THE SNAKE DANCE OF THE MOKIS.—I.

BY GEORGE WHARTON JAMES.*

In five of the seven villages of the Hopi—improperly termed the Moki—there occurs, every other year, the most wonderful religious ceremony known. It is conducted with decorum, dignity, and reverence, and yet, to many white onlookers, it seems wild, thrilling, chaotic, and disorderly. Having witnessed the ceremony eight times, and four times having been admitted to the secret kivas, or underground sacred chambers of the two fraternities who conduct the dance, I feel at liberty to speak of its religious character, the dignity with which it is performed, and to suggest the only point of view from which the visitor may obtain the right understanding of its mysteries.

The province of Tusayan is situated in northern Arizona, about one hundred miles due north of the town of Winslow, on the line of the Santa Fe Railway. This province was first exploited by Ensign Tobar, of Coronado's force, after the "Seven Cities of Cibola" had been discovered at what we now know as Zuni. This was 350 years ago. There have been changes in the valleys and their locations in that time, but the number of the cities is still seven, and the general characteristics but slightly altered. The seven villages are located on three mesas, or tongues of land, which are thrust out from the main plateau into a sandy plain, through which, in the rainy season, a stream meanders to lose itself in the sand. The easternmost of these three mesas is generally known as the "first mesa," on account of its nearness to Keam's Canyon, which for many years was practically the only known gateway into the Hopi region. On this first or east mesa are the three towns of Tenea, Sichomavi, and Walpi, the latter being the best known town of the province, the one most visited by the whites, and, consequently, the one that seems to be the most civilized. It is the only village on this mesa where the snake dance occurs. On the middle mesa, about nine miles to the west, are three more villages. This mesa is not a level, rocky plateau, as are the eastern and western mesas. It is divided into two parts, in the western portion of which is the town of Shimopavi, and from which a deep sandy ravine must be crossed ere the eastern portion is reached, on two distinct terraces of which are Mashonguavi and Shipauluvi. On the western or third mesa is the largest of all the Hopi villages, Oraibi, and all these four villages of the two westernmost mesas have their own celebration of the snake dance every other year.

This dance alternates in each village with the Lelentu, or flute ceremony, so that, if the visitor goes on successive years to the same village, he will see one year the snake dance and on the following year the Lelentu. But if he alternates his visits to the different villages he may see the snake dance every year, and, as the ceremonies are not all held simultaneously, he may witness the open air portion of the ceremony, which is the snake dance proper, three times on the even years and twice on the odd years. For instance, this year, 1899, it will occur at Walpi and Mashonguavi; next year, at Oraibi, Shipauluvi, and Shimopavi.

The Hopi are keen observers of all celestial and terrestrial phenomena, and, as soon as the month of August draws near, the snake and antelope fraternities meet in joint session to determine, by the meteorological signs with which they are familiar, the date upon which the ceremonies shall begin.

This decided, the public crier is called upon to make the announcement to the whole people. Standing on the housetop, in a peculiarly monotonous and yet jerky shout he announces the time when the elders have decided the rites shall commence. Sometimes, as at Walpi, this announcement is made sixteen days before the active ceremonies begin, the latter, in all the villages, lasting nine days and terminating in the popularly known open air dance, after which four days of feasting and frolic are indulged in, thus making, in all, twenty days devoted to the observance.

But for all practical purposes nine days covers all the ceremonies connected with it.

At Walpi, on the first of the nine days, the first ceremony consists of the "setting up" of the antelope altar. This is an interesting spectacle to witness, as at Walpi the altar is more elaborate and complex than in any other village. It consists, for the greater part, of a mosaic made of different colored sands, in the use of which some of the Hopi are very dexterous. These sands are sprinkled on the floor. First a border is made of several parallel rows or lines of different colors. Within this border, clouds are represented, below which four zigzag lines are made. These lines figure the lightning, which is the symbol of the antelope fraternity. Two of these zigzags are male, and two female, for all things, even inanimate, have sex among this strange people. In the place of honor, on the edge of the altar, is placed the "tipoui," or palladium of the fraternity. This consists of a bunch of feathers, fastened at the bottom with cotton strings to a round piece of cottonwood. Corn stalks, placed in earthenware jars, are also to be seen, and then the whole of the remaining three sides of the altar are surrounded by crooks, to which feathers are attached, and bahos, or prayer sticks. It was with great trepidation I dared to take my camera into the mystic depths of the antelope kiva. I had guessed at focus for the altar, and

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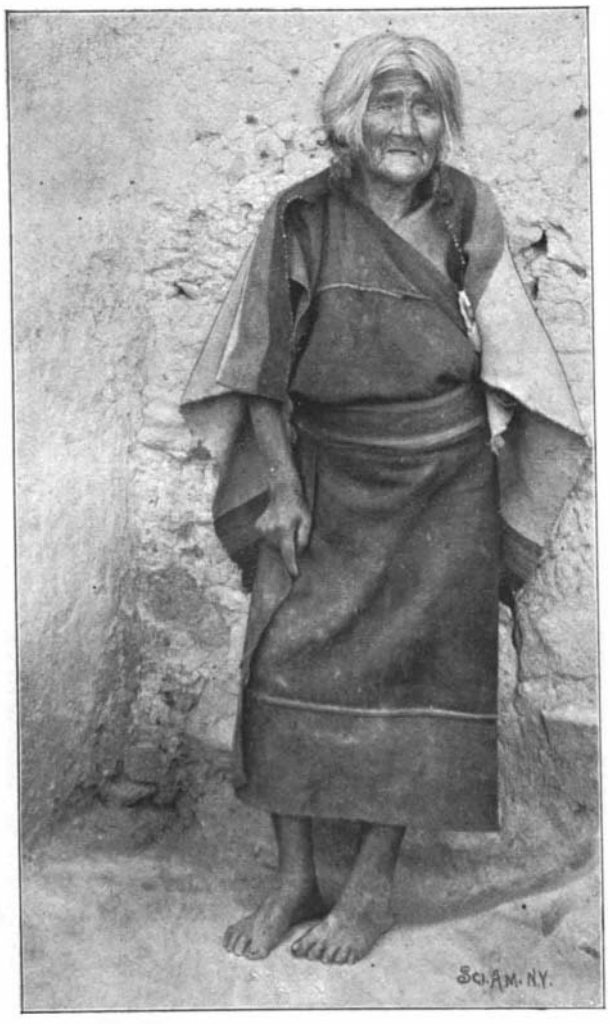
Snake Altar God.

when I placed the camera against the wall, pointed toward the sacred place, the antelope priests bid me remove it immediately. I begged to have it remain so long as I stayed, but was compelled to promise I would not place my head under the black cloth and look at the altar. This I readily promised, but, at the first opportunity, when no one was between the lens and the altar, I quietly removed the cap from the lens, marched away, and sat down with one of the priests while the dim light performed its wonderful work on the sensitive plate. The photograph here reproduced is the result.

The other ceremonies of general interest which occur during the underground secret rites are the singing of the sixteen dramatic songs, and the washing of the snakes. The sixteen songs are a kind of Moki Edda or Book of Hopi Genesis. Snake and antelope priests meet solemnly in the kiva of the latter. The chief priests take their places at the head of the altar, and the others line up on either side, the snake priests to the left, the antelope to the right. Kneeling on one knee, the two rows of men, with naked bodies, solemn faces, bowed heads, no voice speaking above a whisper, demand respect for their earnestness and evident sincerity. To one unacquainted with their language and the meaning of the songs, the weird spectacle of all these nude priests, kneeling and solemnly chanting in a sonorous humming manner, their voices occasionally rising to a grand crescendo, speedily to diminish to a thrilling pianissimo, produces a seriousness wonderfully akin to the spirit of worship.



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Old Woman at Walpi.

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The meaning of the songs, when their burden is studied, is that they give the legendary lore of the snake and antelope fraternities as to the origin of their ancestry and the methods the gods instructed them to follow in order that they might be blessed with rain and fertilization of their crops and productiveness among their herds. Listen to a brief summary of these interesting songs.

The Zunis, Mokis, Piutes, Coconinos and white men all made their ascent from the lower world to the earth's surface through a portion of Pisis-bai-ya (the Grand Canyon of the Colorado River), near where the Little Colorado empties into the main river. As the various families emerged, some went north and some south. Those that went north were driven back by fierce cold which they encountered, and built houses for themselves at a place called To-ko-ná-bi. But, unfortunately, this was a desert place where but little rain fell, and their corn could not grow. In their pathetic language the Hopi say "The clouds were small and the corn weak." The chief of the village had two sons and two daughters. The oldest of these sons, Tiyo, resolved to commit himself to the waters of the Colorado River, for they, he was convinced, would convey him to the underworld, where he could learn from the gods how always to be assured of their favor.

(This idea of the Colorado River flowing to the underworld is interesting as illustrative of Hopi reasoning. They said, and still say, this water flows from the upperworld in the far-away mountains, it flows on and on, and never returns, therefore it must go to the inner recesses of the underworld.)

Tiyo made for himself a kind of coffin boat from the hewed-out trunk of a cottonwood tree. Into this he sealed himself and was committed to the care of the raging river. His rude boat dashed down the rapids, over the falls, into the secret bowels of the earth (for the Indians still believe the river disappears under the mountainous rocks) and finally came to a stop. Tiyo looked out of his peepholes and saw the spider woman, who invited him to leave his boat and enter her house. The spider woman is a personage of great power in Hopi mythology. She it is who weaves the clouds in the heavens, and makes the rain possible. Tiyo accepted her invitation, entered her house, and received from her a powder which gave him the power to become invisible at will. Following the instructions of the spider woman, he descended the hatch-like entrance to Shi-pá-pu, and soon came to the chamber of the snake-antelope people. Here the chief received him with great cordiality, and said:

"I cause the rain clouds to come and go,
And I make the ripening winds to blow;
I direct the going and coming of all the mountain animals.
Before you return to the earth you will desire of me many things,
Freely ask of me and you shall abundantly receive."

For a while he wandered about in the underworld, learning this and that, here and yonder, and at last returned to the snake-antelope and snake kivas. Here he learned all the necessary ceremonies for making the rain clouds come and go, the ripening winds to blow, and to order the coming and going of the animals. With words of affection the chief bestowed upon him various things from both the kivas, such as material of which the snake kilt was to be made, with instructions as to its weaving and decoration, sands to make the altars, etc. Then he brought to Tiyo two maidens, both of whom knew the snake-bite charm-liquid, and instructed him that one was to be his wife and the other the wife of his brother, to whom he must convey her in safety. Then, finally, he gave to him the "tipoui," the sacred standard, and told him, "This is your mother. She must ever be protected and revered. In all your prayers and worship let her be at the head of your altar or your words will not reach those above."

Tiyo now started on his return journey. When he reached the home of the spider woman, she bade him and the maidens rest while she wove a pannier-like basket, deep and narrow, with room to hold all three of them. When the basket was finished she saw them comfortably seated, told them not to leave the basket, and immediately disappeared through the hatch into the lower world. Tiyo and the maidens waited, until slowly a filament gently descended from the clouds, attached itself to the basket, and then carefully and safely drew Tiyo and the maidens to the upperworld. Tiyo gave the younger maiden to his brother, and then announced that in sixteen days he would celebrate the marriage feast. Then he and his betrothed retired to the snake-antelope kiva, while his brother and the other maiden retired to the snake kiva. On the fifth day after the announcement the snake people from

* The photographs are by Mr. James. It is not possible to print all of the engravings in the present issue; the reader is referred to the second article.

the underworld came to the upperworld, went to the kivas, and ate corn pollen for food. Then they left the kivas and disappeared. But Tiyo and the maidens knew that they had only changed their appearance, for they were in the valley in the form of snakes and other reptiles. So he commanded his people to go into the valleys and capture them, bring them to the kivas and wash them and then dance with them. Four days were spent in catching them from the four world quarters; then, with solemn ceremony, they were washed, and, while the prayers were offered, the snakes listened to them, so that when, at the close of the dance, where they danced with their human brothers, they were taken back to the valley and released, they were able to return to the underworld and carry to the gods there the petitions that their human brothers had uttered upon the earth.

This, in the main, is the snake legend comprised in the sixteen songs which are sung with many interesting and dramatic episodes. The youth and the maidens are represented, the snake-antelope priest of the lower world giving the instructions to Tiyo which were forever after to be the salvation of his people's land from drought and famine. Hence the keen interest and sacred energy displayed by all the priests as they sing, and sing again, and yet again, the songs of their forefathers.

The catching of the snakes foreshadowed in the snake legend is faithfully carried out each year by the snake men. After earnest prayer, each man is provided with a hoe, a snake whip, consisting of feathers tied to two sticks, a sack of sacred meal (corn meal especially prayed and smoked over by the chief priest), and a small buckskin bag, and on the fourth day after the setting up of the antelope altar they go out to the north for the purpose of catching the snakes. Familiarity from childhood with the haunts of the snakes, which are never molested, enables them to go almost directly to places where they may be found. As soon as a reptile is seen, prayers are offered, sacred meal sprinkled upon him, the snake whip gently stroked upon him, and then he is seized and placed in the bag. In the evening the priests return and deposit their snakes in a large earthenware olla provided for the occasion. I should have noted that before they go out their altar is erected. This varies in the different villages, the most complete and perfect altar being at Walpi. At Oraibi the altar consists of the two wooden images—the little war gods—named Pü-ü-kon-hoy-a and Pal-un-hoy-a; and in 1898 I succeeded, with considerable difficulty, in getting into the snake kiva and making the accompanying photograph of these gods. The small figures on each side of them are hunting fetiches made of stone, and the snake bags may also be seen.

This catching of the snakes occupies four days, one day for each of the four world quarters.

Then on the noon of the ninth day the ceremony of washing the snakes takes place in the snake kiva. This is such an exciting and thrilling ceremony that I will leave its description for the next article, in which also the public snake dance will also be described and pictured.

The Fossil Deposits of Wyoming.

BY L. P. GRATACAP.

The recent announcement in the public prints of the discovery of a gigantic extinct animal in Wyoming, whose proportions are sufficiently astounding to meet the sensational requirements of the most advanced journalism, has excited popular interest in the remarkable desposits of the Mesozoic age in Wyoming and renewed curiosity in the strange animal remains they contain. This colossal beast is described in one paper in the following terms: "It is the complete petrified body of an animal weighing 40,000 pounds. The bone monster is a relic of the Jurassic age, 130 feet long, 35 feet high at the hips, and 25 feet at the shoulders." The further statement is made that the management of the Union Pacific Railroad, in its creditable anxiety to "transport the great fossil to a less obscure place," is willing to place its facilities at the disposal of science. The dimensions here given are certainly staggering and some doubt may be reasonably indulged in as to the absolute accuracy of the relations of length and height, but they clearly reveal the reptilian nature of the creature Prof. Reed has found, and place it among the great dinosaurs, the prevalence of whose remains in the Cretaceous and Jurassic inland seas of Wyoming has been so clearly established. The dinosaurs were land animals or lived amphibiously on land and in fresh water swamps, possibly even along the margins of the salt oceans; their limbs were unadapted for swimming, and curious developments of horns brought their cranial structure into ludicrous resemblance, in some instances, to that of the rhinoceros. They belonged to a rather highly developed class of reptiles, though, as Marsh has shown, their order of intelligence was low.

They flourished from the Triassic to the Cretaceous, and in Wyoming have been exhumed in surprising numbers, and with dimensions that seem incredible, while the Laramie Cretaceous, to which zone this latest newspaper marvel may be referred, has been distinguished for its possession of their skeletons. In the University of Kansas an immense skull of one of these anomalous beasts decorates a shelf in the museum, with horns over three feet in length on the top of the head, while another, a foot long, gives facial prominence to its nose. This skull is seven feet long, five feet wide and five feet high. A thigh bone of one of these pleasing ornaments of a past age measures over six feet in length, and the monster weighed 11,000 pounds. This individual, with its covering of flesh, must have formed a generous burden for the quaking earth it walked over when, in the remote period it now signalizes, it wandered along the margin of an inland sea.

The range in size of the dinosaurs is interesting, the smallest being computed to equal a cat in size, while the largest have in linear extent measured over sixty feet. Prof. Marsh has created three great divisions into which these animals may naturally be grouped, the Theropoda or the carnivorous forms, and the Sauropoda and Predentata, the herbivorous members, the last being again split up into three separate suborders, of which the first (Stegosauria) includes dinosaurs protected by dermal plates, the second (Ceratopsia) those bearing horns, and the third (Ornithopoda) forms that "in shape and structure most nearly resemble birds."

These wonderful creatures seem to have begun their course of development in the early Triassic, to have widened their areas of habitation and their structural variety in the Jurassic, and attained in the Cretaceous an amplitude of specialization prophetic of their decline, for, with the close of this period, they disappear from the surface of the earth. They had a wide range, being found in South America, extensively in North America, and in Europe, Asia, Africa and Australia. Such explorations as are now enlisting scientific attention throughout the world and such especially as are fostered in this country, will more and more reveal the affinities and features of this most strange family, and delight the imagination with closer views of that portentous fauna of the Mesozoic day.

It is so customary to look to the West for the revelations of vertebrate palæontology that few of the public realize that along the shores of Connecticut and in the interior of New Jersey, when the Triassic ocean was forming its deposits over both those States, dinosaurs were moving their unwieldy bodies, leaving the traces of their presence in the so-called "bird tracks," those tri-dentate impressions in sandstone which are so commonly seen in our museums. Indeed, in the Triassic sandstone of Connecticut, in 1818, one of the first discoveries of the skeleton of a true dinosaur was made, remains in part now preserved in the museum of Yale University. Again, bones of a dinosaur were found in Lehigh County, Pa., in 1847, and later in Prince Edward Island, Canada.

But the paradise of the collector has been in the West, in the Rocky Mountain region, where the remains are abundant and wonderfully preserved, and where the classification of the family has been made possible by the number of forms discovered.

Here at Lake Como, Wyoming, the celebrated Atlantosaurus beds are found, yielding hundreds of individuals, and one species (Atlantosaurus immanis, Marsh) which possibly attained the length of 80 feet. In Colorado, in South Dakota, in Kansas, the Jura-Triassic and Cretaceous areas also yield up to the zeal and patience of science their marvelous contents of fossil bones, entire skeletons, and huge or grotesque skulls.

But while from their more complete exposition the dinosaurs of these Mesozoic beds in the West rivet the attention of the student accompanying them were numerous representatives of allied groups of animal life, and the picture of exuberant fertility in faunal variety would be very incomplete without allusion to these associated forms. Birds of the Hesperornis type, wingless, measuring six feet from point of bill to the tip of the feet, with small conical teeth set firmly in the jaw, and aquatic in habit, were then moving in the shallow bays or estuaries, while through the air birds of the Ichthyornis type were swiftly passing, their habits of life in preying upon fish bringing them in numbers to the shore line of the continent. The huge Masasaurs, marine lizards, attaining a length of forty feet, then dashed through the waters, chasing fish, or engaged in savage duels, the traces of whose ferocity can yet be distinguished, according to Prof. Williston, in the exostosial growth in their skeletons. Turtles moved sluggishly along the shores of the Cretaceous continent or basked motionless upon the surface of the sun-heated bays. The picture which science in its retrospective glance can thus summon to our eyes surpasses the most weird dreams of fancy, and impresses the mind more and more profoundly with the mystery of that progression of life which now, in this modern day, seems to have reached the limit of its possible evolution.

CEMENT for tin is produced by dissolving equal parts of shellac and colophony in 6 parts of strong spirits of wine.—Neueste Erfindungen und Erfahrungen.

Alcohol in the Human System.

Prof. W. O. Atwater, of Wesleyan University, at the meeting of the Middletown Scientific Association on June 12, gave the results of experiments which he had recently carried out upon the effects of alcohol on the human system. These experiments were conducted with the aid of his respiration calorimeter, which we intend to illustrate in an early issue. Sensational accounts of the experiments have appeared in newspapers from time to time, but Prof. Atwater in his paper gave, for the first time, an authentic account of certain of his experiments which were conducted under the auspices of a committee of fifty for the investigation of the drink problem. The special object of the experiments was to determine the nutritive value of alcohol. Pure alcohol was administered with water or coffee. Sometimes it was also given in the form of brandy or whisky, wine or beer. The alcohol was taken with the ordinary diet. The amount consumed was equivalent to 2½ ounces of absolute alcohol or 5 or 6 ounces of average commercial liquor. It was found that the alcohol was oxidized as completely as bread, meat, or other form of food. In the oxidation all of the potential energy of alcohol was transformed into heat and muscular work, that is to say, the same use was made of alcohol as that of ordinary food materials. The alcohol protected the material of the body from undue consumption as effectively as the corresponding amount of sugar, and starch. Alcohol, like the fats, starch, and sugar, does not form tissue, but it yields energy. To express it popularly, it serves as fuel for the system. Prof. Atwater was careful to explain that his experiments were simply to get at the real facts in the case. Of course the conclusions which he deduces are not to be considered as advocating the use of alcohol. At the same time, it is no more than fair to state that the results of scientific experiments and the latest researches tend to show that alcohol is not a poison, but is a food.

The National Export Exposition at Philadelphia.

The National Export Exposition to be held in Philadelphia from September 14 to November 30, 1899, will occupy over sixty acres of ground. The site is admirably adapted for exposition purposes, being within a short ride of the City Hall. The main building is 1,000 feet long and 400 feet wide. It includes three pavilions two stories in height and a spacious auditorium with a seating capacity of 5,000. In this auditorium the sessions of the International Commercial Congress will be held and concerts will be given. The pavilions are constructed of bricks and structure steel and are each 90 by 380 feet. The walls of the main building are covered with "staff," and the cornices are made of the same material. A broad driveway will skirt the main building. A spacious promenade dotted with Japanese pagodas containing rustic benches will encircle the main building. Wide walks will be laid to the detached structures containing special exhibits. A special track will be provid d for automobiles. The grounds will be neatly laid out, and the space has been so utilized that large crowds can be handled with safety and convenience. The power house measures 58 by 190 feet and is situated on the river side of the grounds and has a flat roof which will be utilized as a roof garden.

American Pipe in Russia.

The city of Odessa, Russia, is now engaged in increasing its municipal waterworks. The Russian authorities gave the contract for the iron pipe to an American firm. The French Ambassador at St. Petersburg asked to have the contract taken away from the American firm to be given to a French firm on the extraordinary grounds of the close relationship between Russia and France. It is strange to say that the Russian Foreign Office took the matter up, and the Governor of Odessa was ordered to investigate and see what could be done. He was obliged to report that the town refused to change its arrangements, as they were quite satisfied with the American contract. The French Ambassador then asked that the specifications be changed so that the French pipe could be used, but the town again declined to do this on the ground that the best engineers favored the shape called for in the specifications, which was the shape used by the Americans. American pipe is now well known all over the world and our exports of pipe are constantly increasing.

WE have received the Annual Report of the American Museum of Natural History for 1898. The frontispiece shows the building which will be entirely finished in a few months. The entire front is now practically completed and shows one of the most imposing facades possessed by any museum in the world. The report of the President shows that the Society is in a very flourishing state, and that it has accomplished much for American science. A number of well-selected half-tone engravings are inserted, and the report gives a list of members, additions to the library, connections, etc. Work is now proceeding on three distinct sections of the building at the same time.