W. D. Matthew, Ph.D. *Price, 10 cents.*

REPRINTS

THE GROUND SLOTH GROUP. By W. D. Matthew, Ph.D. *Price, 5 cents.*

METHODS AND RESULTS IN HERPETOLOGY. By Mary Cynthia Dickerson, B.S. *Price, 5 cents.*

THE WHARF PILE GROUP. By Roy W. Miner, A.B. *Price, 5 cents.*

THE SEA WORM GROUP. By Roy W. Miner, A.B. *Price, 10 cents.*

THE ANCESTRY OF THE EDENTATES. By W. D. Matthew, Ph.D. *Price, 5 cents.*

The white-tailed deer of the Adirondacks