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EXPLORATIONS AND FIELD-WORK OF THE
SMITHSONIAN INSTITUTION
IN 1914

(WITH ONE PLATE)



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During the year 1914 explorations and field-work were continued in various parts of the world under the direction or with the cooperation of the Smithsonian Institution. The more important are here reviewed, chiefly in the words of the participants therein. They include geological, zoological, botanical, anthropological, and astrophysical lines of investigation.

Three government branches of the Institution are represented in this report: the National Museum, although having no funds set aside for this purpose, avails itself wherever possible of opportunities to engage in natural history investigations and to add to its collections; the Bureau of American Ethnology is occupied largely with field-work among the Indians themselves, the annual report of that Bureau covering this work in detail; and the Astrophysical Observatory, in connection with its regular work of studying the physical properties of the sun and their effects on the earth, undertakes expeditions in this country and abroad for purposes of observation and investigation.

These various lines of field-work have tended to increase knowledge in the sciences and have added much valuable material to the collections of the National Museum and the Bureau of American Ethnology. The Institution was prevented from participating in many other expeditions only by its limited funds.

GEOLOGICAL EXPLORATIONS IN THE ROCKY MOUNTAINS

In continuation of his previous geological researches in the Rocky Mountains of Canada and Montana, Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, spent a week during the field season of 1914 at Glacier, British Columbia, where he assisted Mrs. Walcott (née Mary M. Vaux) in measuring the flow of the Illecillewaet and Asulkan glaciers, photographs of which are shown in plate 1 and text figures 1 and 2.

From Glacier, Dr. Walcott proceeded to White Sulphur Springs, Montana, for the purpose of studying the ancient sedimentary Pre-paleozoic rocks of the Big Belt Mountains. These explorations were made on the eastern and southern slopes of this range, and

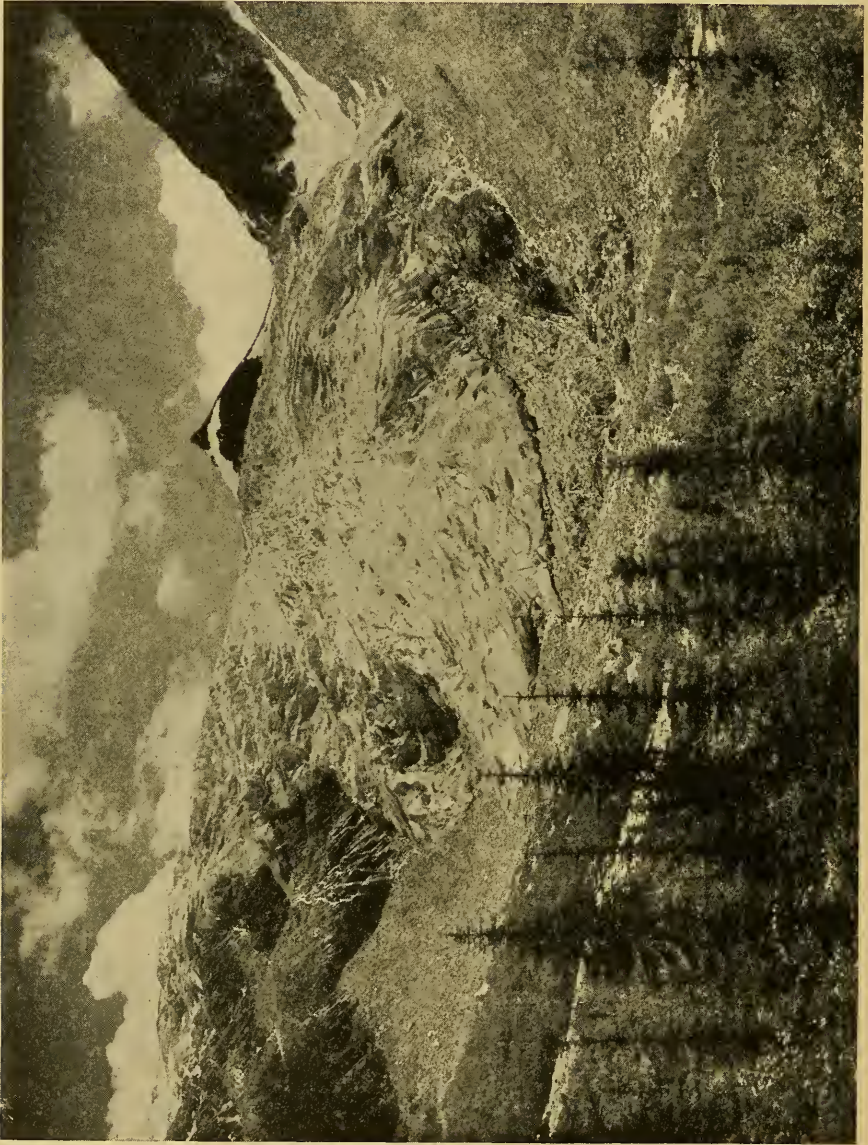


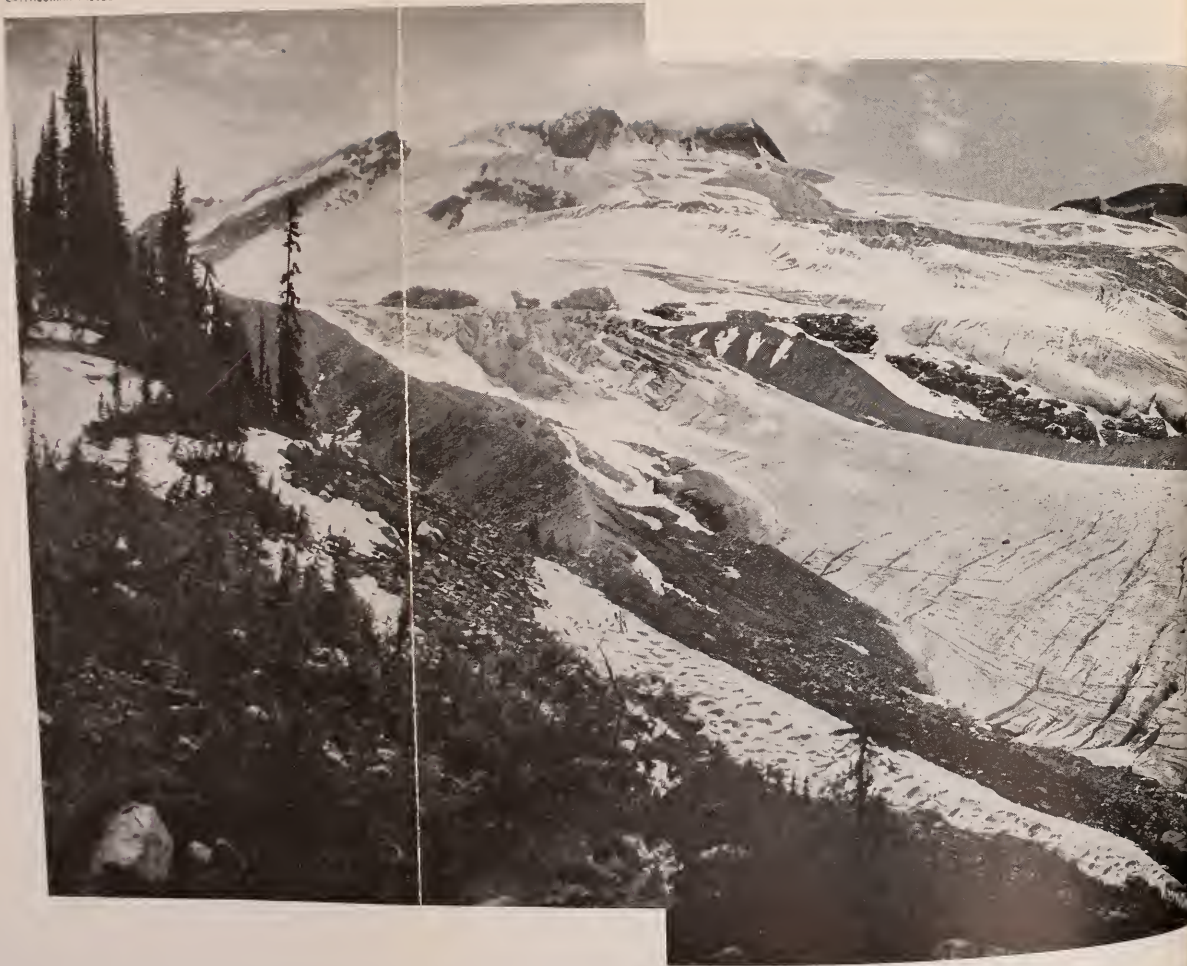
FIG. 1.—View of Illecillewaet Glacier from the north, showing the lower cascading portion and the bare rocks at its foot, which have been uncovered by the melting back of the ice for several hundred feet during the past five years. Photograph by Mary Vaux Walcott.



PANORAMIC VIEW
of an entire glacier from its inception



VULKAN GLACIER.
Retreating foot rests on the moraine



PANORAMIC VIEW OF THE
 Showing the névé moraines and foot of the glacier. This is an unusual illustration of an entire glacier from its inception

ASULKAN GLACIER.
 The retreating foot rests on the morainic débris that it has brought down from the mountain.

Photograph by Mary Vaux Walcott.



FIG. 2.—View from the foot of Asulkan Glacier, looking down the valley toward Illecillewaet Valley, through which the Canadian Pacific Railway passes. A ridge of the Selkirks is shown in the distance. Photograph by Mary Vaux Walcott.



FIG. 3.—Hard sandstones which rest on the granite at the base of the Belt Mountain rocks. These sandstones form cliffs along the canyon, about five miles above Neihart, Montana. Photograph by Walcott.



FIG. 4.—Slaty shales in which the Prepaleozoic crustacean fossils were found near the mouth of Deep Creek Canyon, Big Belt Mountains, 16 miles east of Townsend, Montana. Photograph by Walcott.

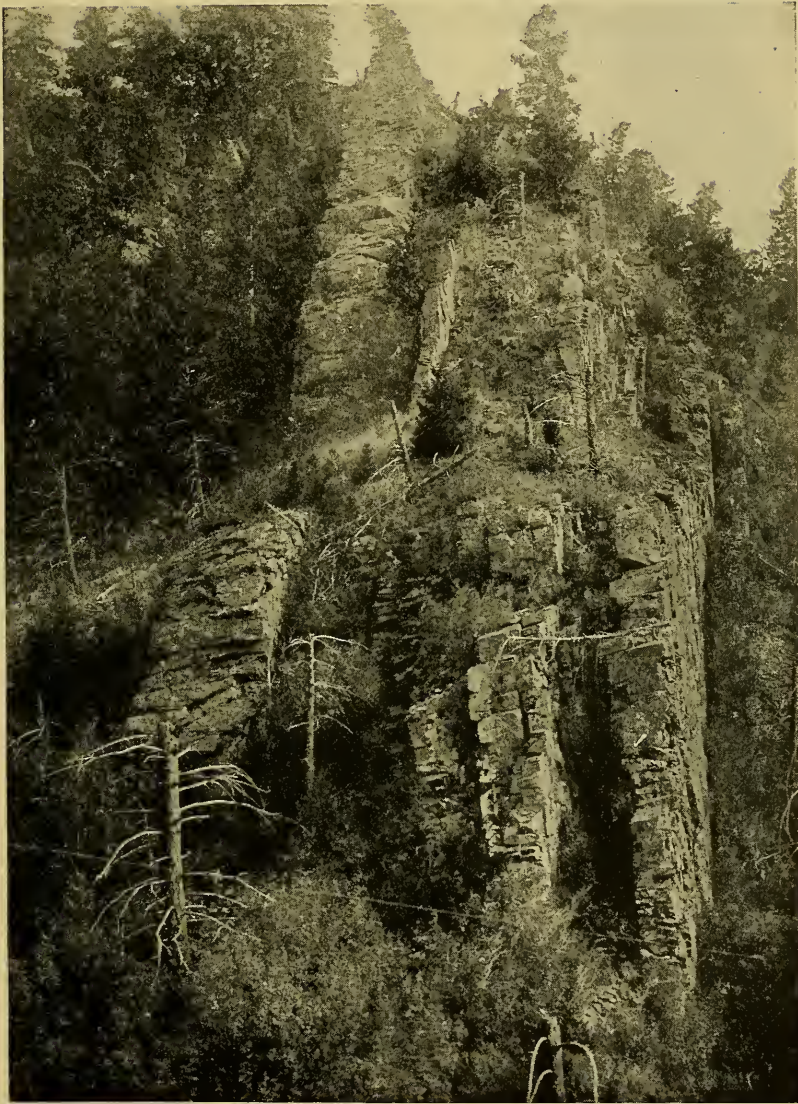


FIG. 5.—Vertical layers of hard sandstone that occur in the formation beneath the shales, illustrated by fig. 4, and above the limestones carrying the algal remains that occur higher up in Deep Creek Canyon. Photograph by Walcott.

then extended to the south on the Gallatin, Madison, and Jefferson rivers.

It was found that the Prepaleozoic sedimentary rocks were exposed by the uplift of the granite mass forming the summit of Mount

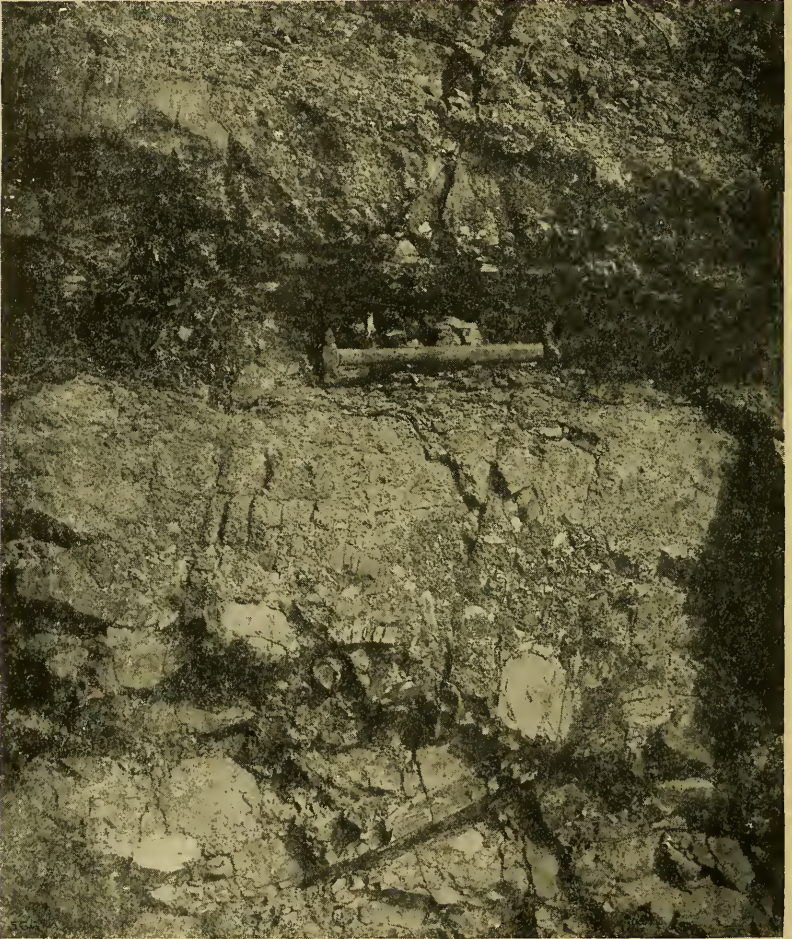


FIG. 6.—Conglomerate in the sandstones illustrated by fig. 5, where there are boulders and pebbles derived from the limestones beneath. This indicates that the limestones were raised above the surface of the water, so that they were broken up by weathering, and fragments of them carried by streams into the near-by lake and embedded in the sand. Photograph by Walcott.

Edith of the Big Belts, in such a way that the thickness of the sandstones, limestones, and shales could be readily measured in the numerous sections exposed in the canyons worn by waters descend-

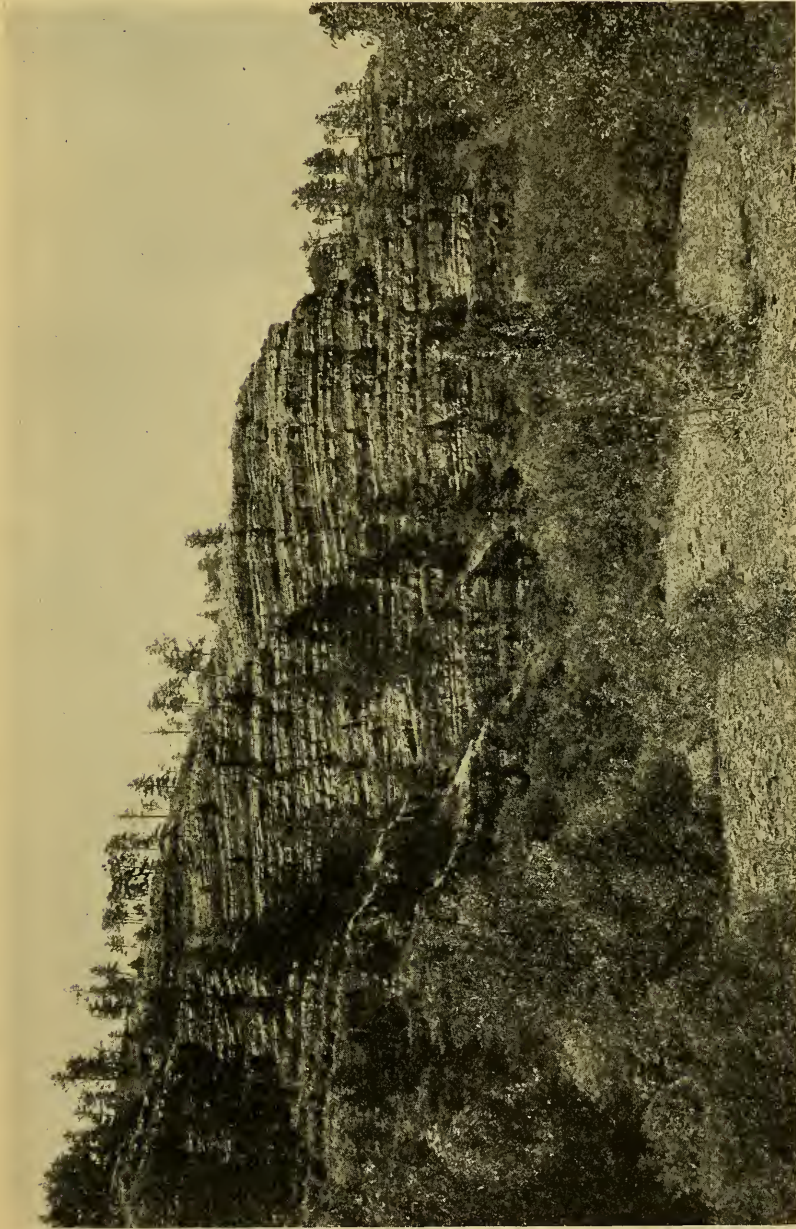


FIG. 7.—A cliff formed by hard layers of sandstone with thin layers of shale between. These rocks occur above the shales illustrated in fig. 4. Photograph by Walcott.



FIG. 8.—Curious pattern in limestones supposed to result from algal deposits.



FIG. 9.—Etched section through the center of a double concretionary-like form which may have been influenced in its growth by algal deposits, and which contains numerous fossil bacterial remains.

ing from the higher points to the valley surrounding the range. Nearly five miles in thickness of rock were measured, and in the limestone belts reefs of fossil algal remains were studied and large collections made with the assistance of Mrs. Walcott and Charles E. Resser and sent on to Washington.

It was found that the algal remains were deposited very much in the same manner as those that are now being deposited in many fresh-water lakes, and that many of the forms had a surprising

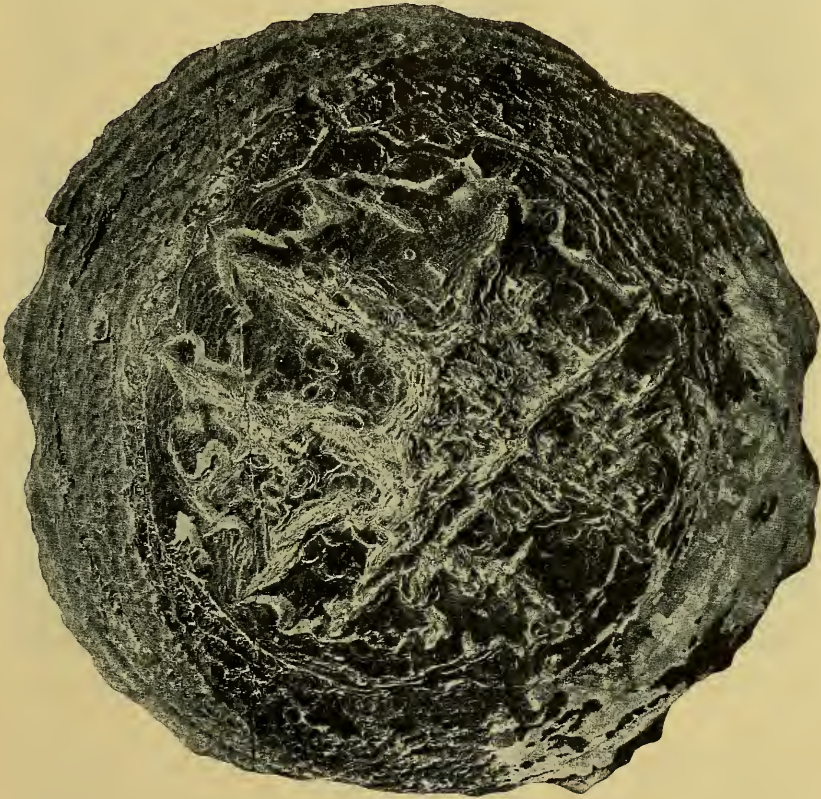


FIG. 10.—Upper surface of a lens-shaped concretionary-like form which resembles some of the siliceous deposits of the Yellowstone Park hot springs. This form has been named *Gaiaitinia pertexa*. Numerous cells such as occur in the Blue-green algae have been found in thin sections of this type of supposed algal deposit.

similarity to those being deposited in the thermal springs and pools of the Yellowstone National Park.

In the lower portion of Deep Creek Canyon southeast of the city of Helena, a deposit of siliceous shale was examined, where some years ago Dr. Walcott discovered the remains of crab-like animals

suggesting in form the fresh-water cray fishes found in the streams and ponds all over the world.

These fossils are the oldest animal remains now known, and the algal deposits which occur at intervals for several thousand feet below the shales containing the crustaceans, are the oldest authentic vegetable remains. It is also most interesting that two types of bacteria have been found in a fossil state in the rock in association with the algal remains.

On the north side of the Gallatin River, two very rich beds of algal remains were found, many of which, on account of the fossil being silicified and embedded in a softer limestone, were weathered out in relief, as shown by figure 8.



FIG. 11.—Calvert Cliffs, Chesapeake Bay, Maryland, showing outcrop of Miocene bryozoan beds. Photograph by Bassler.

STUDIES IN COASTAL PLAIN STRATIGRAPHY AND PALEONTOLOGY

Dr. R. S. Bassler, curator of paleontology, U. S. National Museum, was engaged during the month of June, 1914, in a study of the Tertiary paleontology and stratigraphy of the Atlantic Coast Plain with special reference to the bryozoan faunas. This work was for the purpose of making further collections and of determining the stratigraphic relations of these bryozoan faunas for publication in the Monograph of North American Early Tertiary Bryozoa, now in course of completion by Ferdinand Canu of Versailles, France, and Dr. Bassler.

Starting at Chesapeake Beach, Maryland, and continuing southward through Virginia, North Carolina, South Carolina, Georgia, and Alabama, all the classic localities were visited, as well as many not so well known. The celebrated Calvert cliffs along Chesapeake Bay yielded a rich Miocene fauna and here many specimens were easily secured by searching the débris along the beach as shown in the accompanying photograph (fig. 11).

At Wilmington, North Carolina, an especially fine lot of material suitable for biological studies was collected from the city rock quarry, through the generous cooperation of the contractor in charge of some convict laborers. In South Carolina, the curator was taken through the swamps to the fossil localities by Mr. Earle Sloan, former



FIG. 12.—Cypress swamp, Santee River basin, South Carolina. Photograph by Bassler.

State geologist, without whose expert knowledge of the region little could have been accomplished. Here in many cases the rock exposures consisted of nothing but small outcrops brought to the surface by the "knees" of the cypress trees (fig. 12), but weathering of the hard rock had been so complete that many specimens could be had free of surrounding matrix. In Georgia and Alabama an abundance of material collected carefully with regard to its geologic position was secured and the stratigraphic position of several hitherto unplaced faunas was determined. The results of this field work from both the paleontologic and stratigraphic standpoints were so satis-

factory that the completion of a monograph upon the subject is now assured.

EXPLORATIONS FOR FOSSIL ECHINODERMS IN WESTERN NEW YORK

The field explorations conducted under the supervision of Mr. Frank Springer, associate in paleontology in the U. S. National Museum, for the purpose of adding to the Springer collection of fossil echinoderms, were devoted mainly to careful work in the Silurian rocks exposed along the new Erie Canal in western New York. Here Mr. Springer's private collector, Frederick Braun, spent some weeks during the summer of 1914 searching especially the waste material thrown out in excavations for the canal. The most valuable specimens from this part of New York occur in the Rochester shales of Niagaran age, which weather rapidly into mud upon exposure to the elements. It was necessary, therefore, that the new outcrops exposed along the canal be examined at once if valuable returns were to be expected, and Mr. Braun was directed accordingly to concentrate his efforts upon this area. The results were highly satisfactory, as numerous specimens of crinoids and cystids were found, a number of them having, as is rarely the case, root, stem, and crown preserved. These specimens were prepared for exhibition during the fall of 1914 and form a valuable addition to Mr. Springer's unique collection of fossils.

FOSSIL COLLECTING AT THE CUMBERLAND CAVE DEPOSIT

In continuation of the work of the previous year in the Pleistocene cave deposit near Cumberland, Maryland, Mr. J. W. Gidley, assistant curator of fossil mammals, again visited this locality in May and June of 1914. This expedition was highly successful and has added over 400 specimens to the fine collection from this deposit, including a good skeleton of the large extinct peccary, a partial skeleton of the wolverine, and several nearly complete skulls of these and other species. Among the latter are five good skulls of extinct species of the black bear and eight skulls, in more or less good state of preservation, of the extinct peccary.

Some new forms not before found in this deposit were obtained, the most important being a new species of badger and a second type of extinct peccary known as *Mylohyus*. The collection of the 1914 expedition far exceeds, both in numbers and quality of specimens, those previously taken from this deposit. The cubic space excavated was also much greater than before, yet at the end of the season's work the deposit showed no signs of immediate exhaustion of fossil-

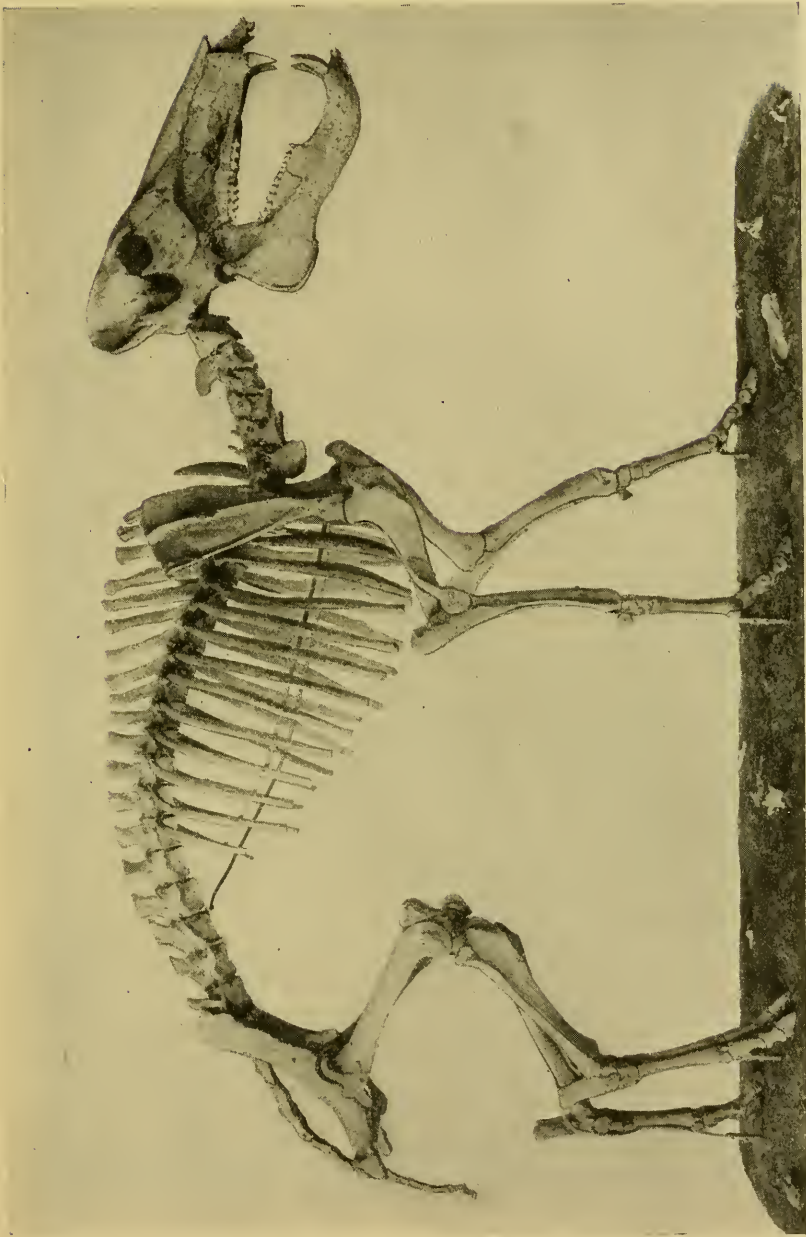


FIG. 13.—Skeleton of extinct Peccary from the Cumberland cave deposit. About $\frac{1}{8}$ natural size.

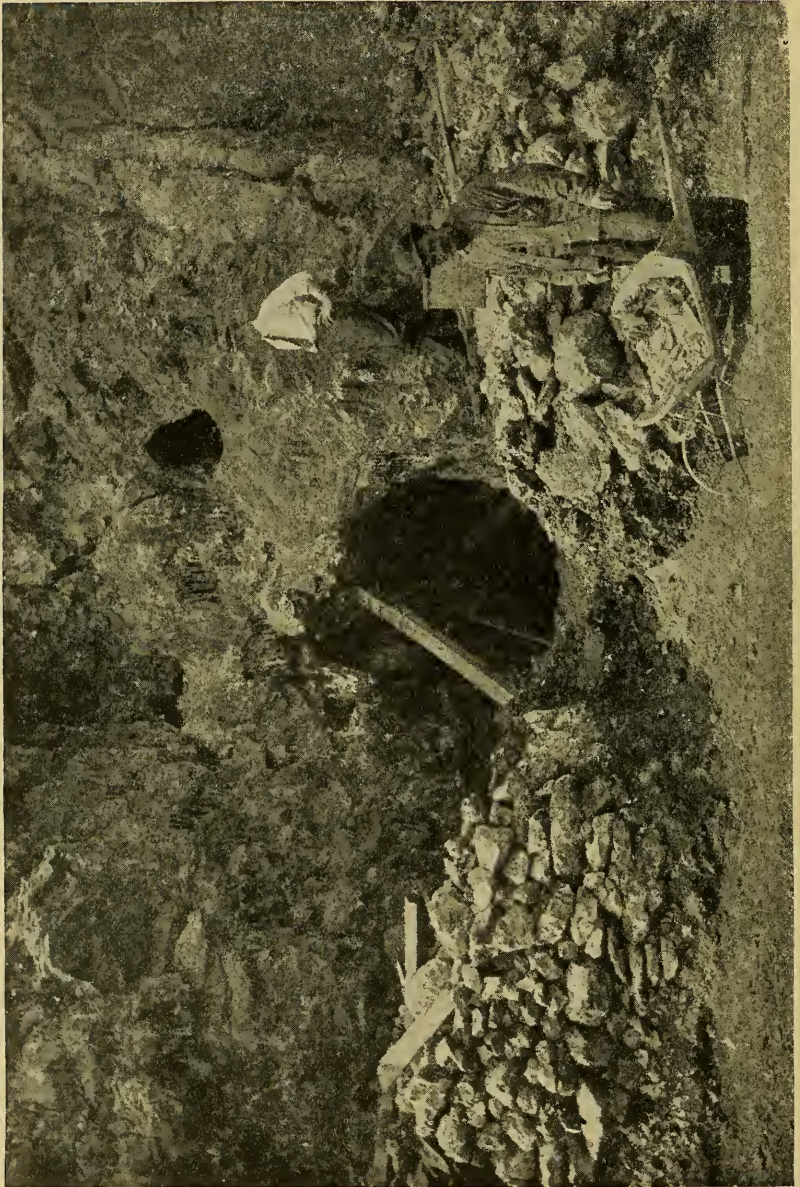


FIG. 14.—View in railroad cut showing excavation made by U. S. National Museum party, 1914 expedition.
Photograph by Armbruster.

bearing material, and it is expected that this work will be further continued during the coming summer.

In addition to the fossil bearing cave clays and breccias filling the old cavern, it was necessary to remove several tons of overhanging stalactitic rock and anciently fallen blocks of limestone. This added to the more cave-like appearance of the opening, as may be seen by comparing figure 14 herein with figure 18¹ published in last year's account of the work at Cumberland.

The results of the work of the 1914 expedition have greatly increased the possibility of accurate determinations of the fauna represented in this very interesting cave deposit and it is hoped the



FIG. 15.—Bad Land exposures near the mouth of Dog Creek, Montana. Photograph by U. S. Geological Survey (T. W. Stanton).

proposed further exploration will furnish added material of even greater importance.

HUNTING VERTEBRATE FOSSILS IN MONTANA

During the summer of 1914 Mr. Charles W. Gilmore, assistant curator of fossil reptiles in the National Museum, spent three weeks searching for fossil vertebrate remains in the Judith River formation in north central Montana.

By arrangement with the U. S. Geological Survey Mr. Gilmore worked in cooperation with one of their field parties. From their camp as a base of operations he conducted an exploration of the exposures along Dog and Birch creeks, near Judith post office, in

¹ Smithsonian Misc. Coll., Vol. 63, No. 8, 1914, p. 16.

the hope of collecting identifiable material to supplement the fragmentary fossil specimens secured by earlier expeditions. Abundant evidence of the presence of fossil remains was found, but much of the material was fragmentary and only a few specimens were shipped



FIG. 16.—Judith River and Claggett formations as exposed on Dog Creek, Montana. Bird remains found at base of cliff in middle distance. Photograph by Gilmore.

to Washington. From a paleontological standpoint the most noteworthy discovery was the fragmentary remains of a fossil bird related to *Hesperornis* found by Dr. T. W. Stanton on Dog Creek (fig. 16). It came from practically the same locality as the type of *Coniornis altus* Marsh, and is of importance as showing these bird

remains as occurring in the upper part of the Claggett formation, whereas heretofore it was thought that *Coniornis* had come from the lower part of the Judith River formation.

Incidental to this paleontological work a collection of Indian skeletons was obtained for the National Museum. These remains, consisting of parts of eleven individuals, were found in shallow graves in the crevices of a large block of Eagle sandstone that had been faulted up and which forms a conspicuous landmark in the valley just above the mouth of Dog Creek. A picture of this rock is shown in figure 15.

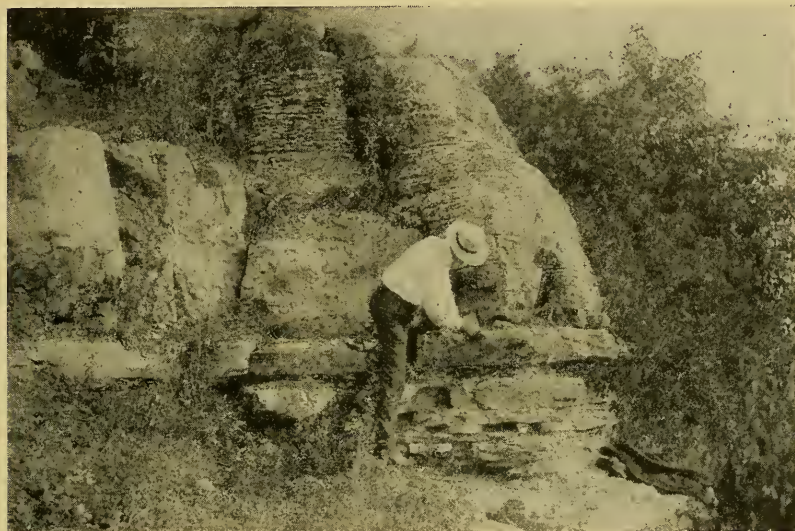


FIG. 17.—Unconformity between Lower Chazyan (Stones River) and Lower Black River (Lowville) strata at Columbia, Tenn. Dr. Ulrich is pointing to the undulating line which lies one to three inches below the top of the ledge indicated. Photograph by Bassler.

STRATIGRAPHIC STUDIES IN CENTRAL TENNESSEE

Dr. E. O. Ulrich, associate in paleontology, and R. S. Bassler, U. S. National Museum, were engaged for several weeks during the summer of 1914 in a study of debated points in the stratigraphy of the Central Basin of Tennessee under the joint auspices of the U. S. Geological Survey and the U. S. National Museum. The particular objects of the work were: first, to determine accurately the division line between the Chazyan and Black River groups, and second, to secure additional information on the black shale problem.

The well known marble beds of east Tennessee and associated shales and sandstones of Upper Chazyan age with a thickness of over 3,000 feet have never been found in central Tennessee, or in fact in any area west of the Appalachian Valley. The first problem was therefore to determine either the corresponding rocks in the more western areas or, if such strata were wanting, to discover the unconformity representing this great thickness. After some days of careful stratigraphic work it was learned that the Lower Chazyan or Stones River rocks of central Tennessee are succeeded directly by the lowest Black River or Lowville formation. In other words,



FIG. 18.—Exposure of black shale and underlying Silurian strata at Bakers, Tenn. Photograph by Bassler.

all of the Upper Chazyan rocks are wanting entirely, and central Tennessee therefore was presumably a land area during the time of deposition of the celebrated east Tennessee marbles. The unconformity between the two groups of strata is shown in figure 17, where it may be seen as an undulating line in a single ledge of limestone.

The second problem entailed further work on the determination of the age of the widespread Chattanooga black shale, which previously had been considered to be middle to late Devonian. In recent years this determination had been questioned and facts had accumulated showing it to be of younger age. Two features of considerable

significance in this problem were the discoveries in northern Tennessee, where the shale is well exposed, as shown in figure 18, that (1) this black shale passes without a discernible break into the overlying Mississippian (Kinderhook) shales, and (2) that the fossils of this overlying shale are of late instead of early Kinderhook age. As a result of this work good collections of several well preserved faunas were added to the Museum collection.

GEOLOGY OF CERTAIN AREAS IN EASTERN PENNSYLVANIA

Dr. Edgar T. Wherry, assistant curator of the division of mineralogy and petrology, by arrangement with the U. S. Geological Survey, spent a month during the summer of 1914 in the study of the Pre-Cambrian, Cambrian, Ordovician, and Triassic formations of the Reading and Allentown quadrangles in eastern Pennsylvania. In the former area particular attention was directed toward the lithologic character and fossil content of the Conococheague and Beekmantown limestones, and the mapping of these and other post-Cambrian formations, which had been begun the previous season, was practically completed.

In the Allentown region brief visits were paid to several localities to secure data for the text of the Allentown-Easton folio, which is in course of preparation. The criteria for recognition of the various Pre-Cambrian formations, especially the metamorphosed sediments, were worked out in detail, and sections of the Triassic and Paleozoic beds measured.

GEOLOGICAL STUDIES IN NEW YORK STATE

Dr. J. C. Martin, assistant curator of geology, has spent some time completing minor details in the preparation of a report on "The Pre-Cambrian Rocks of the Canton, N. Y., Quadrangle," to be published by the New York Geological Survey.

The examination of this area involved the working out of structural and genetic problems of a high degree of complexity, the solution of which demanded methods of great accuracy and detail.

Among the results obtained may be mentioned, particularly, the determination of the close analogy between tectonic elements of widely differing degrees of magnitude, and the recognition of a type of major isoclinal folding with steep-dipping axes, paralleled, so far as known, only by occurrences in Sweden. In addition there were obtained many new data with reference to the origin and relations of multiple injection gneisses of more than one generation,

as well as the sequence of acid and basic igneous rocks and the complex interrelations of extensive garnet gneisses, amphibolites, and other Grenville and post-Grenville crystalline formations.

EXPEDITION TO BORNEO AND CELEBES

Mr. H. C. Raven, who, through the generosity of Dr. W. L. Abbott, has been working in Borneo since the summer of 1912,



FIG. 19.—The "Bintang Kumala," used by Mr. Raven in Borneo from July, 1912 to July, 1914. Photograph by Raven.

continued his explorations, with Samarinda, Dutch East Borneo, as headquarters. During the early part of the year he worked on the coast north of Samarinda, and later he ascended the Mahakam River. The results were satisfactory, though the region of the upper Mahakam proved somewhat disappointing on account of the practical extermination by the natives of all mammals large enough to be used as food. About the middle of July Mr. Raven finished his Bornean exploration and crossed the Macassar Strait to the Island

of Celebes, where he intends to remain for an indefinite period. This change of base was not so simple a matter as might be supposed, as is shown by the following passage from a letter dated at Tanjong Lango, Celebes, August 28, 1914:

As I wrote before, when I returned from the interior of Borneo to Samarinda, I had to have my boat, the "Bintang Kumala," hauled out. It needed repairs and drying after having been in the water constantly for two years or more. The Assistant Resident stationed at Samarinda at this time went up



FIG. 20.—Camp at Karang Tigau, Celebes, August, 1914. Photograph by Raven.

along the coast to Beraoe and I asked him to bring me two or three sea-faring natives to act as a crew to cross with me to Celebes. He was unable to get them. I tried, but could find no Bajans or Soeloes who would go, but finally found, near Samarinda, three Bugginese who claimed they could sail. So when the boat was ready we started, and to my great disappointment I found my crew entirely incapable, running the boat ashore before we had gotten fairly started. There was nothing to do but to return to Samarinda. I thought of having the boat either towed or lifted across to Donggala by the steamer making that run at intervals of two weeks; this I found would cost more than one hundred and fifty dollars, and after crossing I would stand a big chance of having the same trouble in getting a reliable crew. Just at that time a small two-master schooner came into Samarinda and my attention was called to it

by a European who considered my boat unsafe to cross in. I had a look at the schooner and found it to be strongly built and in pretty good condition, 54 feet long and 12 feet beam, drawing about 4 feet of water. It is made entirely of iron-wood.

After considering, I decided the best plan would be to buy the schooner, and as the owner was willing to sell, we came to terms. He bought my boat for three hundred and fifty guilders and I was to buy the schooner for thirteen hundred and fifty guilders, but found that I could not own and sail a boat under the Dutch flag unless I had been holder of citizen's papers for a full



FIG. 21.—Beraoe Malays at Maratua Island, southeast Borneo.
Photograph by Raven.

year. According to the Dutch law, coasting under a foreign flag is prohibited. Thus my only way was to make a contract of "Bond Loan," stating that I had loaned thirteen hundred and fifty guilders to Hadji Mohamad Arsad and as security he gives into my absolute custody his schooner, which he may redeem only during the thirteenth month after date by paying the sum of thirteen hundred and fifty guilders and must accept the schooner in any condition in which she may be at that time. He can never claim damages, inasmuch as the loan equals the value of the schooner; also that if Hadji Mohamad Arsad breaks the contract and takes back the schooner before the end of the twelve months after date (July 4, 1914), he must pay not only the sum of the loan

but also a fine of five hundred guilders. To find a crew for this boat was not difficult, and she is far better to handle than the smaller one and no more expensive to man, probably cheaper. Having crossed to Celebes in this boat, I should not care to do it in the smaller one, for Macassar Strait is 140 miles wide and over a thousand fathoms deep. A current running against the wind sometimes makes bad weather. Nearly all the coast of Celebes is rocky, with deep water close in to shore, so that in case of storm we sometimes have to run out to sea rather than chance going on rocks. In such cases it is exceedingly difficult in a small boat to keep anything dry.



FIG. 22.—Dyak woman, Segah River, Borneo. Note ear ornaments and tattooing on thighs. Tattooing is difficult to photograph on account of its coloring. Photograph by Raven.

On reaching Celebes Mr. Raven immediately began his field work, with what success may be inferred from further passages from the letter of August 28.

The country here is a great contrast to that of Borneo and mammal life not nearly so plentiful. There is a mining company located at Paleleh working gold, and they have cut trails back into the jungle. There are several Europeans and they allowed me to use their trails. I went inland about four or five miles over the mountains and made camp at the edge of the Paleleh River,

which is a small brook and at this season nearly dry, with steep mountains or hills on all sides.

My traps I placed not far from the river, which at this dry season should be as good as any place. Nearly everywhere the shore is planted with coconuts and oftentimes clearings are made on the hill slopes, but inland the original forest remains unmolested, though it is not open forest like that of eastern Borneo. There is much underbrush, composed principally of a variety of almost worthless rattan.

Thus far I have collected specimens of Babirusa [a pig with peculiar erect tusks curved backward above forehead at extremities], two females with

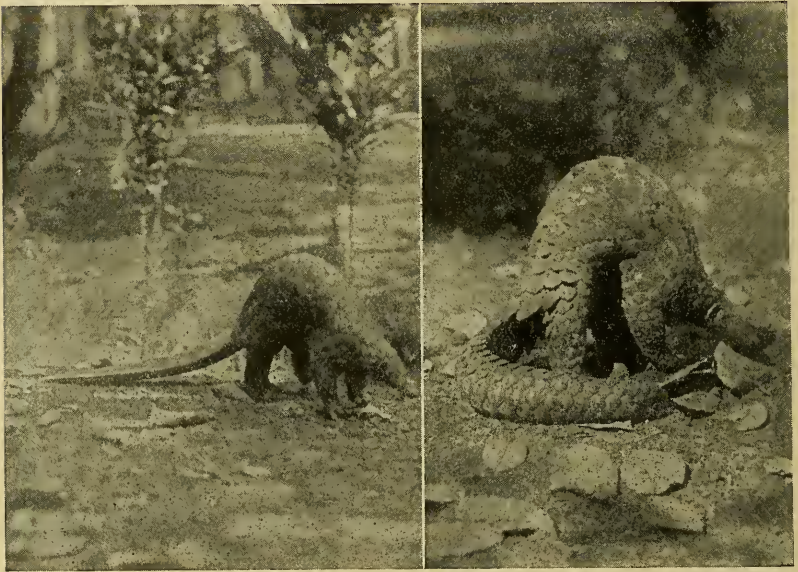


FIG. 23.—Two attitudes of Pangolin. Length of animal: head and body, 26 inches; tail, 22 inches. Mahakam River, Borneo. Photograph by Raven.

skins and some fine skulls of males. Also a peculiar black pig with hard cartilaginous conical nodules on its nose and hard jowel patches; a marsupial and two species of squirrels. I have also seen a reddish squirrel running on the ground, but have not gotten one; also I have seen a small carnivore. Of rats I have six or seven species, and possibly there are more. I have also some bats. The ants do not seem to destroy as many rats here as in Borneo; this will prove a great advantage in collecting.

According to natives, Sapi-utan [a dwarf buffalo peculiar to Celebes] and Rusa [deer] in certain localities are abundant, though I have yet seen none. The natives also say there are many wild water-buffalo which have escaped from captivity years ago.

Reptiles appear to be common and the miners at Paleleh killed a python which they say *measured* 10 meters.

Black macacus monkeys are generally common and at a distance look like black dogs. About the edges of the forest I have seen many birds, but in the deep forest I have seen very few.

Photographs I can probably send via Gorontalo. The chief difficulty in making pictures here is the dirty, warm water.

No specimens from Celebes have yet been received in Washington; but all the Bornean material is at hand, forming a very important addition to the National Museum collection. It includes 310



FIG. 24.—Gymnura, an animal related to the European hedgehog, though its body is covered with coarse hair instead of spines. Length: head and body, 14 inches; tail, 11½ inches. Samarinda, Borneo. Photograph by Raven.

mammals taken in 1914, making total of 1,613; and 261 birds taken in 1914, making total of 1,440.

Some of the photographs alluded to by Mr. Raven are here reproduced.

EXPEDITIONS TO THE FAR EAST

Mr. Arthur de C. Sowerby has continued his explorations in Manchuria and northeastern China. Interesting specimens received from him are two wapiti bucks and a roe deer. A recent letter announces the capture of two bears and a peculiar rabbit.

Mr. Copley Amory, Jr., a collaborator of the National Museum, joined the party accompanying Captain J. Koren to the northeast coast of Siberia. This party sailed from Seattle about June 25, and was last heard from at Nome, Alaska, on July 19. It is Mr. Amory's intention to explore such territory as may be practicable from Nijni Kolymsk as a winter base. He will give special attention to mammals and birds. Figure 25 is from a photograph of Captain Koren's boat.



FIG. 25.—Captain Koren's vessel which took exploring party to Siberia.

THE "TOMAS BARRERA" EXPEDITION IN WESTERN CUBA

During the months of May and June, 1914, an expedition under the joint auspices of the Smithsonian Institution and the Cuban Government was made to Cape San Antonio and the Colorados Reefs of northwestern Cuba. Through the great generosity of Senor Raoul Medivilla of Havana, the use of the large and well-equipped schooner "Tomas Barrera" was given the expedition free of all cost of charter. This schooner, of the class locally known as a "Vivero," contains a large well or tank admitting sea water, a feature which proved of greatest value for stowage of living specimens. A carefully selected crew, familiar with the intricate channels of the reefs, was also provided by Senor Medivilla. Besides the schooner, two power launches were also taken, one especially equipped for dredging in moderate depths.

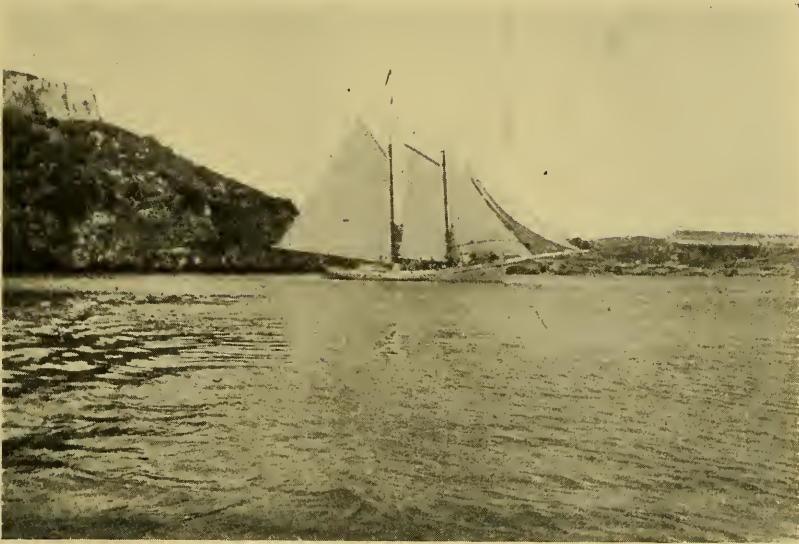


FIG. 26.—The "Tomas Barrera" in Havana Harbor.



FIG. 27.—Setting traps for fish and crustaceans off Cape Cajon.

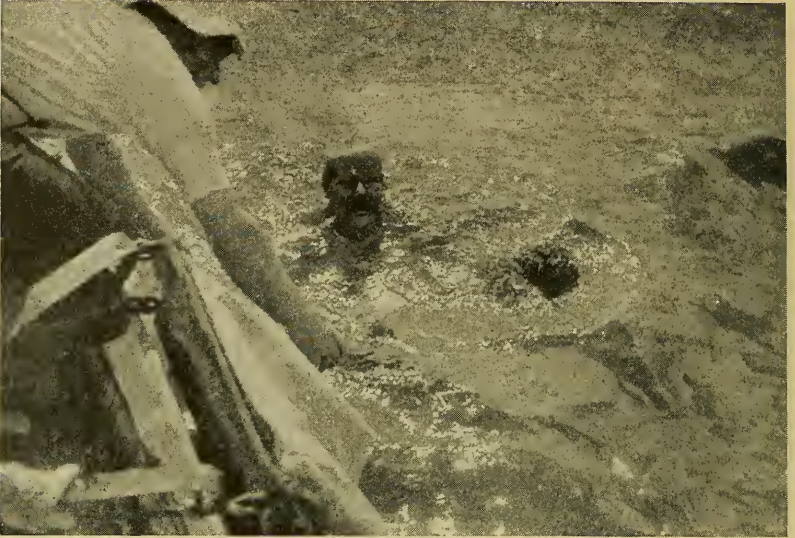


FIG. 28.—The Patron of the "Tomas Barrera" with a huge sponge, only a portion of which appears above water, secured by diving. One of the dredges used by the party is shown hanging over the edge of the launch.



FIG. 29.—Henderson and Greenlaw collecting Cerions.



FIG. 30.—The big land Crab of Cuba.



FIG. 31.—Track for charcoal burners' carts, extending miles into the interior at Cape San Antonio, along which were obtained hundreds of specimens of all kinds of animals.

The main object of the expedition was to make as complete as possible a biological survey of the waters of western Cuba, especially of the extensive Colorados Reefs, heretofore wholly unexplored by naturalists, and to obtain fine specimens for the exhibition series of the National Museum. Another purpose of the visit to this region was to investigate closely the fauna of certain high mountains of the northern ranges of the *Sierra de los Organos* to gather material from those inaccessible localities. The chief interest of the Cuban Government was a study of food-fish life of the reefs, and to that end

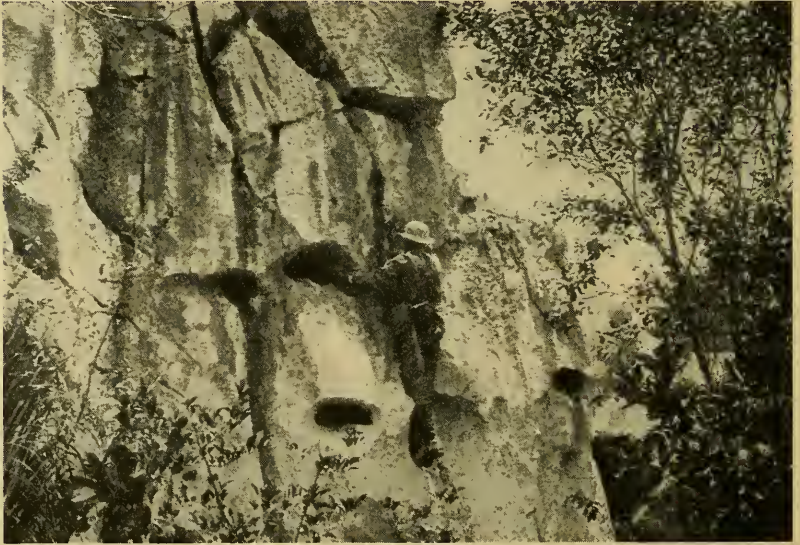


FIG. 32.—Bartsch collecting the rare landshell, *Urocoptis dautzenbergiana*, of which several hundred were obtained in the space shown in the photograph.

Sr. Lesmes of the Cuban Fish Commission was detailed by President Menocal to accompany the party.

Careful preparation was made for intensive field work and a full equipment of dredges, traps, submarine electric lights, chemicals for stupefying marine animals, etc., was taken.

Besides extensive dredging operations carried on daily, shore parties visited the two great mountains, Pan de Guajaibon and Pan de Azucar, and also spent some time in the Viñales region, about Guane, and in the low-lying country about La Fe, and finally spent several days collecting in the heavily forested region about Cape San Antonio. From these shore stations an immense number of specimens were collected, including many species new to science.

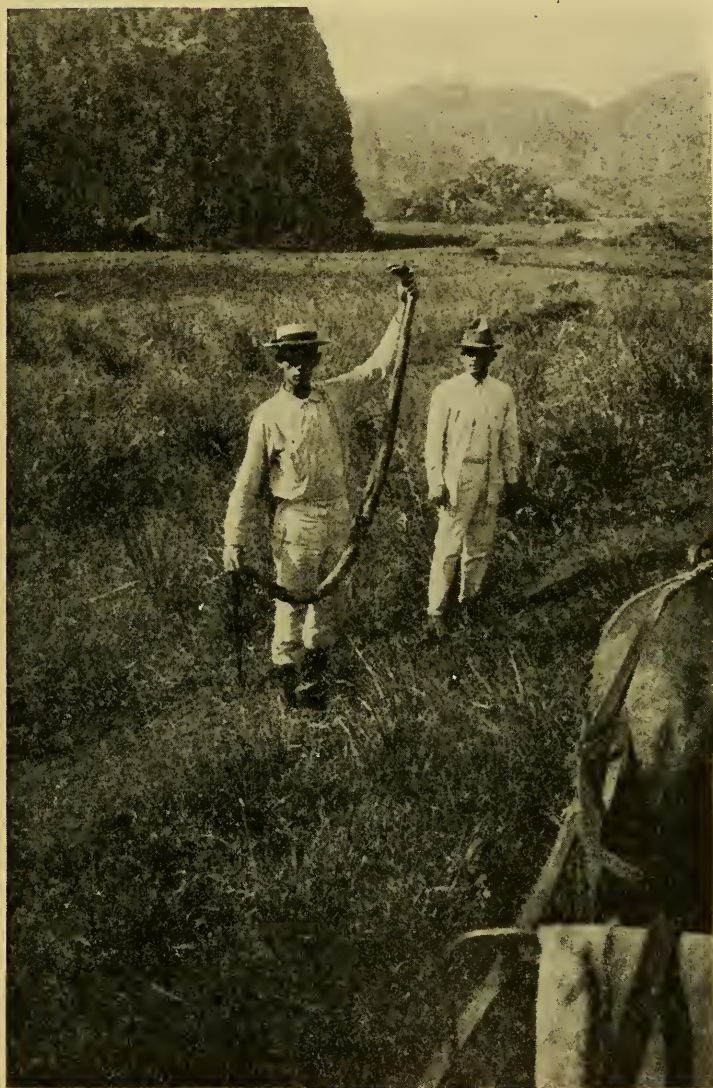


FIG. 33.—The Cuban Maja (*Epicrates angulifer* Bibron). Frequently met with while hunting landshells in the mountain country.



FIG. 34.—River at La Mulata on the trail to Mt. Guajaibon, where fresh-water animals of various kinds were collected. Henderson and Clapp at water's edge, and Rodrigues at right.



FIG. 35.—Typical jungle scene and a favorite place for fresh-water mollusks.

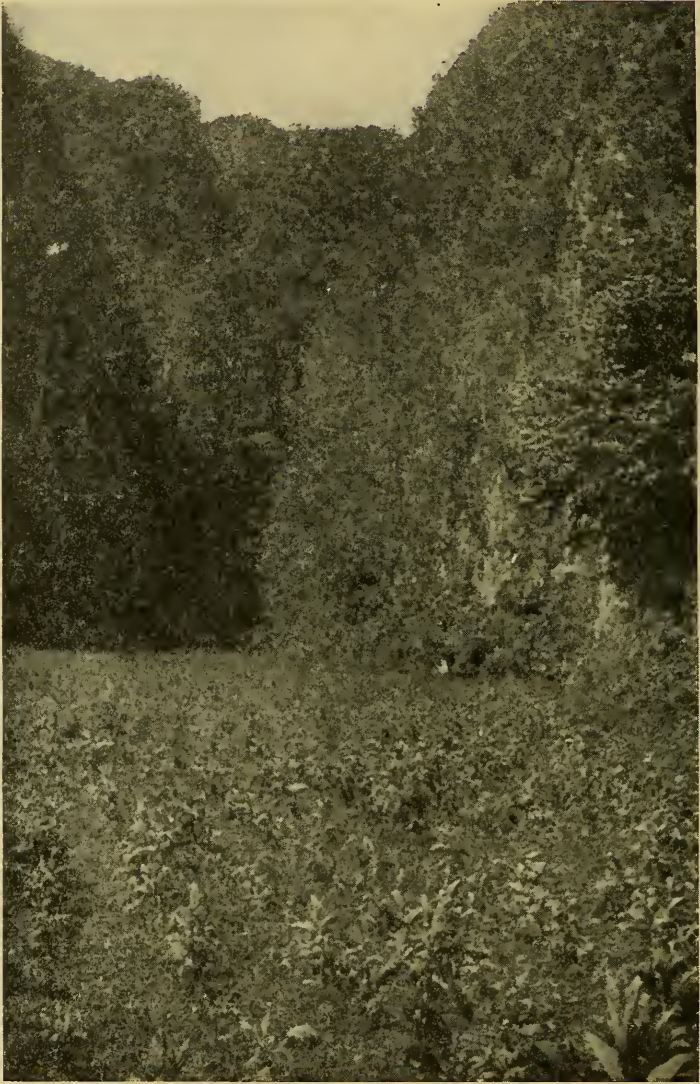


FIG. 36.—Cove of Delight in the Viñales Range. A famous collecting ground for land mollusks.

The expedition met with signal success and returned a great quantity of interesting material to the Museum, which is now in the hands of specialists for final report. Splendid collections in all of the phyla of marine organisms, including protozoa, sponges, corals,



FIG. 37.—A Cuban cactus in flower.

gorgonians and medusæ and other cœlenterates, annulates, echinoderms, crustaceans and mollusks, were made. The usual hydrographic data were also carefully kept, and bottom and water samples were taken at the various stations. Whenever possible collections of fresh water organisms were secured. The wonderful development of molluscan life furnished by far the greater part of our

catch, though the efforts of the expedition were by no means solely devoted to this end. The vertebrates, as well as the lower organisms, added materially to our catch. Among plants, special attention was given to the cacti, of which a number of very interesting forms were secured. A general account of the expedition, "The Log of the Tomas Barrera," by Mr. Henderson, is almost completed, and detailed reports on results of the expedition, by various specialists, are to follow.

The party consisted of Mr. John B. Henderson, member of the Board of Regents of the Smithsonian Institution; Dr. Paul Bartsch, curator of marine invertebrates, U. S. National Museum; Dr. Carlos de la Torre of the University of Havana; Mr. George H. Clapp of Pittsburgh, Pa.; Mr. Charles T. Simpson of Little Rivers, Fla., formerly of the Museum staff; and of Mr. Gill, the Museum colorist, and Mr. Victor Rodrigues, preparator at the University of Havana.

It is expected that this expedition to western Cuba will be followed by a series of similar explorations in other parts of the Antillean regions looking primarily to the enrichment of the Museum collection in the fauna of the West Indies, in order that we may gain a clearer understanding of the faunas and faunal relationship of the West Indies.

EXPERIMENTS WITH CERIONS IN THE FLORIDA KEYS

Brief accounts have been published in previous Smithsonian exploration pamphlets¹ of the Bahama Cerion colonies planted on the Florida Keys by Dr. Paul Bartsch of the U. S. National Museum, under the auspices of the Carnegie Institution of Washington. As regards the development of the new generation of these shells in a new environment, it was stated last year that "judging from the young collected which were born on these keys (fig. 38), the first generation will be like the parent generation, unless decided changes should take place in the later whorls, which have not as yet been developed." On Dr. Bartsch's visit to the colonies in April, 1914, however, adult specimens of the new generation were found at several localities, and these fully developed adults enable him to state that a decided change has taken place. So pronounced are the departures from the parent generation that the specimens would undoubtedly be considered by one unfamiliar with the history of the material as distinct species and not closely related to the parent

¹ Smithsonian Misc. Coll., Vol. 60, No. 30, pp. 58-62; Vol. 63, No. 8, pp. 27-30.



FIG. 38.—Young Ceratium grown on Loggerhead Key, Tortugas, Florida.

stock. Also the first generation shows a wider range of variation than the parents.



FIG. 39.—Bahama Cerions on Duck Key, Florida.

This departure from the parent generation is shown in the shape, coloration, and sculpture of the shells (fig. 40). The tendency of the whole lot is toward elongation, and toward the attenuating and

rounding of the base. There is one type of variation in which the ribs are almost obsolete and very widely spaced. Another is darker and narrower, and the ribs are much more crowded together. All these various modifications in the new generation show that the



FIG. 40.—*a*, A typical planted specimen; *b* and *c*, two changes shown in the first generation of Florida-grown specimens.



FIG. 41.—Man-o'-war birds suspended on motionless wing on upthrust of air above southeast corner of Fort Jefferson, Tortugas, Florida.

somaplastm in the Cerions experimented with has been affected by the new environment in which they were developed.

Further even more interesting results bearing on heredity and environment are expected from the continuation of Dr. Bartsch's studies with the Cerions. A full account of the work so far done and the results obtained will shortly be published by the Carnegie Institution of Washington.

During Dr. Bartsch's trip in 1913, a record was kept of the birds observed on the Florida Keys, and as this list proved of considerable interest to ornithologists, the observations were continued in 1914. Some 46 species were noted, including 19 not observed the previous year. A detailed account appears in the Year Book of the Carnegie Institution of Washington for 1914, pp. 192-194.

BIRD STUDIES IN ILLINOIS

Incidental to continued work on preparation of manuscript of the unpublished volumes of "Birds of North and Middle America" (Bulletin 50, U. S. National Museum), Mr. Robert Ridgway made a careful study of bird-life in southern Illinois, in order to compare present conditions with those existing half a century ago. The results of this investigation will be published in the May-June, 1915 number of "Bird-Lore." It was found that with a few exceptions the native birds have greatly decreased in numbers. At least three species (the passenger pigeon, wild turkey, and ruffed grouse) have totally disappeared from the region examined, while several others are on the verge of extermination. A few species, such as the crow blackbird (bronzed grackle) and blue jay, and perhaps the robin, are, apparently, as numerous as they were fifty years ago.

The principal causes which have brought about this greatly diminished bird-life are: (1) in the case of the game birds, relentless shooting; (2) greatly reduced breeding and shelter areas, through clearing of forests, cutting away of woody growths along roadsides and fence-lines and drainage of swampy or marshy areas; (3) introduction of the European house sparrow, which has increased to such an extent that it now outnumbered, even on the farms, all the smaller native birds combined, greatly reducing their food supply, and monopolizing the nesting sites of such species as the blue bird, purple martin, wrens, swallows, and other birds that nest in cavities or about buildings; (4) invasion of the woods and fields by homeless house cats, and destruction of eggs and young (often the parents also) of ground-nesting species by "self-hunting" bird dogs (setters and pointers); and, probably, (5) spraying of orchards.

CACTUS INVESTIGATIONS IN PERU, BOLIVIA, AND CHILE

Dr. J. N. Rose, associate in botany, U. S. National Museum (at present connected with the Carnegie Institution of Washington in the preparation of a monograph of the Cactaceæ of America), spent nearly six months in travel and field work on the west coast of South America during the summer and fall of 1914, visiting Peru, Bolivia, and Chile. He made collections on the coast at the following places: Paita, Pacasmayo, Saliverry, and Mollendo in Peru; Iquique, Antofagasta, Coquimbo, Los Vilos, Los Molles, and Valparaiso in Chile. As his chief work was to study and collect cacti, most of his time was spent in the interior deserts. A section was made through central Peru from Callao to Oroya, from sea level to the top of the Andes, the highest point reached being 15,665 feet. Cacti were found in the greatest abundance at an altitude of 5,000 to 7,500 feet; but the various species range from a few feet above sea-level to as high as 12,000 to 14,000 feet.

A second section was made across southern Peru, from Mollendo to Lake Titicaca via Arequipa. The highest point reached was 14,665 feet. Here also the cacti are found from near sea-level nearly to the top of the Andes; but the most remarkable display is on the hills surrounding Arequipa, at an altitude of from 7,000 to 8,500 feet. While the cacti are abundant in both these regions, they are, with only a few possible exceptions, quite distinct. Side trips were made from Arequipa to Juliaca and Cuzco, in Peru, and to La Paz, Oruro, and Comanche, in Bolivia.

On the pampa below Arequipa are found the famous crescent-shaped sand dunes. Each dune or pile of sand is distinct in itself, often separated some distance from any other dune, and occurring, too, on rocky ground devoid of other sand. The dunes are found on the high mesa some 5,250 feet above the sea. They form definite regular piles of sand, each presenting a front 10 to 100 feet wide and 5 to 20 feet high, nearly perpendicular, crescent shaped, and from the crescent-shaped ridge tapering back to the surface in the direction from which the wind blows. These piles of shifting sand go forward about 40 feet a year.

In Chile two sections were made into the interior—one from Antofagasta to Calama, and one from Valparaiso to Santiago. The first is through the rainless deserts of northern Chile, the whole region being practically devoid of all vegetation. The second is across central Chile, the hills and valleys of which are veritable



FIG. 42.—Showing the front of one of the crescent-shaped sand dunes characteristic of the high pampa between Mollendo and Arequipa, Peru. These dunes move forward about 40 feet a year.



FIG. 43.—A group of palms, *Jubaea spectabilis* H. B. K., common in the Chilean valleys north of Santiago. From the sap of this palm is made a delicious syrup, "Miel de Palma," much prized by the people of this region.

flower gardens, the hills often being a mass of yellow. Various trips were made in the central valley of Chile and one journey along the Longitudinal Railway of Chile extended from Caldera to Santiago. Special trips were made for certain rare plants like *Cereus castaneus*, first collected in 1862 and not since observed until found by Dr. Rose; and *Cactus horridus* and *Cactus Berteri*, described in 1833, but long since discarded by Cactus students. In the central valley of Chile is seen that beautiful palm, the only one native of Chile, *Jubaea spectabilis* H. B. K., which often forms forests of considerable extent. From this palm is made the "Miel de Palma" so much used as a syrup on ships and at hotels.

Dr. Rose made extensive shipments of living cacti. Most of the material is of species new to American collections and quite a number have not before been in cultivation, while some are new to science. In addition, formalin and herbarium material was obtained in abundance. His collection represents over 1,000 numbers, consisting not only of cacti, but ferns, grasses, mosses, marine algæ, parasitic fungi, and other miscellaneous groups which Dr. Rose believed would be of help to various specialists.

BOTANICAL EXPLORATIONS IN NEW MEXICO AND TEXAS

During August and September, 1914, Mr. Paul C. Standley of the division of plants of the National Museum and Mr. H. C. Bollman of the Smithsonian Institution spent nearly five weeks camping in northern New Mexico at the Brazos Canyon in Rio Arriba County. This locality is about 30 miles south of the Colorado line and about half way across the state. While the trip was a private undertaking primarily for vacation purposes, a representative collection of the plant life of the region was made.

The Brazos Canyon is a gorge through which the Rio Brazos, a tributary of the Chama River, runs for several miles. Near Tierra Amarilla, where it flows into the Chama, the Brazos is a broad stream, with only a moderately rapid current. As one follows up its course the stream gradually becomes more rapid, and the valley narrower. Eight or nine miles west of Tierra Amarilla there rises on the north side of the valley a high mesa, with an abrupt escarpment of naked reddish rocks, and one finally comes to a gigantic fissure in the escarpment from which the Brazos issues. Here, for several miles, the stream runs through a deep gorge, bounded by bare, perpendicular granitic walls from two to three thousand feet high, in places less than a hundred yards apart. This chasm is

similar to the Taltéc Gorge, which receives so much attention from the tourists who travel over the line of the Denver and Rio Grande Railroad between Antonito and Durango, Colorado, and it is probably superior in size to that better known canyon. The Brazos, within its canyon, and for a couple of miles after leaving it, is a swift stream of considerable volume, rushing along over rapids or falling now

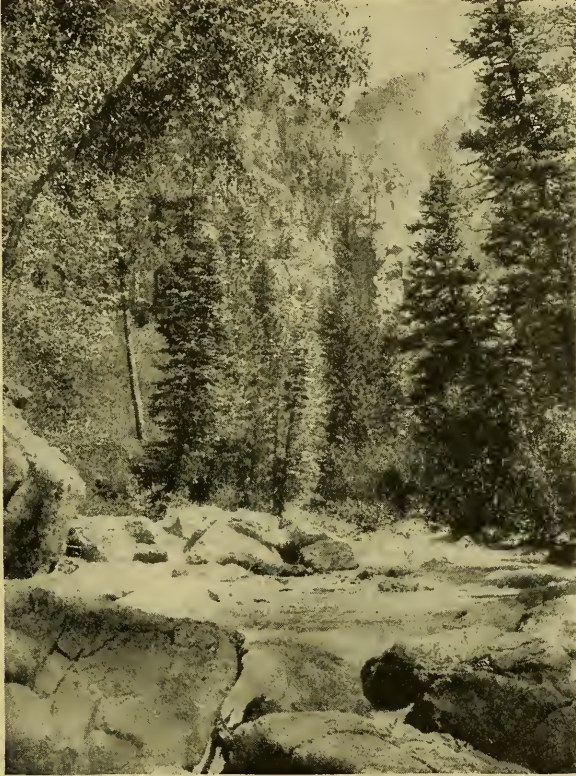


FIG. 44.—Along the Brazos, looking toward the Brazos Canyon. Photograph by Standley.

and then over great polished boulders into broad, deep, dark green pools. It is frequented by large numbers of trout, and for fishing is not excelled by any stream in the state, unless it may be the upper Pecos.

The surrounding country is well timbered, at least in the less accessible portions. The region being included in one of the old Spanish grants, it has been impossible to conserve it in one of the national forests, and most of the yellow pine at lower levels has

been removed. In the vicinity of the canyon, however, there is a moderately heavy growth of Douglas spruce, Colorado blue spruce, white fir, white pine, and yellow pine. Animal life is abundant, especially deer, wild turkeys, grouse, ducks, and beaver. Bears are



FIG. 45.—Inside Brazos Canyon. The trees are chiefly spruce and fir. Photograph by Standley.

said to be common, but in the autumn they were still feeding at the higher levels and no signs of any were seen.

About 800 specimens of plants were collected, special attention being given to the cryptogams, of which practically nothing is known in New Mexico. Several species of rusts were collected

which are new to the State. The lichens have been named by Mr. G. K. Merrill. Nearly all of them are additions to the known flora of New Mexico, and two of them are undescribed species. The

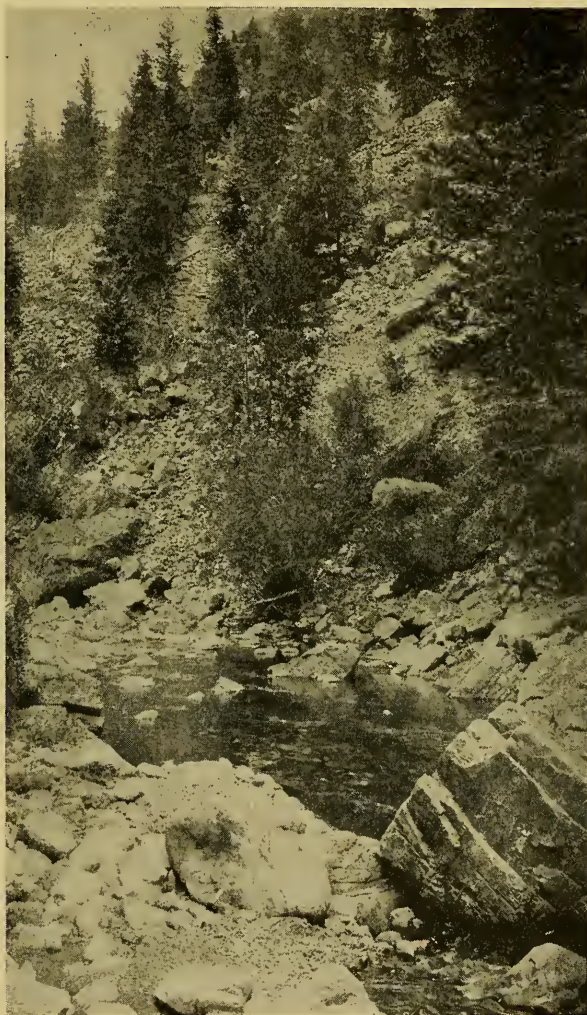


FIG. 46.—Rock slide along the Rio Brazos. Photograph by Standley.

ferns of the Brazos Canyon region are particularly interesting. Twelve species were collected, three of which were not known before from the State. The season was too far advanced to find the flower-

ing plants in the best condition—snow fell on the surrounding mountains the middle of September, just before camp was broken; but a considerable collection was obtained, nevertheless. Although only a part of the phanerogams have been determined, it is found that several species have been added to the known flora of New Mexico. Chief among the additions was a family new to the State, the Sparganiceae. Several of the plants apparently represent species new to science, descriptions of which will be published later.



FIG. 47.—Along the Rio Brazos below the canyon. Photograph by Standley.

COLLECTING FOSSILS ON CHESAPEAKE BAY

During 1914, several trips were made by Mr. William Palmer to the Chesapeake Miocene on Chesapeake Bay and some very important material was collected. Many years ago four very peculiar caudal vertebræ were described by Prof. Cope as *Cetophis heteroclitus* and these have ever since remained unique. About a dozen vertebræ of this animal were collected during the year by Mr. Palmer, and while the material is insufficient to reconstruct a skeleton, it surely indicates that a snake-like mammal of perhaps 10 feet in length and unlike anything known to-day, inhabited the Miocene sea. The skull is not known.

Material representing Zeuglodont and Squalodont mammals was also collected, indicating that representatives of those groups lived

through the greater part of the existence of the Miocene sea. One specimen is a very perfect skull evidently unlike anything heretofore known from North America. Unfortunately it contained no teeth, but teeth presumably belonging to the species were also collected. Many other vertebræ were found representing known species as well as others apparently new.

ANTHROPOLOGICAL INVESTIGATIONS IN GUATEMALA

Early in January, 1914, arrangements were made whereby Mr. Neil M. Judd of the National Museum was enabled to accept an



FIG. 48.—A view among the ruins of Utatlan, the last capital of the Quiché empire.

invitation to participate in the third season's archeological investigations at Quirigua, Guatemala, conducted under the direction of Dr. Edgar L. Hewett by the School of American Archaeology. Accounts of the earlier investigations have been published by the Archaeological Institute of America.¹

Plans for the expedition of 1914 included a continuation of former excavations upon the prehistoric temples and pyramids surrounding the so-called "Temple Court," the religious center of the sacred city of Quirigua, and the reproduction, in plaster, of several of the huge stone monuments which have made these ruins world-famous. Mr.

¹ Bulletins: Vol. 2, pp. 117-134 (1911), and Vol. 3, pp. 163-171 (1912).



FIG. 49.—Quiché Indians at Sunday morning market in the central plaza, San Tomas de Chichicastenango. Every article of native industry and art is offered for sale on market day.



FIG. 50.—A nearer view of a Quiché fire-altar near San Tomas de Chichicastenango. A horizontal stone bearing the figure of a human being and several lesser carvings stand at the back of the fire pit; rows of the young tips of spruce bows are spread in front.



FIG. 51.—Quiché Indians at fire worship, San Tomas de Chichicastenango. The worshipper stands or squats in front of the fire and mutters his prayers into the rising smoke of his burning copal cakes.



FIG. 52.—1914 excavations on the temple at the north side of the Temple Court, Quirigua, Guatemala.

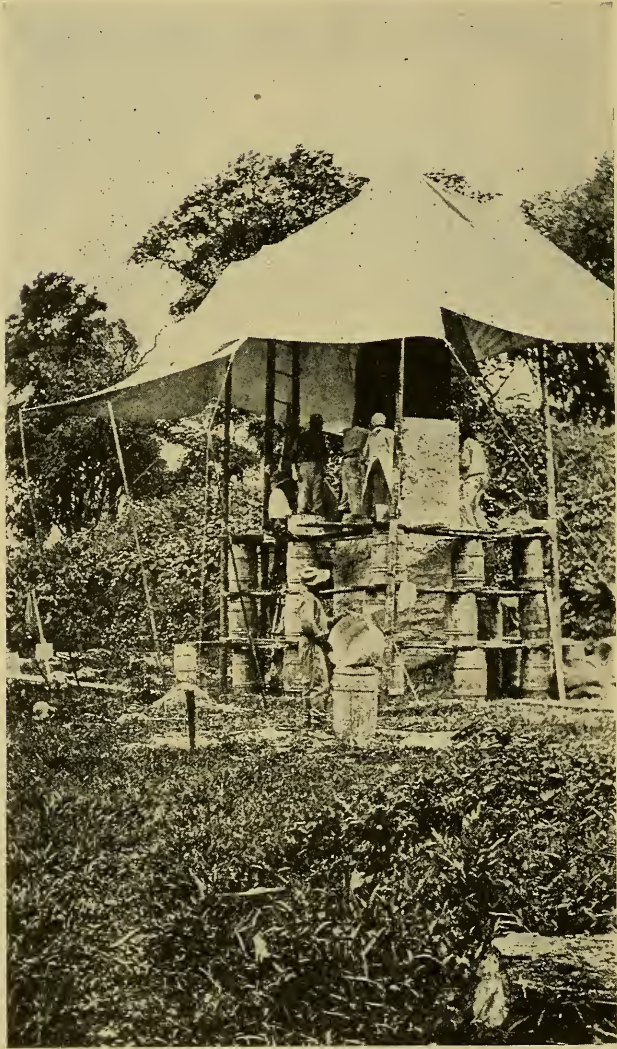


FIG. 53.—Building the plaster forms around one of the Quirigua monuments. By means of these forms glue molds of the carvings were secured and, from the glue molds, plaster duplicates of the originals were constructed.

Judd was directed to superintend this latter phase of the expedition's activities, and, with the aid of a small corps of able assistants, completed casts from six of the colossal stelae before the brief "dry season" came to an end. The task of reproduction was greatly facilitated by the use of glue or gelatine, a medium never before employed in the torrid zone. With this material, negative impressions of the carvings and inscriptions were obtained from the monuments; from these impressions, plaster duplicates of the originals were readily constructed. The results far surpassed those which had previously been secured with other processes. The 1914



FIG. 54.—Plaster cast of a "Death's Head" from one of the Quirigua stelae.

reports of the School of American Archæology consider, in detail, the results of its Guatemala expedition.

At the conclusion of the Quirigua work, Mr. Judd journeyed to Guatemala City and from there by Indian foot paths to the mountain valleys that lie between the capital city and the Mexican border. His object in making this trip was to gain, in the few days at his disposal, a hasty view of present anthropological possibilities among the several Indian tribes who inhabit the region. Although each village has its distinctive ethnological features, but little remains, in the remnants of the Quiché, Cachiqual, and Tzutuhil tribes, to indicate the strength and magnificence of the Quiché empire which Pedro de Alvarado destroyed in 1523, at the beginning of his conquest of Guatemala.

Among other important Indian communities, Mr. Judd visited Totonicipan and Quezaltenango (Xelahun), former Quiché strongholds which have since become, respectively, a modernized Indian town and Guatemala's second city. One day was spent at Lake Atitlan, that beautiful body of water which played such an important part in the pre-Columbian history of the native peoples who knew its shores. Overlooking the blue lake and well-guarded from strangers, are several small villages, their gardens terracing the volcano slopes to a point beyond the drifting clouds. San Tomas de Chichicastenango, with its 16,000 Quiché Indians, and Santa Cruz del Quiché were also visited. At the former pueblo, photographs were taken of a Quiché fire-altar, with Indians at worship. Other fire-altars were noticed before the doors of the two Catholic churches whose white walls tower above the Indian houses.

Near Santa Cruz del Quiché lie the crumbling ruins of Utatlan, the last capital of the Quiché kingdom and the largest and most important of the old cities. Every block of dressed stone has been removed from the old walls and employed in the construction of the modern village—acres of massed cobblestones, plaster-paved courts, and fortifications are all that remain of Utatlan's ancient splendor. At the modern town of Santa Cruz there was an opportunity of witnessing a native play in which was depicted the reception of the Conquerors by the emperor, Nima-Quiché, and the subsequent faithlessness of the Spaniards.

Although the natives of these interior valleys have always been considered treacherous, Mr. Judd experienced few difficulties and his hurried journey seems to indicate that extended anthropological investigations in this region will be as easy as they are desirable.

ANTHROPOLOGICAL RESEARCHES IN AFRICA AND SIBERIA.

In connection with the work of the division of physical anthropology in the National Museum, two expeditions were sent out during the year 1914, under the joint auspices of the Smithsonian Institution and the Panama-California Exposition.

One of the two expeditions was in charge of Dr. V. Schück, anthropologist of Prague, Bohemia, and its objects were: 1, to study the negro child in its native environment, and thereby create a basis of comparison for the study of the negro child in our country; 2, to visit the South African Bushmen for the purpose of obtaining measurements, photographs, and facial casts of the same; and, 3, to visit British East Africa in search of the Pygmies. The tribe chosen

for the child study were the Zulu of Natal and Zululand, and over one thousand children and adolescents of all ages—ages which could be definitely determined—were examined. These data are expected to contribute some very important results to anthropology. The Bushmen were reached in the Kalahari Desert and, besides other results, 20 first-class facial casts were obtained of the people, which have since then been installed among the anthropological exhibits at San Diego. As to British East Africa, the work soon after a successful beginning was interrupted by the war; Dr. Schück was arrested and obliged to leave.

The second expedition of 1914 was in charge of Dr. St. Poniatowski, head of the Ethnological Laboratory at Warsaw. The object of this expedition was to visit a number of the remnants of native tribes in Eastern Siberia, among which are found physical types which so closely resemble the American Indian. The expedition reached two such tribes, and secured valuable data, photographs, etc., when it was also interrupted by the war.

PREPARATION OF EXHIBITS ILLUSTRATING THE NATURAL HISTORY OF MAN

Some of the results of exploration and field work by the Institution among various races of mankind are shown in connection with the anthropological exhibits of the Panama-California Exposition at San Diego. These exhibits were in preparation for over three years. They are original and much more comprehensive than any previous exhibits in this line, either here or abroad.

The exhibits fill five large connecting rooms, which occupy the building of the Science of Man at the Exposition. Four of these rooms are devoted to the natural history of man, while the fifth is fitted up as a modern anthropological laboratory, library, and lecture-room. Of the four rooms of exhibits proper, the first is devoted to man's phylogeny, or evolution; the second, to his ontogeny, or life cycle at the present time; the third, to his variation (sexual, individual, racial); and the fourth to his pathology and death.

The exhibits in room 1, on human evolution, consist of: (a) a large series of accurate, first-class casts of all the more important skeletal remains of authentic antiquity; (b) photographic enlargements and water color sketches showing the localities where the specimens were discovered; (c) charts showing the relation of the archeological position of the various finds, and their relation to the extinct fauna and to archeological epochs; (d) a series of sketches by various scientific men showing their conception of the early man,

with several illustrations of drawings, statuettes, and bas-reliefs, showing early man as drawn or sculptured by the ancient man himself; and (e) a remarkable series of ten large busts, prepared by the eminent Belgian sculptor, M. Mascré, under the direction of Prof. Rutot, representing early man at different periods of his physical advancement.

The main part of the exhibits in room No. 2, devoted to man's development at the present time, from the ovum onward, are three



FIG. 55.—Five of the Mascré-Rutot busts in the anthropological exhibits at San Diego.

series of true-to-nature busts, showing by definite age-stages, from birth onward and in both sexes, the three principal races of this country, namely, the "thoroughbred" white American (for at least three generations in this continent on each parental side), the Indian, and the full-blood American negro. These series, which required two and one-half years of strenuous preparation, form a unique exhibit, for nothing of similar nature has ever been attempted in this or any other country. Each set consists of 30 busts, 15 males and 15 females, and proceeds from infants at or within a few days after birth, to the oldest persons that could be found. The oldest negro woman is 114. After the new born, the stages are 9 months, 3 years,

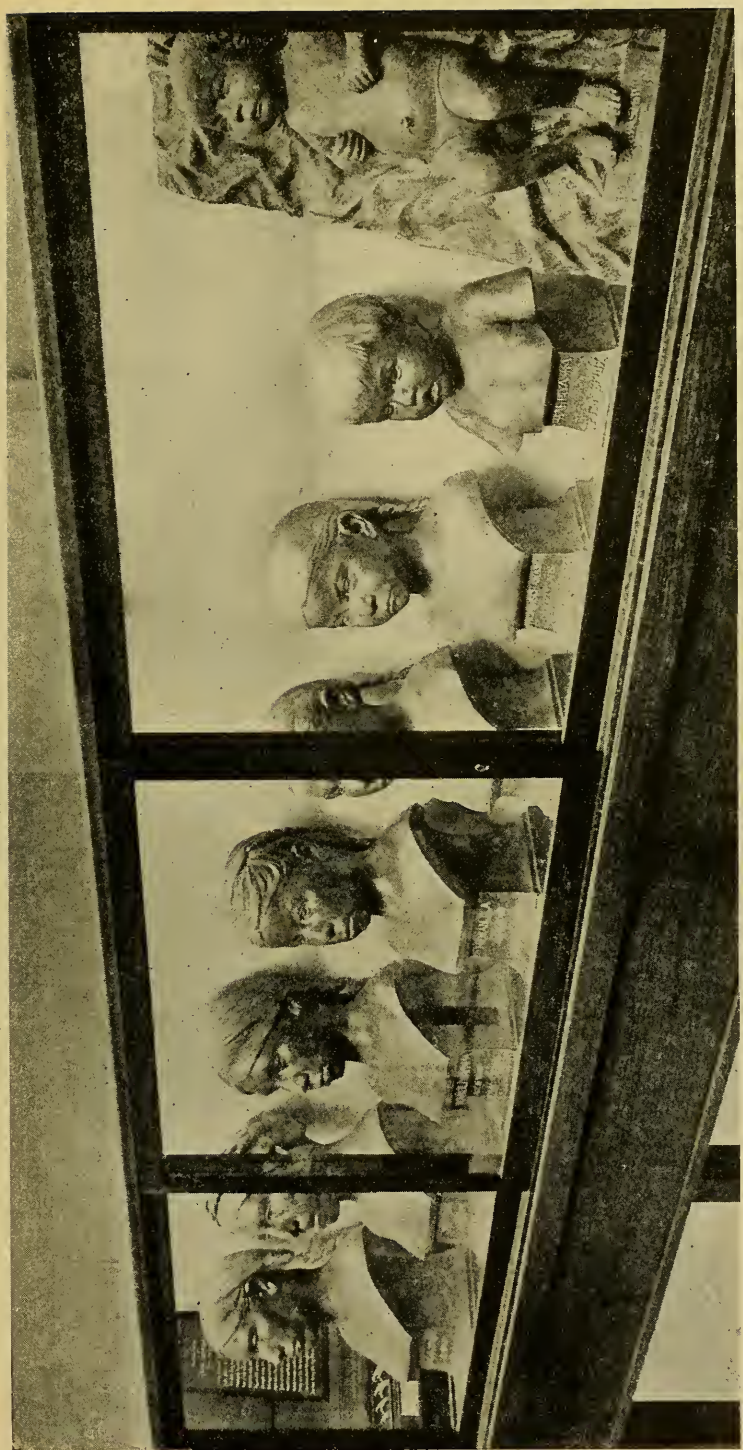


FIG. 56.—A part of the Indian female series at the San Diego anthropological exhibits showing development.

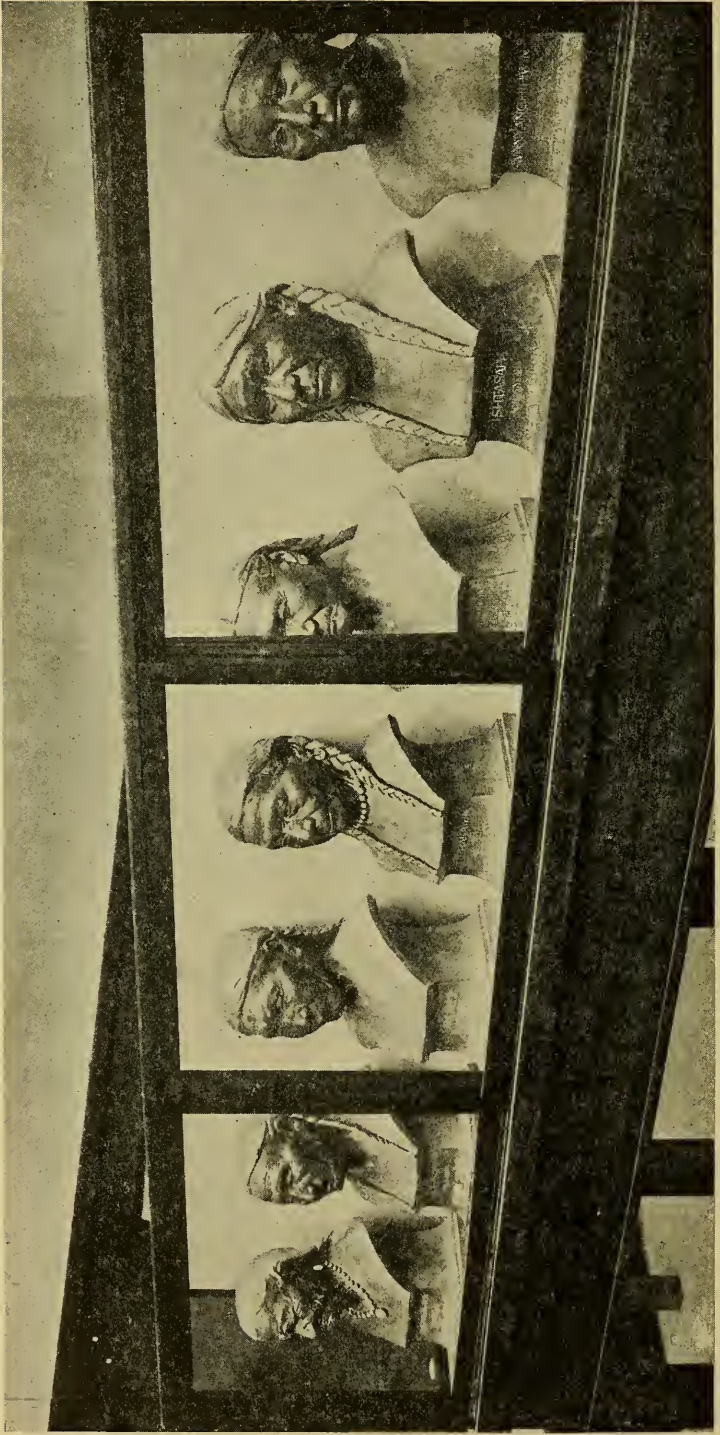


FIG. 57.—The second part of the Indian female series, showing advance with age among adults.

6, 10, 15, 20, 28, 35, 45, 55, 65 and 75 years. The utmost care was exercised in ascertaining the age, particularly among the negro and Indian. No choice was made of the subjects beyond that due to the requirements of pedigree, age, and good health. The whites and negroes were obtained, with a few exceptions, in Washington and vicinity, but their places of birth range over a large part of the Eastern, Southern, and Middle States; for the Indian, we chose the Sioux, a large, characteristic, and in a very large measure still pure-blood tribe, and one in which the determination of the ages of the subjects was feasible. Special trips were made to these people, and no pains were spared to get just what was wanted; in the case of the new born, it was actually necessary to wait until they came.

Other exhibits in room 2 show the development, by various stages, of the human brain, the skull, and various other parts of the body. A large series of original specimens show the animal forms most closely related to man at the present time, particularly the anthropoid apes; a series of charts on the walls deal with the phenomena of senility; finally, ten photographic enlargements show living centenarians of various races.

Human variation is shown in room 3 by ten sets of large busts representing ten of the more important races of man; by 200 original transparencies giving racial portraits; by over 100 bronzed facial casts, showing individual variations within some of the more important branches of humanity; and by numerous charts and other exhibits.

In room 4, a series of charts and maps relates to the death rate in various countries; to the principal causes of death in the different parts of the world, and to the distribution of the more common diseases over the earth. Actual pathology is illustrated extensively by pre-historic American material. Many hundreds of original specimens, derived principally from the pre-Columbian cemeteries of Peru, show an extensive range of injuries and diseases, such as have left their marks on the bones. In many instances the injuries are very interesting, both from their extent and the extraordinary powers of recuperation shown in the healing; while among the diseases shown on the bones there are some that find no or but little parallel among the white man or even the Indian of to-day. In addition, this room contains a series of 60 skulls with pre-Columbian operations (trepanation).

The exhibits as a whole are supplemented by a descriptive catalogue and other literature, and by frequent lectures and demonstra-

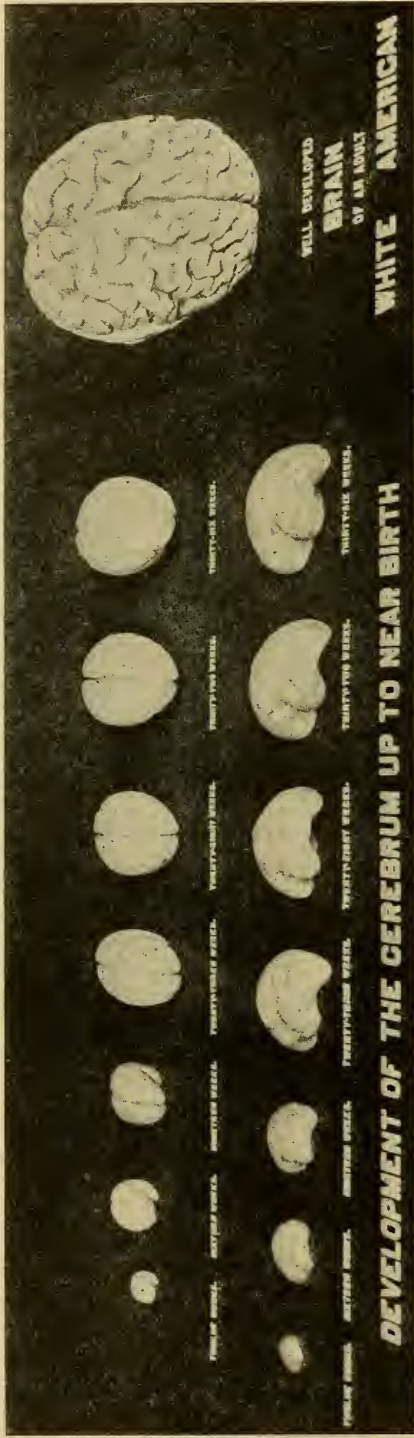


FIG. 58.—Casts in wax and plaster illustrating development of brain.

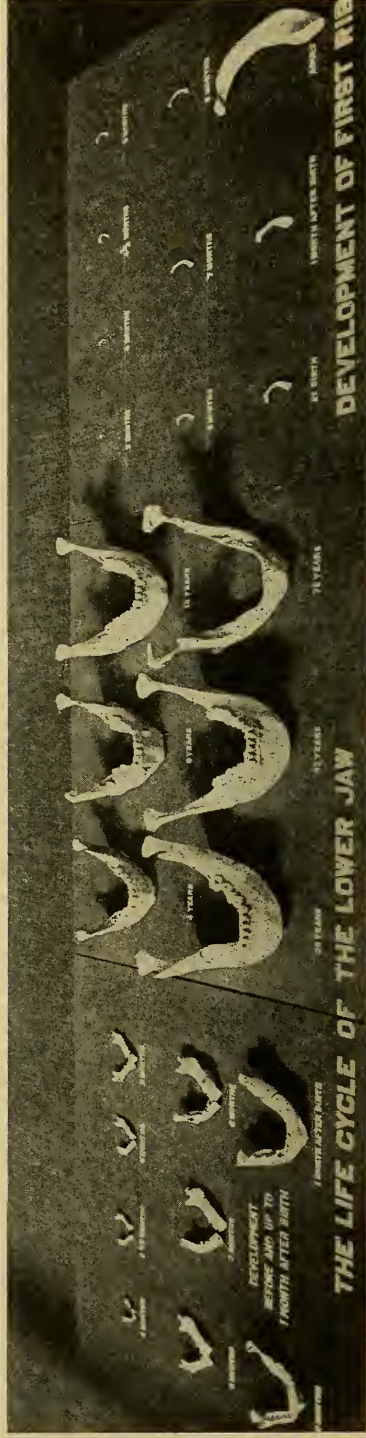


FIG. 59.—Original specimens showing pre-natal as well as later development of lower jaw and the first rib.

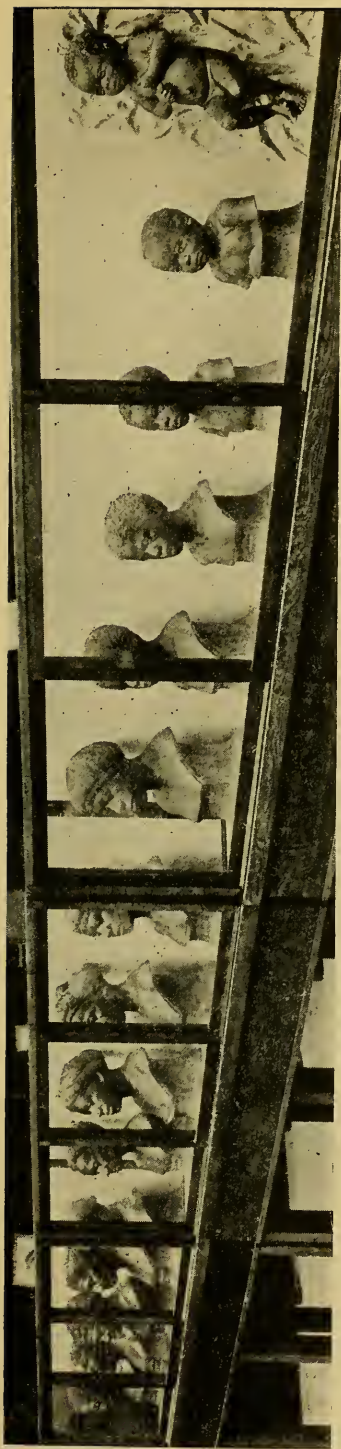


FIG. 60.—The development series of the American female negro, in room 2 of the anthropological exhibits at San Diego.

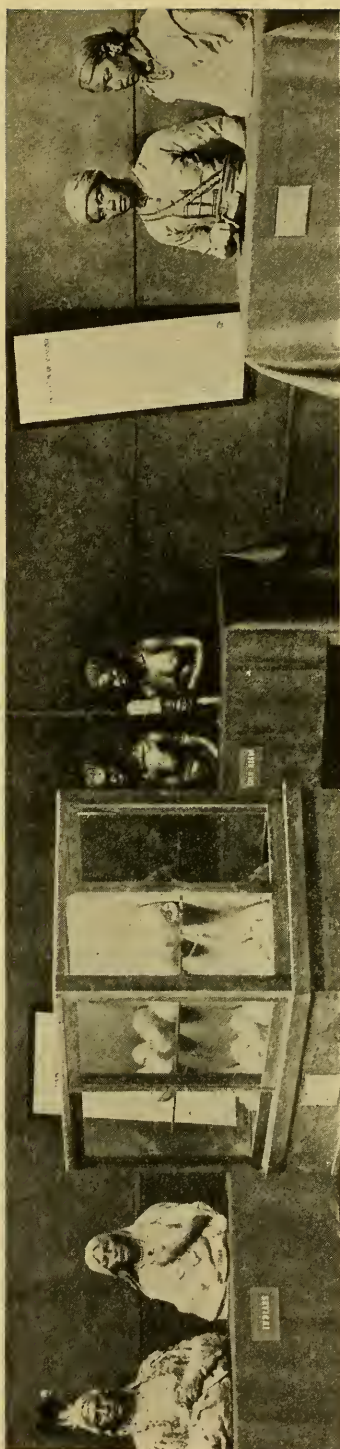


FIG. 61.—A view of a corner in room 3 of the anthropological exhibits at San Diego, showing the large racial busts, casts, and charts.

tions. They constitute an educational unit of considerable value, have attracted from the beginning the best and most serious attention, and eventually, it is hoped, will become the foundation of a museum in San Diego.

PREHISTORIC REMAINS IN NEW MEXICO

Previous to the month of May, 1914, it was pretty generally believed by archeologists that the elevated plateau extending from Deming, New Mexico, to the Mexican border was destitute of any ruins indicating a prehistoric occupation by man. In April of that year Mr. E. D. Osborn wrote to the Bureau of American



FIG. 62.—Ruin near Osborn Ranch. Photograph by J. W. Fewkes.

Ethnology that he had made a considerable collection of pottery and other objects from a village site (fig. 62) not far from his ranch, 12 miles south of that city. From the nature of these objects, especially the decoration on the pottery, photographs of a few of which accompanied his letter, it was apparent not only that the Mimbres Valley was peopled in prehistoric times by a sedentary people, but also that the former inhabitants of this valley had attained a considerable artistic development. Accordingly Dr. J. Walter Fewkes, an ethnologist on the Bureau staff, was sent to Deming to investigate these remains, and to secure, if possible, a typical collection.

He was two months in the field, confining his work more especially to the above mentioned ruin, and to the somewhat larger and more populous village (figs. 63, 64) near Oldtown, 22 miles north of the above mentioned city. He secured by excavation and purchase a

collection of over 200 objects, which are typical and regarded as an important accession to the U. S. National Museum, especially as up to that time objects illustrating the prehistoric development of the



FIG. 63.—Cliff on which Oldtown ruin is situated, overlooking Sink of Mimbres. Photograph by J. W. Fewkes.



FIG. 64.—Oldtown ruin. Photograph by J. W. Fewkes.

Mimbres Valley had been unrepresented in any museum in the world. A preliminary report in which these objects were described and figured was published by the Smithsonian Institution near the close of the year.¹

¹ Smithsonian Misc. Coll., Vol. 63, No. 10 (Publ. 2316), 1914.

The majority of these specimens are mortuary food bowls, the most significant of which were decorated on their interior with painted figures representing animals known to the ancient inhabit-

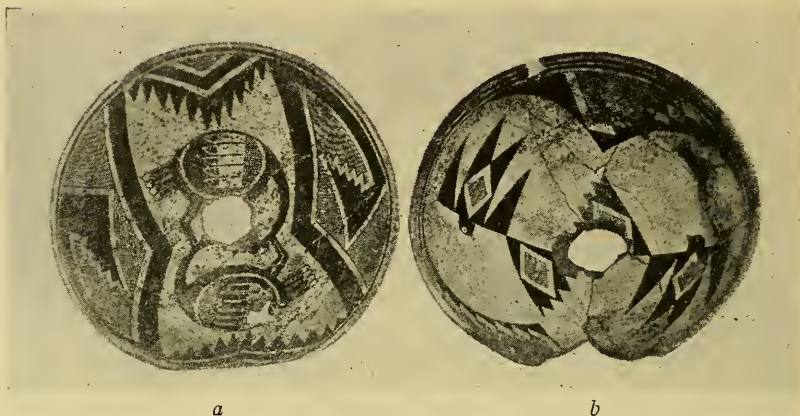


FIG. 65.—*a*, Two birds, bowl from Pictured Rocks 4 miles north of Oldtown ruin. Heye Museum. *b*, Two birds, bowl from Pictured Rocks, 4 miles north of Oldtown ruin. Heye Museum.

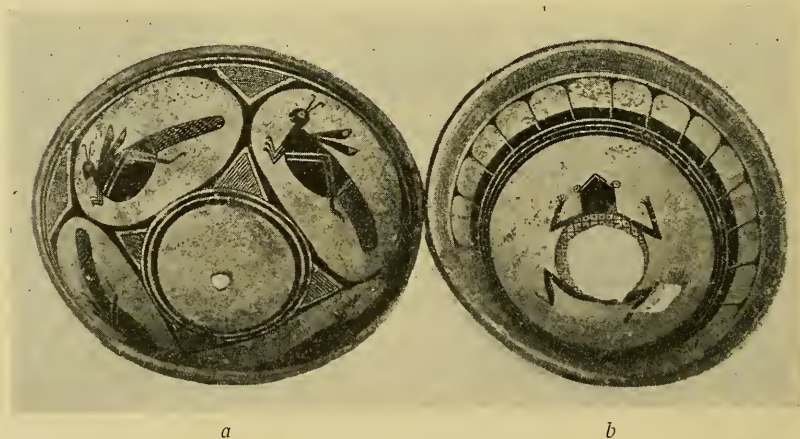


FIG. 66.—Mortuary food bowls. Photographs by E. D. Osborn. *a*, Four grasshoppers, bowl from Pictured Rocks, 4 miles north of Oldtown ruin. Heye Museum. *b*, Frog, bowl from ruin at Pictured Rocks, 4 miles north of Oldtown. Heye Museum.

ants of the valley, and pictures of warriors or priests engaged in secular or religious observances. Some of the bowls are decorated with characteristic geometrical designs so different from any others yet found in the Southwest that it is believed that they indicate an

undescribed prehistoric culture area in the valley of the Mimbres. The symbolic and other figures show that this culture has affinities, on the one side, with ruins in Chihuahua, and on the other with the Pueblos in northern New Mexico. Some of the fragments of Mimbres pottery are identical with Casas Grandes ware.



FIG. 67.—Geometrical design. U. S. National Museum.

The elevated plateau in which the Mimbres lies is commonly known as the Sierra Madre plateau, which was a trail of migration for interchange of prehistoric cultures of Mexico and the Pueblo region. This plateau extends from the headwaters of the Gila far down into Chihuahua, including the valley of the Casas Grandes River, in which are situated the largest and best preserved ruins of northern Mexico. Between these two extremities may be traced a chain of ruins broken at a few points, indicating prehistoric connections between Mexican and Pueblo culture.



FIG. 68.—Geometrical design. U. S. National Museum.

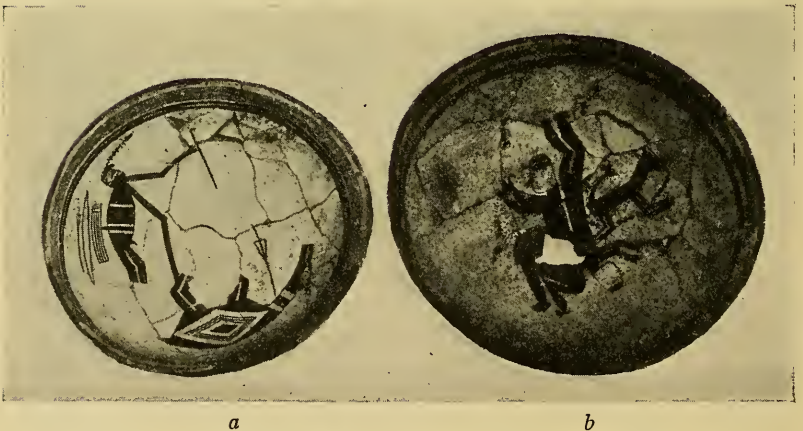


FIG. 69.—Mortuary food bowls. Photographs by E. D. Osborn. *a*, Hunter with throwing-stick, antelope wounded in neck, Oldtown ruin. Heye Museum. *b*, Man carrying a dead man on his back, accompanied by animal. Heye Museum.

It was found that the ancient people of the Mimbres disposed of their dead by inhumation, or earth burial, under the floors of their rooms, and that almost invariably they covered the head or face with a mortuary bowl. This bowl was artificially punctured, or "killed," before it was deposited with the dead, and in many instances the necklaces, bracelets, and other ornaments of the deceased were left on the body.



FIG. 70.—Geometrical design. U. S. National Museum.

Many of the dead were buried in a sitting posture or in the well-known contracted position; the bodies of some were extended at length or placed on one side. Evidences of cremation were not noticed, but charcoal, ashes of burnt timber, and charred corn were repeatedly found in the course of excavating. Several types of stone implements, a few of which are unique, were brought to light by the explorations made by Doctor Fewkes in the ruins of Mimbres Valley. Among the latter may be mentioned a form of rubbing stone, flat on one side but round on the opposite, in the convex surface

of which are cut grooves for the four fingers and thumb of the right hand. A large "holed stone" in the shape of a barrel, found near Oldtown, is a unique form (fig. 74) from the Southwest. One end of this is covered with shallow pits similar to those found on slabs of rocks from other ruins. The use of this stone is unknown, but, like similar holed stones from Mexico, it may have served in the ball game called *pelota*.

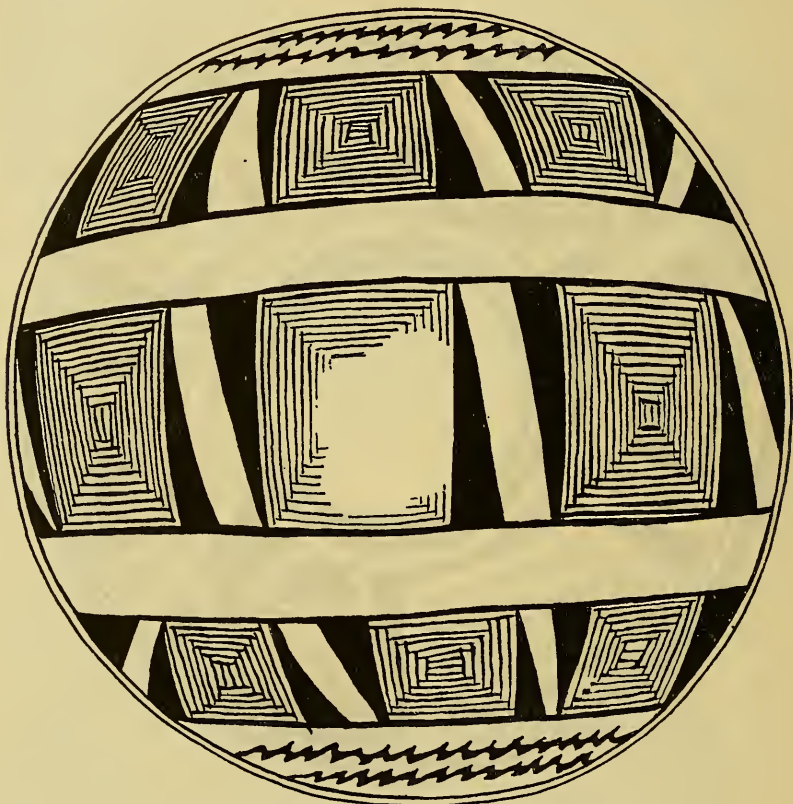


FIG. 71.—Geometrical design. U. S. National Museum.

A number of facts were observed in the course of these studies suggesting the probable causes of the abandonment of the pre-historic settlements south of Deming, where the majority of specimens were found. Until a few years ago, the Antelope Valley, except in its northern part or that occupied by the Mimbres, was a desert, capable of supplying water sufficient for stock but hardly adequate to meet the needs of any considerable human population. Notwithstanding this inadequacy of the water supply there is evi-

dence of the existence of several populous villages in what is now an arid desert. Evidently the region formerly had more water than at present, but the reason for its increased aridity and consequent abandonment by the prehistoric villagers was not due to a modification in climate, but to a change in the bed of the Mimbres River, which, there are reasons to believe, has occurred since the advent of man in that valley. The former course of the river past the now



FIG. 72.—Geometrical design. U. S. National Museum.

deserted villages can be easily traced, but by some shifting of the soil in its bed the river now flows to the east of the Florida Mountains. This change in direction deprived the former inhabitants of villages situated on the west side of the mountains of their supply of water, and caused them to abandon their homes.

The construction of the prehistoric buildings, as shown by an examination of the photographs of village sites (f.igs. 62, 63, 64), indicates that the ancient ruins in the Mimbres region had little resemblance to those of the pueblos in northern New Mexico, but

more closely resembled the fragile-walled dwellings of the Pima and Papago. The walls of the habitations were made of upright logs, chinked and plastered with clay or a natural cement (*caliche*), the base being protected by rows of stones. These walls have fallen, but the stumps of the logs, generally charred, and the rows of stones still remain, while a few feet below the surface the floor is generally

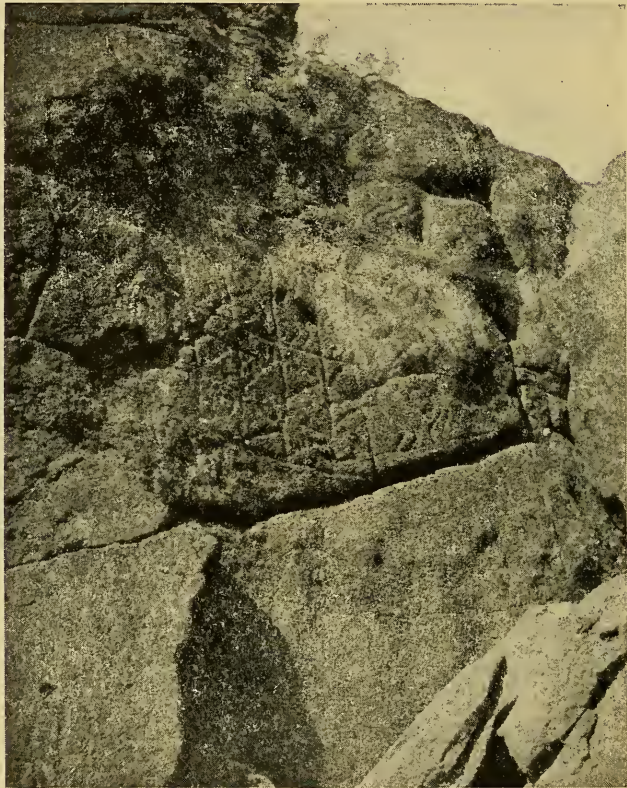


FIG. 73.—Pictographs at Pictured Rocks near Brockman's Mill.
Photograph by J. W. Fewkes.

well preserved. The roof was flat and held up by one or more vertical logs in the middle of the room. The inner walls of the room were smoothly polished and apparently sometimes painted. The different families composing the population of each village were not apparently crowded into terraced communal dwellings several stories high, but lived in rancherias composed of several one-storied isolated houses.

No evidences were found in the Mimbres Valley of the former presence of walled inclosures or compounds so pronounced at Casa Grande, or of massive buildings found at Casas Grandes. Sacred rooms, or kivas, could not be distinguished from secular rooms, although clusters of depressions resembling subterranean rooms were especially abundant on the terraces along the river banks.

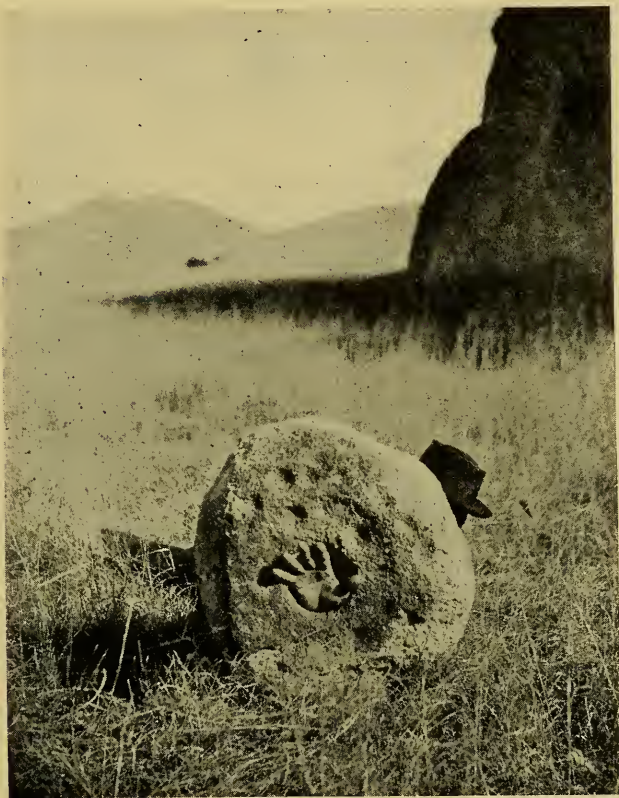


FIG. 74.—Pitted-holed stone, base of Oldtown Cliff. Photograph by J. W. Fewkes.

These rooms undoubtedly belonged to a very ancient type, of which the subterranean sacred room, or kiva, of the pueblo is a survival.

It is believed that the character of the prehistoric culture in the valley of the Mimbres, brought to light by these studies, is more ancient than the true pueblo of northern New Mexico, and closely related to that existing in northern Mexico in prehistoric times.

Several hot springs were examined in the upper courses of the Mimbres which were evidently once used by the natives for sacred

purposes, bones and teeth of extinct animals and stone artifacts, regarded as sacrificial offerings, having been obtained from them.

The accompanying views show the general character of designs on pottery from the Mimbres region, and sites of the ancient villages from which it was obtained.



FIG. 75.—Cherokee ball play: the struggle for the ball.

FURTHER STUDY OF THE CHEROKEE SACRED FORMULAS

On June 22, Mr. James Mooney proceeded to the East Cherokee reservation in Swain and Jackson counties, western North Carolina, returning to Washington September 15. Headquarters were made with the most conservative element of the tribe, in the heart of the mountains, some 12 miles above the agency, and the time was devoted chiefly to further study and elaboration of the Cherokee Sacred Formulas previously collected. Opportunity occurred also for witnessing the ceremonial Ball Play, and by special permission of some

of the Indian priests Mr. Mooney was able to be present for the second time at the family ceremony of invoking the blessing upon the new corn and on those about to partake of it for the first time. This ceremony, probably never witnessed by any other white man, is still strictly observed in private at their homes by most of the full-blood families before tasting the new corn of the season, the priests who conduct the rite going, while yet fasting, from house to house through the settlement for that purpose. The so-called Green Corn Dance, the great tribal celebration of thanksgiving for the new corn, was last performed in 1887, on which occasion Mr. Mooney was also present. The East Cherokee, numbering now about 1,600, constitute that portion of the tribe which remained in the old home territory when the main body of the nation was removed to the West.

THE SUN AND THE ICE PEOPLE AMONG THE TEWA INDIANS OF NEW MEXICO

One of the most interesting ceremonies observed by Mrs. Matilda Coxe Stevenson during her studies among the Tewa is associated with the coming of spring or the revival of the Earth Mother from her dormant state through the winter. The Tewa are a poetic people, but they never allow their love of the beautiful to interfere with their constant efforts to sustain life. Almost every breath is a prayer, in one form or another, for food. "May we be blessed with food, more food!"—this great thought is paramount among these people who have lived in an arid country from time immemorial. Having no outside resources, everything, life itself, depends upon their own exertions and their influence with their gods. In order to gain this influence they must have priests who are capable of communing directly with the gods. "Heart speaks to heart," they say. The earth must not be wet with summer rains all the time, nor must it be perpetually covered with ice and snow: conditions must be equalized. To accomplish these desired results in past ages the Tewa were divided into the Sun and the Ice people. Each body had its rain priest as it has at the present time, the priest of the Sun people taking precedence over the priest of the Ice people. The special duty of the priest of the Sun people is to observe the rising and setting of the sun, and to bring summer rains and new creations. The priest of the Ice people observes the rising and the setting of the moon, and the moon aids him in keeping the calendars; he brings the cold rains of winter, and the snows and ice to retard plant life. The invocation says in reference to the earth: "Let our Mother sleep; let her rest so covered in ice and snow that she will sleep well

to awake with the coming of spring in all her greatness." While it is the duty of the priest of the Sun people to invoke the Sun Father to bring rains, there is a change in administration from



FIG. 76.—Juan Rey Martinez, ex-Governor and one of the most distinguished theurgists of San Ildefonso.

October 15 to February 18, when the priest of the Ice people assumes precedence over the priest of the Sun people, and he observes the rising and setting sun. He appeals to the Sun Father so to influence

Nukónse, the "black stone man of the north," and Tsäⁿ okí Kivi, the "white fog woman of the east," to send their breath to make cold the waters of the rain makers and convert them into snow and ice. Summer winds are the breath of the gods.

While the moon is feminine with many Indians, the Tewa believe the moon to be masculine and brother to the sun. In fact, these divine ones, according to Tewa philosophy, are the gods of war, born of a virgin and conceived through the embrace of the rays of the ancient Sun Father while the maiden slept on the banks of the lake Aga'chännê. Pregnant as she was, the maiden tossed in a canoe for many days upon the angry waters during the great flood that covered the earth. Finally the bark landed near the site of Santa Fe, where the maiden gave birth to twin sons. When the divine ones learned of their father they determined to find him. The earth was dark in the day and in the night, but the little fellows were guided by Kosa, star people who emitted bright light from their bodies. The father was found in a lake deep under the earth. The aged Sun Father recognized his children and wept for joy at meeting them. He said to them: "The earth is now dark, but it should have light and warmth. I will make you boys the sun and moon to pass over the earth with the burning shields of crystal." He designated the younger one to be the sun and the elder to be the moon. The divine ones were happy to remain with their Sun Father and to perform the duties assigned to them. The present sun and moon bear the names of their predecessors, Tapsédo, "sun old man," and Po'sédo, "moon old man." They are still elder and younger brother warriors, and are appealed to as such by the elder and younger brother Bow Priests, who are the earthly representatives of these gods. The ancient Sun and Moon remain in their house below, while the divine ones do duty in the world above.

Preparatory ceremonies for the coming of spring begin at sunset of February 9th in San Ildefonso and close at sunrise the morning of the 13th. The first three nights the party disbands at midnight, provided there are no serious interruptions in rehearsing the ancient songs. This must be learned from the director of the Squash fraternity, who knows the ancient prayers and songs by heart. The first three nights the party in the kiva consists of the rain priest of the Sun people, his four male and two female associates, younger brother Bow priest, and the director of the Po'kuni, native Squash fraternity. The Bow Priest is present as guardian of its altar, and the director of the fraternity as the sage of San Ildefonso. The e'he altar is erected by the rain priest of the Sun people. On completion of the

altar the rain priest makes a sand painting on the floor a little to the northeast of the altar. First a circular ground of sand from the river bank is laid; this is outlined with a circle of black earth from the river bed; the entire disk is then covered with fine white earth; a small blue disk is next made in the center of the large one, which is then surrounded by a circle of yellow and one of red. Four crosses representing the Pleiades, are made in black upon the smaller disk. This sand painting is made in honor of the ancient Sun and Moon and remains until the close of the fourth night, when the Priests of the Bow gather the sand into a cloth and deposit it in the Rio Grande to be carried to the house of the ancient Sun and Moon.

On the fourth and last night the party in the kiva is joined by the rain priest of the Ice people, his four male and two female associates, and the elder brother Bow Priest. The priest of the Ice people sits at the northern side of the altar, the priest of the Sun people at the southern side, while the director of the Po'kuni fraternity takes his place at the north. The associates of the rain priest of the Sun people sit back of him and south of the altar, and the associates of the priest of the Ice people sit back of him and north of the altar. The two rain priests discuss the change of the seasons, the rain priest of the Sun people urging that in case the rain priest of the Ice people is not sure of his functions, he consult the priest of the Ice people of Tesuque. The rain priest of the Sun people and the director of the Po'kuni, or native Squash fraternity, make no claim to understanding the songs and prayers for ice and snow, but the sage has a perfectly clear knowledge of all ceremonies associated with the Sun people, and there is no time in the year when so important a ceremony for the good of all the people is performed as the one here described. Unless the long and most ancient rites to the "old" Sun are observed at this time, there can be no certainty of the fructification of the earth. The hearts of all the people are filled with a great desire so to please the ancient Sun Father that he will use his power to have the rain-makers send the spring rains and cause the Earth Mother to send forth her being in all its beauty.

The great ceremony is performed on the night of the 17th of February. This is no ordinary occasion. All the fraternities gather in the kiva presided over by the priest of the Sun people. Every man, woman, and child presents offerings to the ancient Sun Father, which are deposited in a heap before the altar. Each member of the order of Mystery Medicine carries the wowayí (a perfect ear of corn decorated with macaw and other plumes), and places it before

the altar. The fraternities of the Sun people take seats south of the altar, the women sitting together back of the male members. The fraternities of the Ice people sit north of the altar, the women grouping slightly apart from the men. After all the rehearsals of the priest of the Sun people and the sage of the kiva the people feel pretty sure that their songs and prayers will be recognized and received by the ancient Sun Father. All the men present sing to the accompaniment of the rattle and pottery drum. They are perhaps more profoundly interested in this ceremony than in any other, for this ritual enters into the very heart of their lives. This great ancient Sun God sits in state in his house in the lake, and it is only once a year that the people as a body invoke him. The larger the family the greater the offerings, which consist of all food that can be obtained by the Indians of to-day, and calico, cotton cloth, and a variety of other things. These offerings are made to Tapsédo with prayers that he will see that the people may be able to secure the desired objects. All parties dance, except the priest of the Sun people and the director of the squash fraternity. These two must listen attentively that no mistake may be made in the song. The priest of the Ice people and his associates are present, having the same position they occupied at the previous meeting. He and his associates join in the dance for the new creation. The men are nude except for the breech-cloth, and their bodies are daubed in white. The women wear the native black woven dress and red belt, but arms, neck, and legs are bare. Each man carries a rattle in the right hand and a sprig of spruce in the left. The women carry an eagle-wing plume in each hand. The spruce signifies the male element, rain. The eagle plumes signify the same, for eagles live among the clouds. All night the dance and song continue, invoking the ancient one. Referring to the great heap of offerings, they sing: "We give these offerings to you; you are great, the ancient one, you who have lived always, that you will be happy and contented; that you will see that all the world receives much water that all crops may develop for good. We pray that you will talk to the rain-makers, urge them to go out and play their games and be happy, and to send rains to every quarter of the world, such rains as will uproot trees, wash out canyons, and cover the Earth Mother in water. Let her heart be great in water. And we pray that you will lift the Earth Mother from her sleep, impregnate her with your rays, and make her fruitful to look upon. Bless the whole world with her fruitfulness." These are the invocations to be heard throughout the night, when all present put their whole souls into supplicating the Ancient One for

food to sustain life. The songs continue until the first light of day, when the great heap of offerings are carried to the river and deposited to go to the ancient Sun Father. The sands of the painting are also deposited, wrapped in a cloth, in the river.

These children of nature feel every confidence that the performance of the ritual so sacred to them will bring all that their long prayers have asked for throughout the night.

WORK AMONG THE IROQUOIS

Mr. J. N. B. Hewitt left Washington on December 11, 1914, for a short field trip among the Iroquois of Ontario, Canada, and of western New York. His first stop was at Brantford, Ontario, where, with the aid of Mr. William K. Loft, a Mohawk speaker, critical phonetic and grammatic study was made of portions of Mohawk texts relating to the Iroquois League, recorded by Mr. Hewitt in former years. Work was also done in taking down a select list of Mohawk verbs for comparative purposes. His next stop was at Middleport, Ontario, where, with the aid of Mrs. Mary Gibson, the widow of the late Chief John Arthur Gibson, Mr. Hewitt recorded a long Cayuga text relating to the origin and ritual of the Death Feast; a comparative Cayuga list of verbs was also obtained. Here, with the aid of Mr. Hardy Gibson, a Cayuga chief, Mr. Hewitt was able to clear up satisfactorily certain mooted questions concerning the ritual of the League Condoling and Installation Council.

Mr. Hewitt also obtained from Mrs. Emily Carrier a list of 50 Nanticoke words which represent all that were remembered by the informant; this short list is of unique interest, as the Nanticoke dialect of the Algonquian stock has become practically extinct. Mr. Hewitt also made about 70 photographs, chiefly of persons.

OSAGE SONGS AND RITUALS

During the year 1914, Mr. Francis La Flesche, ethnologist, secured from Wá-thu-xa-ge, a member of the Tsí-zhu Wa-shta-ge, one of the two peace gentes of the Osage tribe, the rituals and songs of the Wa-xó-be A-wa-thoⁿ, which form the first of the seven degrees of the great Osage tribal war rites. It was with much difficulty that Wá-thu-xa-ge was finally persuaded to give this information. He had three reasons for refusing to give information concerning the rites, which are now being fast forgotten, as most of the older members of the tribe have adopted a new religion to which they give nearly all their thought and attention, and the younger members who are being educated care very little, if at all, for these ancient rites.

The first reason given by Wá-thu-xa-ge for refusing to recite the rituals and to sing the songs is, that he feared to make mistakes which would expose him and his family to punishment through super-



FIG. 77.—Wá-thu-xa-ge of the Tsi-zhu Wa-shta-ge, a peacemaking gens.

natural means ; second, that the man who introduced the new religion, above referred to, forbade those who took up the new faith to give any further thought to the ancient rites, which he told them were the inventions of Ts'a-toⁿ-ga, the Great Serpent, to lead the people

astray and to prevent them from finding the true path to God; third, he suspected the man who introduced Mr. La Flesche to him, and who also belonged to the Tsi-zhu Wa-shta-ge gens, of seeking to secure a working knowledge of the rituals and songs without going through the required ceremonies and the payment of the usual fees.

The Wa-xó-be A-wa-thoⁿ degree of the Tsi-zhu Wa-shta-ge gens, like those of the other gentes, is divided into two great parts. The first part is called the "Seven Songs" and the second part the "Six Songs." The titles of the songs and rituals of the various gentes are generally the same, but the music and the words differ more or less. The number of the songs also varies in the degrees of the various gentes. Wá-thu-xa-ge explained that the number of songs in the war ceremonies of his gens are fewer than those of any of the other gentes because of its position in the tribe as a peace-maker, and that the performing of the war ceremonies of his gens was more a matter of form than for the purpose of encouraging a warlike spirit.

In some of the degrees the songs and rituals of both of the two parts are used, in others only those of the first part, and still in others those of the second part. While the various degrees are used in common, in forms more or less modified, by the various gentes, it is said that the "Seven Songs" belong to the Ho^{n'}-ga dual division, whose ceremonial place is at the south side of the lodge, and the "Six Songs" belong to the Tsi-zhu dual division, who occupy the north side. There also appears to be a further division of the songs and rituals among the several gentes, thus giving the rites, as a whole, a composite character.

The degree given by Wá-thu-xa-ge, whose portrait is here shown (fig. 77), is composed of six rituals and 65 songs—49 songs for the first part and 16 for the second. There are certain preliminary ceremonies that are performed before conferring a degree which contains all of the rituals and songs, or only the first or second parts. These preliminary ceremonies have also been explained by Wá-thu-xa-ge.

For many years this old man has not had occasion to perform the ceremonies, therefore his memory of them had weakened considerably. In order to refresh his memory, for the purpose of giving this information, he attended an initiation which took place a week or so before he came to Washington, although the new religion which he had adopted discouraged his witnessing, or his taking part in, any of the ancient rites. Wá-thu-xa-ge's wife, who was an honorary member of the No^{n'}-ho^{n'}-zhiⁿ-ga order, assisted him materially by prompting him. Wanoⁿ-she-zhiⁿ-ga, whose English name

is Frederick Lookout and who a year ago was the principal chief of the Osage, not only gave assistance with what knowledge he had of the rites, but it was through his influence and urging that the old man consented to give what he remembered of them. Had "Governor" Lookout been less urgent the chances are that the old man would never have given the information and it would probably have been lost at his death.

The words of the rituals and songs of the first part of this degree have been transcribed and type-written, and the music has been transcribed from the dictaphone, but the words of the songs and the music of the second part have yet to be transcribed.

Wá-thu-xa-ge also gave, in fragments, the Ni-ki-e degree of his gens. It was difficult for him to recall all of the songs, rituals and ceremonial forms. Of this degree he gave three rituals and eleven songs. The stanzas of these songs vary in number from one to eleven. Mrs. Lookout said that the Ni-ki-e degree of the Tsí-zhu Wa-shta-ge gens is not half as long as those of the other gentes. She had taken part a number of times in some of the ceremonial forms and thus had gained her knowledge first hand.

Aside from the two degrees of the No^{n'}-ho^{n'}-zhi^{n'}-ga rites, eight songs of the new religion were secured from Wá-thu-xa-ge and "Governor" Lookout, who both take active part in the exercises of this religion.

PRESERVATION OF INDIAN MUSIC

Two field trips were made by Miss Frances Densmore during the summer of 1914. The first trip was to the Standing Rock reservation in North Dakota, the purpose of which was to revise certain portions of the manuscript on Sioux music; this was accomplished by reading the manuscript to several old men of the tribe. Additional information was secured concerning the Hunka ceremony and the Spirit-keeping ceremony, as well as on other subjects which had been studied on previous visits to the reservation. Songs were also recorded to complete certain series in the material in preparation for publication.

The second trip was to the Uinta and Ouray reservation in north-eastern Utah. The Indians on this reservation are the northern Ute who formerly lived in northern Colorado and are best known by their comparatively recent expedition into South Dakota, whence they were brought back by United States troops. The nucleus of that expedition was the White River band of Ute, and one of their leaders was Red Cap, chief of the White River band, whose

photograph is shown in figure 78. As the location for her work Miss Densmore selected Whiterocks, a point 15 miles beyond the agency and 80 miles from the nearest railroad. Whiterocks is the

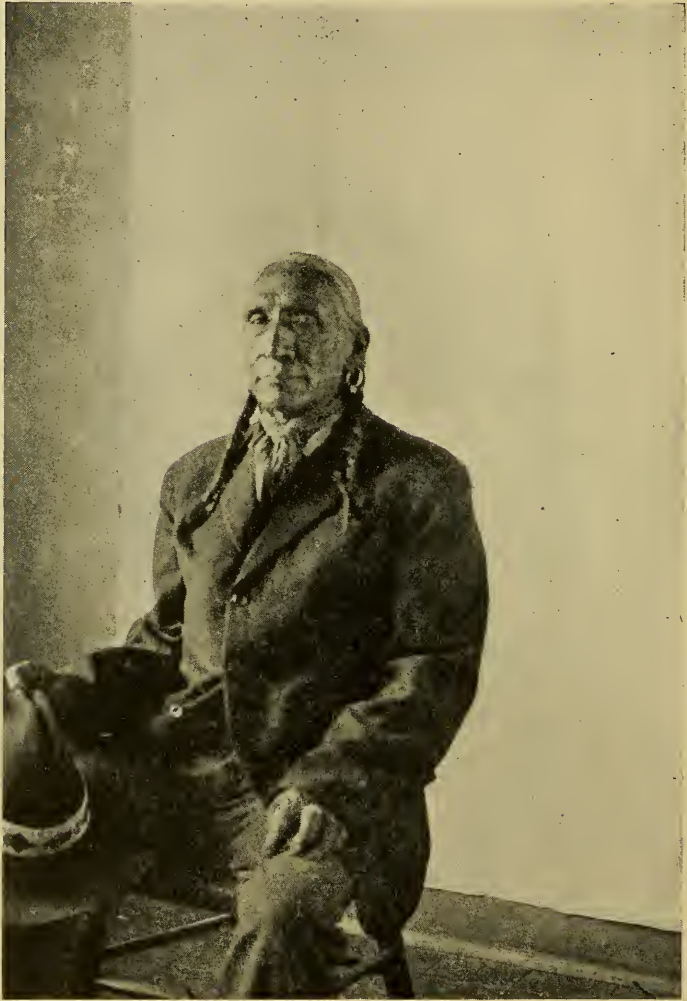


FIG. 78.—Portrait of Red Cap, chief of the White River band of Ute. Photograph by Miss Densmore.

point nearest the camps of the White River Ute, who were the principal subject of investigation.

The difficulty of the work had not been overestimated. The Indians were more conservative than any before encountered. Never having seen a cylinder phonograph, a belief gained some credence

that whoever sang into the instrument would shortly die, hence considerable open opposition developed. Fortunately, this was overcome by the exercise of patience and diplomacy.



FIG. 79.—Sub-chief of the White River band of Ute, commonly known as "Little Jim." Photograph by Miss Densmore.



FIG. 80.—Typical summer abode of the Ute on the Uinta and Ouray reservation. Photograph by Miss Densmore.

After this adjustment of relations with the Ute the work progressed with less difficulty. More than 80 songs were recorded, including songs of the Sun Dance, Bear Dance, and other native dances, as well as very old war songs, and songs used in the treat-

ment of the sick. There were also recorded several folk-stories given by a very aged woman in the manner of a chant. The songs are very diversified and show the people to be unusually musical. Among the Chippewa and the Sioux there were old men who said that when they were young the medicine-men received songs in dreams, but among the Ute this is a custom of the present time. Many "dream songs" were recorded, among them a set of six songs by a young man who said they "were taught him by a little green man who lived in a little stone house far up the mountain." Much interesting information was received concerning this mythical "green man."

The industries of these people also received consideration, and a collection of specimens representative of these industries was purchased. Among these was a bowl-shaped basket, which in old times was placed over an excavation in the ground, the singers sitting around it and accompanying their songs by the rasping together of two sticks, the longer of which was notched. This notched stick rested upon the inverted basket and the shorter was rubbed across it. This music is used only in the Bear Dance, which appears to be peculiar to these people and is still held every spring. A Sun Dance was performed last June in direct violation of orders from the Government. The Sun Dance ground was visited. Neither the Bear Dance nor the Sun Dance was held during Miss Densmore's visit, but she attended a Turkey Dance, which is the mid-summer dance of the tribe and is held about once a month.

In connection with the industries of the Ute Miss Densmore secured a fire-making apparatus in which a blunt stick and sharp sand were used, instead of the usual pointed stick. The "hearth" was similar to that in use among many tribes, except that it contained a little reservoir for the sand and a "spillway" through which the sand, heated by the friction of the rotated stick, could run down upon the fragments of bark to be ignited. A unique specimen of woven work was made for Miss Densmore, consisting of a net for fish or rabbits, formed of the outer bark of reeds, a very delicate tissue which required skilful manipulation to make it into a substantial net.

Many visits were made to the camps, figure 80 showing a typical summer abode of these Indians. Their winter homes are log huts with earth floors. At some distance from Whiterocks is the burying-ground of the Ute. The burial places are marked by the bones of horses slain at the death of their owners. An offering of corn had been placed in one of the trees, and from another hung the head of a

dog with the rope still around the neck. Tipi-poles, cooking utensils, children's toys, and clothing were among the articles placed on the graves of their owners.

The work of last summer emphasizes the close connection between the music of the Indians and the beliefs or ceremonies which they hold most sacred, and in this lies one of the advantages in the study of Indian music. If an Indian consents to sing a song he appears willing to give information which might be difficult to secure in any other manner. An instance of this is the narration of personal dreams or visions, and the relation of ceremonial duties by those who have held responsible positions in native ceremonies. The collection of Indian songs for preservation and for analysis is important, but the recording of these songs also opens the way for the securing of interesting and valuable descriptive material.

ETHNOLOGICAL RESEARCHES AMONG THE KALAPUYA INDIANS

Dr. Frachtenberg left Washington on July 6, 1914, going directly to Oregon for the purpose of concluding his investigations of the language, mythology, and culture of the Kalapuya Indians which he had commenced during the previous fiscal year. After a short trip to the Siletz and Grande Ronde agencies in northwestern Oregon, made with the object in view of interviewing all available informants, he proceeded to the United States Indian Training School situated at Chemawa, where he was soon joined, first by Grace Wheeler and, later on, by William Hartless. These two Kalapuya Indians were his chief informants, and he worked with them during the months of August, September, October, November, and part of December. This work was brought to a conclusion by a stay at the Grande Ronde agency that lasted from December 13 until December 20; this brief time was spent mainly in collecting material for a comparative study of the Kalapuya dialects. A planned trip to the Yakima reservation for the purpose of interviewing the sole survivor of the Atfalati tribe had to be abandoned, owing chiefly to the lack of funds.

Dr. Frachtenberg's field work proved highly successful. He obtained 30 myths, tales, historical narratives, and ethnographic descriptions, told in the various Kalapuya dialects, an unusually large amount of grammatical notes, sufficient material for a linguistic map of the several Kalapuya dialects, and some data on Kalapuya ethnology.

A glance at this material reveals some very interesting facts. The Kalapuya Indians in former days were the most powerful and numerous family inhabiting the present State of Oregon. They claimed possession of the whole fertile valley of the Willamette River, which extends from the Coast Range on the west to the Cascade Mountains on the east. Their settlements reached as far north as Portland and as far south as the middle course of the Umpqua River. This territory comprises an area of approximately



FIG. 81.—Charles Bradford and wife, Smith River (Athapascan) Indians. Courtesy of Dr. Max F. Clausius, Siletz, Oregon.

12,000 square miles; and its topographic nature, its rich fauna and flora, its streams that abound in all kinds of fish, justify the assumption that it sustained a large number of inhabitants. These Indians were brought into the Grande Ronde agency in 1857, at the close of the Rogue River war. Unfortunately tribal wars and epidemics of smallpox and tuberculosis have decimated the several Kalapuya tribes to such an extent that Dr. Frachtenberg found a mere handful of these natives, and the time is not far off when the Kalapuya Indians, like so many other tribes of the Northwest, will have become an extinct group.

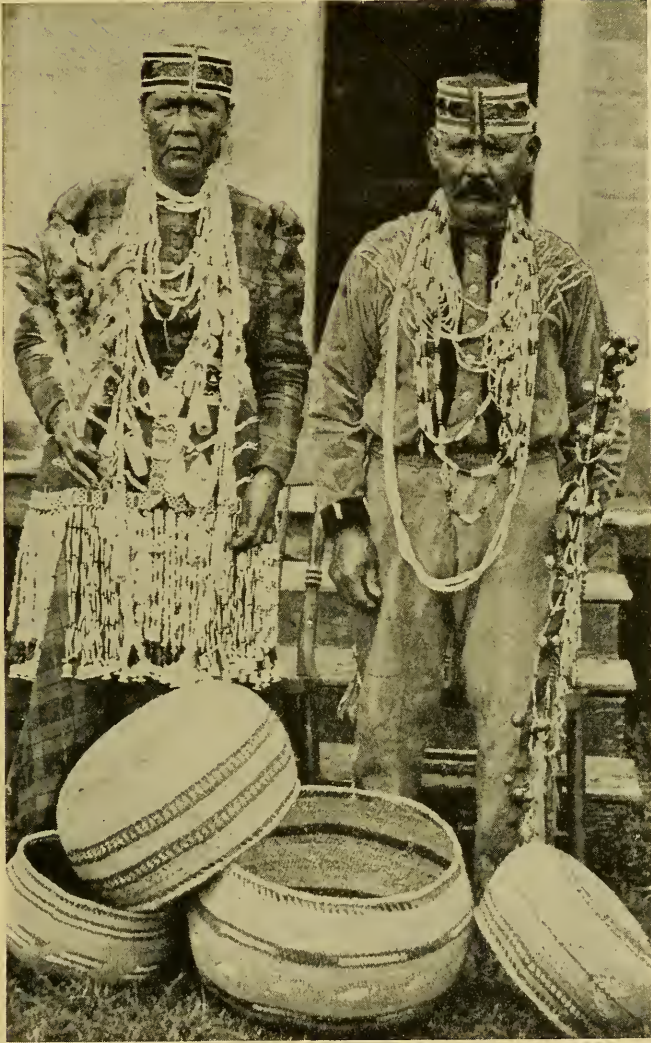


FIG. 82.—Ed Bensell and wife, Makwana-lunne (Athapascan) Indians, dressed for a "Feather Dance."



FIG. 83.—Jennie Rooney, an aged Tula-lunne (Athapascan) woman, ready to participate in the "Feather Dance."

The Kalapuya family embraces a number of tribes, the most important of which are given here as follows: (1) Atfalati, living formerly on the banks of the Tualatin River; (2) Yamhill, claiming as their possessions the banks of the river bearing their name; (3) Lakmayuk, who derived their name from the River Luckiamute; (4) Marys River (Calapooia Proper), whose settlements were situated along the banks of the Calapooia and Marys rivers; (5) Yonkalla, the most southerly Kalapuya tribe; (6) Ahantsayuk, also called Pudding River Indians; and (7) Santiam, who formerly lived on the banks of the Santiam River.

These several tribes spoke varieties of the Kalapuya language that show remarkable lexicographic diversity. Morphological differentiation exists also, but it is chiefly of a phonetic nature. All differences between the various Kalapuya dialects seem to have been caused by a geographic distribution, resulting in three subdivisions, within which idiomatic differentiation is very slight. Thus, the Yamhill and Atfalati dialects form one subdivision; Ahantsayuk, Santiam, Marys River, and Lakmayuk form the second, while Yonkalla belongs to a group of its own.

The Kalapuya language, while showing great phonetic variations (such as the occurrence of a labial spirant *f* and the presence of the trilled *r*), is structurally closely related to the languages of the neighboring tribes, such as the Coos, Siuslaw, Yakonan, Salish, and Athapascan. It belongs to the same type; that is to say, similar psychologic concepts are expressed by means of identical grammatical processes. The language belongs to the suffixing type. Its mythology differs in no way from the mythologies of the other tribes of western Oregon, being characterized by the absence of a distinct creation myth and by the preponderance of animal tales belonging chiefly to the Coyote cycle. An interesting phase of Kalapuya mythology is the presence of elements of European folk-lore, especially the absorption of French fairy tales that deal with the exploits of the orphan Petit Jean. This feature will be made the subject of a separate paper, which will probably appear in the near future.

The long and continued contact of the Kalapuya Indians with white settlers has resulted in a complete breaking down of their native culture and mode of living. Consequently, the ethnological data that could be obtained by Dr. Frachtenberg were very meager and, in most cases, were given as information obtained through hearsay.

INVESTIGATIONS AMONG THE STOCKBRIDGE, BROTHERTON,
AND FOX INDIANS

Early in July Dr. Michelson left for the United States Indian School at Carlisle to arrange for future translations of his Fox texts by Horace Poweshiek, as well as to obtain some linguistic notes on Sauk and Fox. He then proceeded to Wisconsin to investigate the Stockbridge Indians. His headquarters were at Keshena. About



FIG. 84.—Fox sacred pack.

a dozen persons were found who could give isolated words in the Stockbridge (Mahican) language, but only one person who could dictate connected texts. About a half dozen of such texts were obtained with difficulty. Knowledge of the language was too far gone to permit unraveling its details, but nevertheless sufficient material was obtained to show conclusively that Stockbridge belongs closely to Natick and Pequot-Mohegan, which are closer to each other than either is to Stockbridge. Stockbridge likewise shows certain affinities with Delaware-Munsee. If more material can be obtained on a future visit, a brief memoir on this language may be expected.

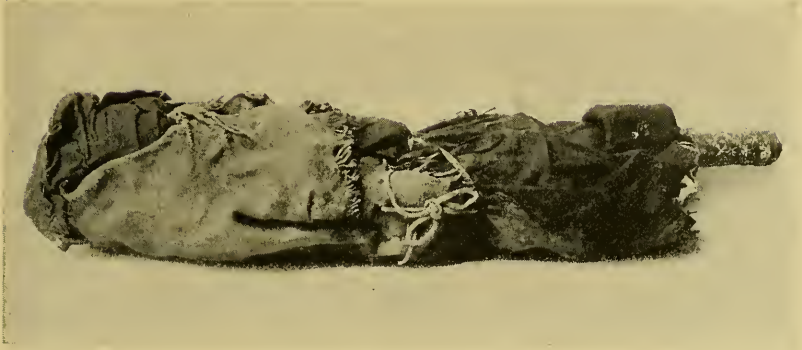


FIG. 85.—Fox sacred pack.



FIG. 86.—Contents of Fox sacred pack.

Some incidental notes on Menominee linguistics and ethnology were obtained.

Among the Stockbridge, near Lake Winnebago, only one person was found who could give even isolated Stockbridge words, and no one who could dictate texts.



FIG. 87.—Contents of Fox sacred pack.

There are probably no absolutely pure-blood Stockbridge Indians living, though perhaps 50 are nearly so; the remainder show various degrees of mixture with white and negro blood, and some with both; however, in all cases the Indian characteristics predominate.

Dr. Michelson next proceeded to investigate the so-called Brother-ton Indians near Lake Winnebago. Unfortunately not a single

person had knowledge of anything Indian except the tribal history. Here again no full-bloods could be found; practically all showed a large infusion of white blood.

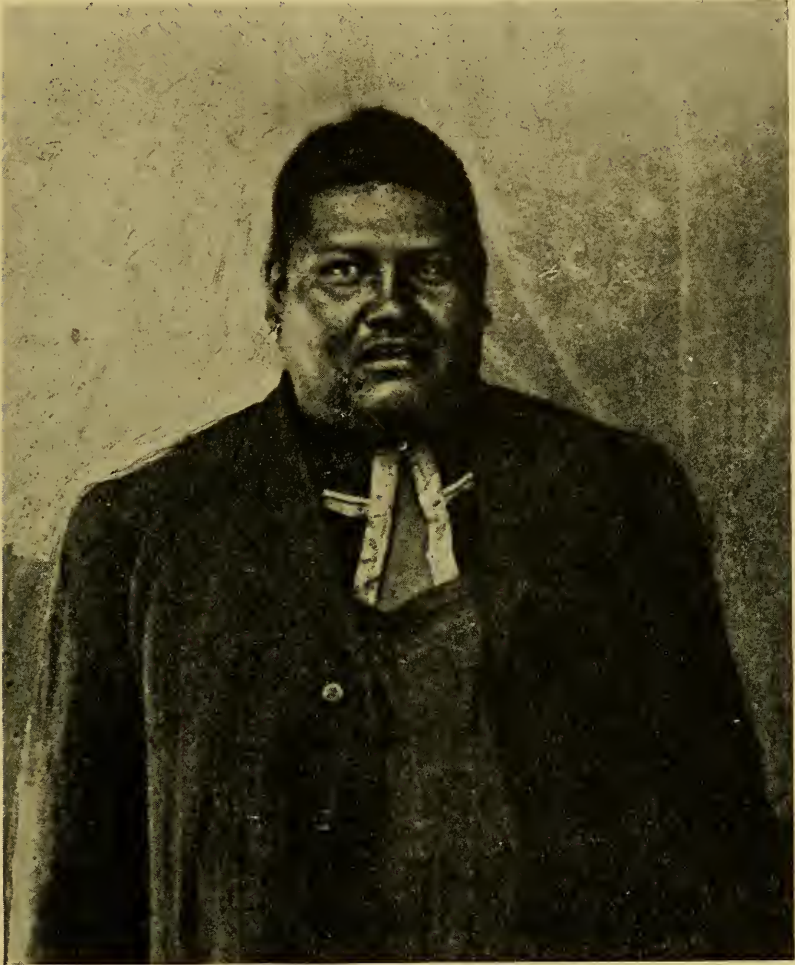


FIG. 88.—Alfred Kiyama, full-blood Fox Indian, age 45. Tama, Iowa.

He next went to continue his work among the Foxes of Iowa. Here particular attention was paid to ritualistic origins; likewise some translations of myths and tales were obtained. Some information was also procured concerning the ancient Midewiwin ceremonies. This information, however, must be checked by the Sauk

of Kansas and Oklahoma, as these ceremonies are now extinct among the Foxes proper.

The accompanying photographs are those of a Fox sacred bundle, with its contents, which is now in Berlin, and of a Fox Indian.

STUDIES OF SOLAR RADIATION

Mount Wilson work.—The Astrophysical Observatory continued its observations on Mt. Wilson, Cal., for the purpose of measuring the intensity of the sun's radiation, as it is at the surface of the earth,

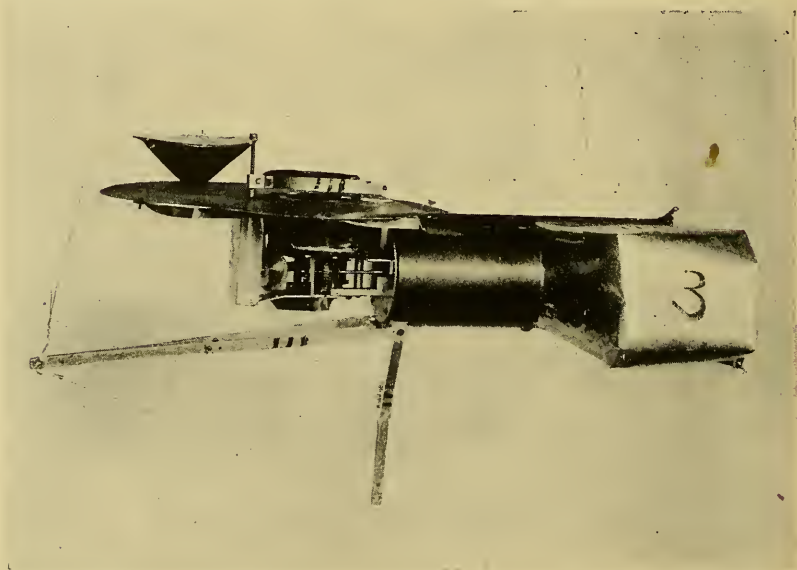


FIG. 89.—Balloon Pyrheliometer.

and the losses which it sustains in passing through the atmosphere, so as to permit the determination of the mean intensity outside the atmosphere, which is called the solar constant of radiation. As shown in former years, solar radiation is really not strictly constant, but is variable. The observations were made at Mt. Wilson on every favorable day throughout the period of the stay of the expedition, from May until November, in order to study the progress of this variability of the sun.

In connection with this work, the observatory was equipped with a tower telescope of 75 feet focus in the autumn of the year 1913. This instrument has been employed for the study of the distribution of light over the image of the sun, and the results indicate that this

distribution is variable from day to day. This variability appears to be closely correlated with the variation of the total radiation of the sun revealed by the solar constant investigations. It is confidently hoped that further study of these two interesting phenomena will throw light on the nature of the sun's radiating envelope.

Sounding balloon work at Omaha.—In order to more thoroughly confirm our determinations of the solar constant of radiation, measurements were undertaken in connection with the U. S. Weather Bureau at Omaha. Sounding balloons were sent up early in July, 1914, equipped with recording pyrhelimeters (fig. 89). The work was in the charge of Mr. L. B. Aldrich, on the part of the Smithsonian Institution, and of Dr. William R. Blair, on the part of the Weather Bureau. Three instruments were sent up and all were recovered. One of these was sent by night as a check on the accuracy of the work, and the other two by day, with the hope of measuring the intensity of the sun's radiation at enormous altitudes. The pyrhelimeter was suspended by means of wire 22 meters below three balloons each 1.25 meters in diameter, weighing with the apparatus about 23 pounds. An altitude of 15 miles was reached on July 11 when, as expected, two of the balloons burst by expansion and the third balloon brought the pyrhelimeter down in safety near Carson, Iowa.

One of the instruments made a very fine record of solar radiation and fortunately was recovered entirely uninjured, and it has been repeatedly tested and standardized at Washington. The tests are not yet completely finished, but they indicate that three excellent determinations of the solar radiation were made at heights so great that the pressure of the air was extremely small, certainly much less than one-twentieth of that which prevails at sea-level. The results, when reduced to mean solar distance and corrected for all known sources of error, come between 1.8 and 1.9 calories per sq. cm. per minute, with a probable error of about 3 per cent. This result is in close accord with the values of the solar constant of radiation secured by spectrobolometric measurements in former years on Mt. Wilson, Mt. Whitney, Bassour, Algeria, and at Washington.