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from
L M Klauber

BULLETINS

OF THE

Zoological Society of San Diego

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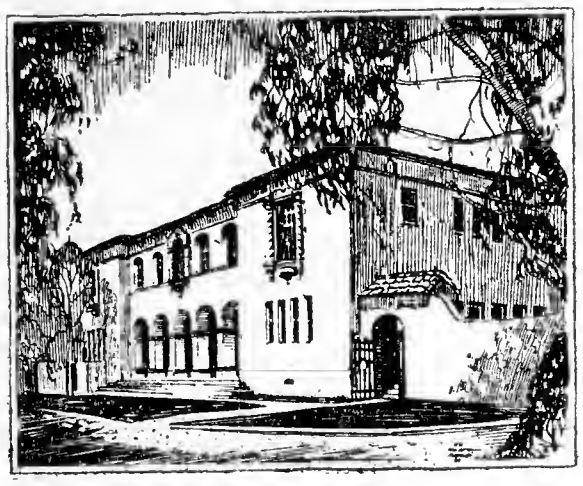
No 9

A Herpetological Review of the Hopi Snake Dance

By

L. M. KLAUBER

Curator of Reptiles, Zoological Society of San Diego



SAN DIEGO, CALIFORNIA

JANUARY 25, 1932

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INTRODUCTION

So often has the Hopi Snake Dance been described in print, it is with some trepidation that I offer another contribution to the subject. Almost every variety of presentation has been published, from the studied and detailed accounts of trained ethnologists, through various grades of popular portrayal to the lurid and sensational stories of the Sunday supplements. Travelers, tourists, artists, novelists on a holiday through the Southwest, have added their contributions, long and short, impressionistic and matter-of-fact, accurate and less so.

The same public reaction to snake-stories which causes some unimportant and often impossible note on a minor ophidian escapade to be broadcast to the American press, and accepted for publication by metropolitan daily and country weekly alike,. has given this dance its fame. Originally but one of the many significant rites practiced by our southwestern tribes, the mere participation of the snakes in the ceremony has attracted such attention that this single dance, of this particular tribe, has become the best known to the public of all our Indian rituals. Annually it attracts a crowd of onlookers who come from all corners of our country and foreign lands as well; annually these return to comb their dictionaries for new synonyms for terrible, fantastic and repulsive; next year they are back again, shocked but fascinated, to find whether their eyes deceived them. And again they see a group of Indian priests, dancing with live rattlesnakes held in their mouths, this being a part (and a small part only) of an ancient and elaborate nine-day religious ritual, presented in a spirit of sincerity and exaltation.

In the already voluminous literature on the ceremonial, only the snakes themselves have failed to receive their due measure of scientific investigation. Therefore my excuse for adding to this flood is an attempt to report the dance from a different angle—one that is somewhat more the viewpoint of a student of the snakes, than of one who knows the Indians; for of the latter I have little acquaintance and no knowledge. To the stray ethnologist who comes upon these notes and reads them with an increasing conviction of my inability to describe any event with truth or accuracy, I plead in extenuation that his brethren have not been entirely without fault in their discussions of the part (of minor importance certainly) that the snakes play in the ritual, and their conduct therein.

Just as the Indian student has observed his thousands of individuals, of a variety of tribes, which constitute his field of study, so I have seen some thousands of rattlesnakes, including all the species found in Arizona, and have given them considerable attention. I have investigated their dispositions alive, and their morphology when dead.

Being particularly interested in the variations of the Prairie Rattlesnake (*Crotalus confluentus confluentus*), as it occurs in northern Arizona, I attended the dance with my son, Philip, to learn what color phases were used by the Hopi, and also to glean any information that might be avail-

able on their methods of handling venomous snakes. As far as I have been able to determine, these particular aspects of the dance have not previously been stressed.

At the time the writer saw the 1931 presentation of the dance at Mishongnovi, he had not read any of the detailed published accounts of the ritual. The sequence of procedure was therefore unanticipated and the significance unknown.

In choosing the Mishongnovi dance rather than at Walpi (time was not available for both) I was influenced by the report that the former, because of relatively greater inaccessibility, would be the more purely primitive and less crowded with spectators, although smaller in number of participants.

THE HOPI AND THEIR COUNTRY

The Hopi[1] (formerly called Moqui) are a sedentary, agricultural group of Indians living in eight villages on their reservation in central Navajo County, Arizona. These villages are located on three mesas, which extend like fingers from the north, resting upon the table of a plain below. This area was known to the Spaniards as the Province of Tusayan, having been discovered by Coronado in 1540. Missionary work was undertaken in 1629, but most of the priests were driven out in the Pueblo rebellion of 1680. The last mission was destroyed in 1700, after which the Hopi were practically without white contacts, either religious or commercial, until the coming of American influence in the sixties of the last century.

Although the Hopi have lived upon these mesas for many centuries, the villages at present existing are relatively modern, having replaced others now abandoned and in ruins; within the last thirty years two more have sprung into being through a tribal schism, and one of the older has been almost deserted.

The towns are located on the rocky and waterless mesas at an altitude of from 400 to 700 feet above the surrounding desert plain. The cliffs are precipitous, and here the peaceful Hopi were afforded protection from their more warlike neighbors, the Ute, Apache, and particularly the nomadic Navaho. The towns at present occupied are these: On First (or East) Mesa, Walpi and Sichomovi (also the Tewa town of Hano); on Second (or Middle) Mesa, Mishongnovi, Shipaulovi and Shimopovi (often written Shongopovi); and on Third (or West) Mesa, Oraibi, Hotevila, and Bacabi.[2] (See Map) In recent years, now that the occupation of the mesas is no longer required as a military necessity, some of the Hopi have established residence on the plain below, at points nearer to their fields and springs. Here are the new towns of Toreva and Polacca, where

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[1] Hopi (Hopitu Shinimu), "Peaceful People;" Moqui, "The Dead," a term of derision possibly affixed by other tribes.

[2] Since these names are the literation of Indian words, marked variations will be found in their spelling throughout discussions on the Hopi.

the schools and trading posts are also located. The total Hopi population is about 2100.

The Hopi, while primarily dependent on a precarious agriculture, are weavers, and makers of baskets and pottery. They raise corn, beans, melons, squash, and peaches; all of these products are exchanged with the Indians of nearby tribes, particularly with the Navaho. They have considerable herds of cattle, sheep, and goats.

Their many religious ceremonials,[3] of which the Snake Dance is one, are intimately related to agriculture, and are carried out with deep feeling, gravity, and dignity.

To reach the Hopi villages, one has the choice of a number of roads: From Cameron and Moekopie to the west; Leupp, Winslow or Holbrook to the south; or Gallup to the east.

We chose the Holbrook road and therefore can speak from experience only of this.[4] The distance from Holbrook to Mishongnovi via Indian Wells, Jeddito, and Keams Canyon is 94 miles. The first thirty miles are upland, rocky, dry prairie; beyond, the Indian Wells Valley is crossed; a few Navaho with their flocks are seen. Then comes a series of buttes, after which the country is increasingly rough and arid.

The terrain, although referred to as desert, is high (5000 to 6000 ft.) and is quite different from our lowland deserts of southeastern California and southern Arizona; it is less sandy, flat, and barren.

The road is moderately good; we left Holbrook at eight o'clock and reached Mishongnovi at noon, having stopped for several reptile hunts along the way. In times gone by, the Hopi mesas were far less accessible; there were three days of toilsome team travel between the railroad and Tusayan; and, until recently, these Indians, by reason of this inaccessibility, were less affected by white contacts, with a purer primitive life and native ceremonials than any other southwestern group.

Travel is easier in the morning; returning from the dance we bogged down twice, once in a wash, and again in a mud-hole, both of which had been dry in the morning. The first, through river sands, was particularly difficult to negotiate because of the congestion of cars leaving the dance; the passage of more than three machines on each newly made crossing invariably resulted in disaster to the last.

One sightseer with the registration plate of a middle-western state on his car, pronounced the road from Winslow the worst in history; but as he had made the trip without the precaution of providing water, food, or maps, we were disposed to question his experience.

The last part of the trip is through the sandy washes which skirt the

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[3] It is said that the Hopi ceremonial calendar is one of the most extensive known amongst any people. More than one-third of the year is occupied with religious rituals, some of the more important of which are the Snake Ceremonial, Flute Dance, Butterfly Dance, Women's Basket Dance, Winter Solstice Ceremony, Bean Planting Ceremony, New Fire Dance, Children's Katchina Dance, and Farewell Katchina Dance.

[4] See Appendix 2, p. 75.

bases of the cliffs, upon which the varicolored Hopi castles gleam in the sun above a dessicated Rhine. In the canyons and other favorable locations are seen their fields; corn widely spaced; and peaches, not trees in regular rows, such as comprise our orchards, but sporadic clumps of small separate trunks, like scattered sumac bushes.

A short grade takes one to a shelf just below Mishongnovi on the west; here parking space is adequate for the toiling cars. The final climb to the village was made on the trail afoot, behind two burros laden with water, in oil cans one regrets to note, rather than in the baked-clay jars of bygone days.

THE CHARACTER OF THE DANCE

In order to understand the rather uncoordinated and disconnected impressions of a single observer, handicapped by an attempt to make accurate notes on a spirited and somewhat confusing scene, it will first be desirable to describe the dance in generalized terms, as condensed from the reports of several ethnologists and other scientific witnesses, especially Fewkes, Dorsey, and Voth.

Fewkes (1896) calls this "A serious, precise ritual which has survived from prehistoric times to our present day," and, further; "No Hopi priest lives who understands the meaning of all the details, nor does he care for an explanation of them." He is merely content to cling to the rites of his ancestors because, through experience, they have been proven good.[5]

It should be understood that the dance, with accompanying ceremonials, differs in detail as practiced at the several villages. That is to say, although the ritual, in all details, is rigidly observed at each village, there are certain differences in schedule, paraphernalia, and performance among the villages; however, such differences are largely of a character which render them important to the ethnologist rather than the casual observer.

The dance is carried on through the cooperation of two fraternities, or secret societies, known as the Snakes and the Antelopes. These societies are not to be confused with the names of clans. There is for example, a Snake clan which is separate from the Snake society; members of other clans may be enrolled in the Snake society, although it is understood that the chief priest of the Snake society is always a member of the Snake clan.

The dances are held at Mishongnovi and Walpi in the odd numbered years, and at Hotevila, Shipaulovi, and Shimopovi in the alternate years. The dates are selected by the priests based on astronomical observations[6] and are announced seventeen days in advance of the culminating Snake dance. The usual time for the dance is the third week in August, and the occurrence is generally on consecutive days in the towns, as for instance in 1931 at Mishongnovi, August 19th, and Walpi, August 20th.

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[5] See Appendix 1, p. 65.
[6] See Appendix 1, p. 67.

The Snake ceremonial, of which the Snake dance is a part, involves a coordinated program of nine days.[7] Much of what transpires is not seen by the public or by the non-fraternity Indians themselves; but the more important secret rites have been witnessed and carefully reported upon by scientific observers, who had won the confidence of the participants, and this fortunately at a time before white influence had been seriously felt. Of the public part of the ceremonials the four important rites are: The Antelope race in the morning and the Corn dance in the evening of the eighth day, the Snake race early on the morning of the ninth day, and the Snake dance itself, occurring in the late afternoon of that day. It is this rite which has given the entire ceremonial its name, and this, as far as the public is concerned, is the all-important feature of the proceeding. However, it should be understood that the Snake dance, while the culminating rite, is only a single half-hour episode in an elaborate nine-day ceremonial. The importance ascribed by the public to this fantastic feature has been rather unfortunate in that it gives an inaccurate picture of the solemnity and symbolism of the celebration as a whole.

Four days of the nine are given over to a ritualistic hunting of the snakes. This is done, not only by catching those found in the open, but also by following their tracks to holes and digging them out with hoes, and other more primitive digging sticks which have been consecrated for the purpose. The snakes may be either rattlers or of non-venomous species. The search is conducted with great energy.[8] No observer appears to have accompanied the Indians on these hunting trips except for short periods, for they are much averse to being followed. The snakes are sought in the area surrounding the village, one day at each of the four cardinal points, invariably in the order north, west, south, and east. During these hunts the novices, some of whom may be quite young, are initiated in the capture and handling of snakes. If not enough snakes are found on the four official or ceremonial days, the hunts may continue informally for several additional days; on these the search may lead anywhere, being unrestricted as to direction.

There are certain accessories to which Indian names are applied which must now be briefly explained. First, we have the kiva, an underground or semi-underground vault, entered by means of a ladder through a hatchway in the roof; this serves the combined purposes of a lodge-room and the scene of various religious rites. There are separate kivas for the different secret society groups; in each of the villages there is one for the Snake society and one used by the Antelope society, and, usually, several others besides. The bahoki (or pahoki) is a permanent stone shrine erected near the center of the plaza, or other public ceremonial place, where the Snake dance and other rituals are performed. I am not sure that this shrine is an important feature in the ceremony at all of the

[7] See Appendix 1., p. 65.
[8] See Appendix 1, p. 68.

towns, but at Mishongnovi it was certainly incorporated in the rite. Then there is the kisi, a temporary bower of cottonwood branches shaped like an Indian tepee, but much smaller. This is erected near the center of the plaza (in the direction of greatest dimension) but close to one side, so as to leave a dancing space before it. The entrance to the kisi is covered with canvas or a blanket. In front of the kisi a hollow has been dug, over which is placed a board. This is the sipapu,[9] the entrance to the underworld. The kisi is used only for the Snake ceremonial.

The snakes having been captured are placed in certain sacred clay jars, and are stored in the kiva of the Snake priests. Here, when not actively engaged in hunting, and particularly after the fourth ceremonial day of the hunt, the Snake priests live, making prayer sticks (pahos), observing various sacred rituals, including ceremonial smokes, and preparing their costumes.

Similarly, while these rites are proceeding in the Snake kiva, the Antelopes, who are relieved of the necessity of hunting snakes, are carrying forward even more elaborate ceremonies in their retreat; for the Antelopes, although they do not handle snakes, have a part in the ritual which is superior, rather than inferior, to that of the other sect. An altar is prepared, consisting of a beautiful colored-sand mosaic, symbolic of a rain storm, with clouds and lightning, surrounded by a variety of ritualistic objects. Prayer-sticks and other sacred paraphernalia, of great diversity and particularity are manufactured and appropriately used; many are sent by official couriers and deposited at four shrines of the rain gods. A tableau with Snake Youth and Corn Maiden, dramatizing the ancient snake myth upon which the dance is based, is enacted, accompanied by traditional songs and chants.[10] There is imitation thunder produced by a whirling stick on a string (called a bull-roarer); lightning is simulated by shooting out and retracting an extensible rack, like a continuous pantograph; clouds by ceremonial smoke; and rain by water asperged from sacred vessels. (These devices are also used in some towns in the subsequent public dance). Sacred corn-meal and corn-pollen are used extensively by sprinkling, to sanctify objects and actions.

During the ceremonies in the kivas, appropriate insignia are attached to the parts of the entrance ladders above ground as a notification to the non-fraternity townspeople that the ritual is in progress; these serve also as a warning against trespassing into the secrecy of the ritual.

Amongst the sacred paraphernalia there is one item of particular interest to the herpetologist; this is the snake-whip or snake-wand, a wooden shaft about eight inches long to which is attached a pair of eagle feathers. From the first hunts to the final dance these serve a very practical purpose in soothing the snakes, or herding them when it is desired to have them go in a certain direction, or to cause them to straighten out when they

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[9] There is also a sipapu in the Antelope kiva.

[10] See Appendix 1, p. 69.

have coiled for defense. Eagle feathers are used because eagles are the masters of (prey on) snakes.

On the morning of the eighth day, at an early hour, occurs the first part of the ceremony which the public (whether Hopi or white) may witness; this is the Antelope race, in which the young men of the village compete.

On the evening of the eighth day occurs the Antelope or Corn dance, which resembles the Snake dance in method, except that wands of corn stalks twisted together with melon vines are used in place of the snakes. Further, the respective roles of the Antelope and Snake priests are somewhat different in the Corn dance, as compared to the succeeding Snake dance. This ceremony is not a rehearsal of the Snake dance, as has been occasionally stated, but, on the contrary, is a definite part of the ritual, a prayer for the growth of corn and other agricultural products upon which the Hopi rely for sustenance.

Early on the morning of the ninth day occurs the Snake race, in which young men of this and adjacent villages participate. The race is said to be for a distance of four or five miles and ends in the steep and exhausting ascent of the mesa on which the dance is to be held. The prize to the winner consists of some small sacred offerings, which he buries in his corn field as a blessing of the crop.

Other young men and boys, most of whom have accompanied the racers only up the final slope, come into the village carrying corn-stalks and melon-vines. These are now the cause of a good natured wrangle with the women and girls, who snatch them from the boys and bear them to their homes as trophies.

At noon on the ninth day occurs the secret rite of washing the snakes, in anticipation of their part in the dance. This has been witnessed and carefully reported upon by a number of ethnologists, especially Fewkes, Dorsey, and Voth.[11] It is an extremely elaborate ritual and differs in detail amongst the towns. In general, the snakes, having been removed from the sacred storage jars, where they have spent most of the time intervening since their capture, are taken in hands-full by the chief Snake priest, before the assembled members of his fraternity, and are dipped in an effusion contained in an earthen bowl, the liquid having previously been the subject of a suitable ceremony. After the washing, the snakes are dried by allowing them to crawl on sand; they are permitted partial liberty in the kiva for as much as two hours, following which they are placed in cloth sacks awaiting the ceremony.

All reporters who have witnessed the washing state that the snakes are handled gently but fearlessly.[12] There is no report of anyone having been bitten. During their brief freedom they are guarded by boy priests.

The Snake dance itself occurs at sundown on the ninth day, this being

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[11] See Appendix 1, p. 69.

[12] But see statement on Walpi washing, p. 21.

the time fixed by precedent. Prior to the dance the snakes are placed in the kisi in one or more cloth bags by the Snake priests.

On the afternoon of the dance the audience, which consists of the local Hopi, visitors from adjacent villages, Navaho, and, with improvements in roads, an increasing number of whites, has been circulating through the village and about the plaza engaged in sight-seeing. A considerable time before the dance most of them have selected vantage points from which they expect to view the ceremony. Many, including the more timid, are perched upon the house-tops in double and triple rows along the fronts of the buildings. On the ground there is another group, completely surrounding the plaza, seated in the doorways of the Hopi homes or on a sort of stoop which is built into the fronts of most of the houses. Competition for vantage-points is sufficiently keen so that the audience is content to remain stationary for an hour or more before the dance, in order to hold their places.

The number of participants in the final ceremony varies in the several towns, and at different times in the same town. There may be as few as six Antelopes and eight Snakes, or as many as twenty Antelopes and fifty Snake priests. The number of reptiles used varies from about 20 (where the priests are few) to 100 or more at Walpi, where the largest dance is held. From a quarter to a half of the snakes are generally reported to be rattlers; the others are harmless bull snakes or racers.

The dance begins at sundown with the entrance of the Antelope priests. They come from their kiva in single file, dressed in elaborate and symbolic costumes, complying in detail with the ritual. The stragglers amongst the audience find the best remaining places. Indian police generally aid in a somewhat haphazard way in keeping the central area clear. The Antelopes hold rattles made of buckskin in one, or both hands, and carry pouches filled with sacred corn-meal. Rather slowly and sedately they make four circuits of the central area, scattering a pinch of meal on the bahoki (shrine) and on the sipapu, the board before the kisi, as they pass; they also stamp with the right foot on the board. Their march is accompanied by a rhythmic shaking of the hand-rattles, and the jingle of their trappings. Finally, having completed the fourth circuit, (always in the direction north, west, south, east) they stand in a single row, either upon each side of the kisi, or with their backs to it, facing the central area.[13]

After a short pause the Snake priests enter from their kiva. They are headed at some distance by one or two of the chief priests. They are not dressed or painted uniformly, for there are certain differences, not only between towns, but between individuals, in symbolic representation of mythological characters and occupations. One or two priests enter the kisi, while the rest make four circuits of the central area as did the Antelopes. The Snake priests move, however, at a considerably more rapid gait than did their predecessors, there being a certain aggressive intensive-

[13] See Appendix 1, p. 71.

ness in their actions not evident amongst the Antelopes. Each time an individual passes the kisi he stamps violently with right foot upon the board, which being over a hole, gives forth a hollow sound. Thus the rain gods of the underworld are advised, by this imitation thunder, of the impending ceremony. At the completion of the fourth circuit the Snake priests line up in a row facing the Antelope priests.

Then follows a ceremony of considerable length involving a slow, weaving dance with rising and falling chants and incantations. Amongst other paraphernalia each Snake priest carries at the back of the right knee a hollow turtle-shell against which dangle small objects, said to be sheep-hoofs; thus, when the right leg is stamped, the turtle-shell gives forth a deep rattling sound, and this keeps time with the dance and the hand rattles carried by the Antelopes.[14]

Now the Snake priests (but not the Antelopes) break up into trios, each containing one man who is usually referred to, in descriptions of the dance, as the "carrier," a second called the "hugger," and a third known as the "gatherer." As the first carrier passes before the kisi he stoops and is handed a snake by one of those within. This snake he puts into his mouth, holding it with teeth and lips from six to twelve inches behind the head. The hugger now puts his left hand on the carrier's right shoulder, or about his neck, and together, the carrier continuing to hold the snake, they slowly dance, with a shuffling step, around the arena, with the carrier on the inner side of the circle. After approximately one and a half times around, the carrier drops, or puts down the snake on the ground and, in passing the kisi, receives another. In one of the villages the carrier holds the snake with his hands as well as lips; elsewhere, however, it is held only by the mouth. The exact position and action of the hugger, with references to the carrier, differs in the several villages.[15]

Meanwhile other trios have followed the first, and there is a circle of dancing priests, picking up, carrying, and putting down snakes in more or less confusion. The hugger, while dancing around at the right hand of the carrier, from time to time brushes the snake's head or the carrier's face with the eagle feathers of a snake-wand This is presumed by some to be for the purpose of engaging the snake's attention, to keep it from biting the carrier. The hugger acts as guide, as well as protector, for the carrier's eyes are generally closed.

The gatherer has been following his two fellow priests. When a snake has been put on the ground by his carrier he picks it up, usually six to eight inches behind the head, sometimes directly, but more often first sprinkling it with sacred corn-meal. Or, if it coils, as if for defense, he brushes it with his feathered snake-wand or snake-whip, and, as soon as it has straightened out to escape, he seizes it. After he has accumulated several snakes in this way, some are handed to the Antelope priests, who

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[14] See Appendix 1, p. 71.
[15] See Appendix 1, p. 72.

hold them until the termination of the dance. The Antelopes have not left their place by the kisi but have continued, with chants and rattles, to furnish the rhythm for the Snake priests. At one point in the ritual a group of women approach with white meal held before them in shallow baskets; pinches of this meal are scattered on the snakes and dancers.

When all the snakes have been danced with and are now held either by the Antelopes or the gatherers, one of the priests draws a circle on the ground with corn-meal. All the snakes are piled into this circle in a seething mass; thence many try to escape but are carried or herded back within the ring. The women scatter the balance of their sacred meal upon the snakes. This is the part of the dance causing most excitement amongst the audience, particularly those nearest the circle.

Now the Snake priests as a group rush to the squirming pile and seize the snakes by the hands-full until all have been picked up. Then they run in the four cardinal directions off of the mesa and down the steep trail onto the plain below, where the snakes are liberated at some distance from the bases of the cliffs, and thus the messengers to the gods are sent upon their way. The Snake priests return to the mesa more slowly. An emetic is taken as a purifier, and then the dance closes with a great feast of celebration and with merrymaking which lasts four days. Meanwhile the audience has dispersed, the Indians to their homes, the whites to their adjacent automobiles or camps.

It should be repeated that there are considerable variations in many details as the dance is practiced in the several villages; not variations resulting from carelessness or indecision, but rather owing to gradual divergences in paraphernalia and ritual, as the dance has been handed down from generation to generation through the centuries. Most of these differences are of importance only from an ethnological viewpoint; they have been completely described in various technical monographs. Observers who have seen the dance in the same town in successive bienniums have noted with approbation how these priests, with no guide save memory, can repeat exactly each year the numberless minute details of action and procedure, seemingly without change.

Surprising as it may seem, in the case of a rite which has lately received so much attention, the first published description of the dance did not appear until 1881. Until 1900 transportation difficulties had kept away all but a few Indian officials, traders, scientists, missionaries, and army officers. The dances at some of the towns were seen annually only by a dozen or fewer non-Indians, and the outsiders admitted to the secret ceremonials could be counted on the fingers of one hand. Yet fortunately these included ethnologists, familiar with the language and customs of the Indians; they were able to gain the confidence of the chiefs, and thus have recorded in detail the ritual as it was practiced before any contamination by outside influences took place. Formerly cameras were permitted and, notwithstanding the difficulty of the late afternoon light, many good photographs have been published; more recently their use has been pro-

hibited, so that no recent pictures are available. Photography is permitted in the villages prior to the dance.

The Indians, though desperately poor in worldly goods, have resisted the commercializing of their ceremonies. They view the white spectators as rather unnecessary annoyances which native hospitality requires them to tolerate. It is stated that they have refused a considerable monetary offer to stage the public part of the dance in a more accessible locality; tenders for moving-picture rights have also been made. Only a few of the younger Indians profit through the sale of refreshments and trinkets, and, in one of the towns, advantageous seats. But the ceremony is a grave, religious matter with the Hopi and they are said to resent an imitation dance, annually staged, with harmless snakes, by a white group, in southern Arizona.

It seems to be agreed by competent investigators, that the entire ceremonial, including the elaborate secret rites, the Corn dance, the races, and the final Snake dance, is a prayer for rain and the fulfillment of adequate crops. But it must not be presumed that the dance is a prayer for rain which is expected to follow immediately upon the termination of the ritual. Lurid accounts occasionally have appeared in the press of priests embarrassed by premature storms, or disconsolate over the failure of rain to follow immediately upon the conclusion of the ceremony. This does not seem to be accurate. Over the northern Arizona plateau the summer constitutes the rainy season. Considerable rain is to be expected before the third week in August, when the dance is usually held. But the rains are sporadic and capricious; almost every afternoon one may look about him (if not in a rainstorm at the time) and see from three to six or more such storms, each giving, for a brief time at least, precipitation to a limited area. The total number of such storms effective at any one point varies considerably from year to year. The Hopi prays for an adequate number to reach his fields; no doubt he hopes that they will be evenly spaced in time so that they will be most effective in nurturing the crops, without spells of withering drought, alternating with cloudbursts to wash away his fields.

An examination of the details of the ceremony, particularly the secret proceedings in the kivas, can leave no doubt as to the purpose of the ritual. Each item is a part of a coordinated whole; each portion carries with it some symbolism toward the bringing of rain. All this is shown in the dramatization of the myth, in the pantomimes, the chants and songs, the sand picture, the fetishes. There is the thunder of the bull roarer, the lightning of the pantograph, the clouds of ceremonial smoke, the rain of the aspergill. The altars are decorated with water worn roots and stones, sea shells, mud from river banks, plants (as the cottonwood) which seek water. It is an astonishingly intricate procedure, painstakingly built up through the centuries, an attempt literally to pull rain from the sky, first by causing the formation of clouds, then their drawing together over Tusayan, and, finally, the delivery of rain with the help of lightning and thunder.

The ceremonies involving the dance are presumed to have had their origin in a Snake Myth involving the "Spider Woman," a youth, and a maiden.[16] After many adventures in the underworld, the youth, with the aid of the Spider Woman, won the maiden and returned with her to his village. Their first progeny were snakes, who were sent back to the underworld for biting the Hopi. Their later children were human, who became the ancestors of the Snake clan. The relationship of the Snake myth to successful crops and the present ceremony is through the following element of the myth: After the snakes were sent back to the underworld in disgrace, there followed a drought; the corn was scorched and the springs dried up. Then the hero of the myth taught his people songs and prayers to restore the rainfall, and in this ritual the snakes were sent back to the underworld as cherished envoys rather than in disgrace as before.

The present ceremony is not a form of ophiology; the snakes are not worshipped, they are "elder brothers of the priests," messengers to the gods of rain. The connection is based on the following: Rain—lightning —sinuous shape—snake; or as it is sometimes expressed, rain—lightning —death dealing stroke—snake. The rain gods are underworld gods, for the Great River (the Colorado) flows forever into the earth. To them the snakes have admission. The scattering of sacred corn-meal, which is so important an element in this and other Hopi ceremonies, is a form of consecration.

THE DANCE AT MISHONGNOVI IN 1931

The visitor to the dance cannot hope, in a single viewing, to catch all of these different events accurately. There is much confusion, and the writing of notes naturally detracts a certain amount of attention from the dance itself. However, it may be of interest to give a few points observed by the writer at the Mishongnovi dance on August 19, 1931.

The plaza is approximately 40 by 180 ft. and is crowded, both on the roofs and on the ground, long before the dance begins. It is a curiously mixed group; cowboys and dude ranchers, tourists and students, Hopi and Navaho; chickens, dogs, color, and noise. A reasonably accurate count of those on the west side indicates that the crowd numbers about 750, equally divided between Indians and whites. The audience is good-natured, but somewhat disorderly before the dance. There are noisy salutations by old friends, and much fruitless inquiry as to when the dance will begin, upon the part of those who have never seen it before. Quite evidently a number of Indians have returned from distant points to view the dance; they are greeted effusively by fellow townsmen. An animated conversation with much laughter is carried on in the native tongue, for the Hopi are an affable and friendly people. There is a general air of happiness. Refreshments are sold by three or four of the local Indians, and while this procedure may detract from the pictur-

[16] See Appendix 1, p. 73.

esque scene, it must be admitted that they are welcomed by many during the long wait; the cool drinks are especially appreciated in the warm plaza. There is a good deal of conversation concerning the snakes and the chance of someone in the audience being bitten. It amuses the old timers to exaggerate this danger with tall stories; whereupon some of the more timid abandon seats already appropriated upon the ground and take to the roofs. The Indians circulate about, the women and girls in brightly colored shawls and holiday garb. The children, who are many and of all ages, roam about in protective groups; they are appreciative of the day's festivities, being fed candy by the visitors. A seven year old who occupies the seat at my left engages in a highly successful zoological expedition on her three year old sister's head. A Navaho girl, whose sister has lately married a Hopi, tells with a mixture of amusement and chagrin, of her initiation that morning into the Hopi tribe (or some clan?). She seems to have been plastered liberally with mud, and as she is seen by dress, speech, and demeanor to be a well educated young woman, it is natural that this primitive rite might be considered no longer exactly appropriate. Some tourists visit the interior of the houses and seem to be welcomed by the residents. A few baskets and jars are bought.

Some little time before the dance begins, a couple of Indian policemen enter and mildly urge the crowd to remain permanently in their seats. This brief authority is all that is in evidence during the ceremony. The grand-marshal, the executive board, the entertainment committee and information bureau, the high hats and badges of authority, auditors and checkers, and all the intrusive exponents of organization which seem so necessary in our public celebrations are here conspicuously absent.

The kisi, or cottonwood bower, is at the center of the narrow plaza and approximately 10 ft. from the west wall. The bahoki (shrine) is to the north and east, on the north-south center line.

At 5:10 P. M. three elderly priests appear, wearing only loin cloths, and deposit three canvas bags of snakes in the kisi. This naturally causes a buzz of comment amongst the audience, which is hopeful of an immediate procedure with the dance. However, it is not until 6:12 that the first dancers appear. They enter from the south, marching sedately in single file northward along the east side of the plaza, then turning west in front of the stone shrine, thence south in front of the kisi and so around. These are the Antelope priests of whom there are eight. They are followed so closely by two of the Snake priests the writer at first thought that these, also, were Antelopes, but as they subsequenly disappeared into the kisi and handed out the snakes, it may be presumed that they were Snake priests. The Antelopes circle four times, shaking their rattles (one in each hand), sprinkling meal on the shrine, and stamping on the sipapu in front of the kisi as they pass. Two youths, aged ten to fourteen, evidently neophytes, bring up the rear. Gradually the circle becomes smaller, and, at the conclusion of the fourth round, they stand in line, four on each side of the kisi, all facing east. They have white marks from ear to ear across the

eyes. Their jaws are painted black, their shins white. Their bodies above are decorated with white lightning-stripes. They wear kilts, a colored and embroidered sash hanging at the right, with a fox skin (tail down) at the waist behind. They wear necklaces of shells, some cottonwood leaves about the leg, and silver decorations on the arm; there are other ornaments which there is no time to catalogue. While standing they continue shaking their rattles and sprinkling meal. The first two carry some insignia which appear to be bundles of feathers.[17]

At 6:16 the Snake priests enter, also from the south. They move faster and more impetuously than the Antelopes. The oldest man is in the middle; the youngest, a mere boy, brings up the rear of the line of eight. They seem to go around the circle divided into three groups, 1 — 3 — 4, but this may be accidental. After they have circled four times, stamping violently on the sipapu before the kisi each time they pass, they face the Antelopes. Several are holding feathers or feathered wands in the right hand. It is noted that the leader carries a bow, or staff, decorated with skunk skins and feathers;[18] he is the only one carrying a staff thus adorned, the others having wands only. Each Snake priest nas a turtle-shell at the back of his right knee against which small suspended objects dangle, making a rhythmic rattling sound as he stamps. Their faces are painted black. They are naked to the waist, with three ochre blotches on the back. All wear dark brown kilts decorated with a wavy black band. Each carries a bandolier over the right shoulder to which shells are attached. A feather or two hangs from the hair. A fox skin is worn at the waist, similar to that of the Antelope priests. There is an arm band on the left arm, with a wide silver plaque. The mocassins are fringed with leather strips or strings. Some of the Snake priests have long, others short hair.

As the two rows of priests, eight in each row, stand facing each other before the kisi the audience is quiet, serious, of a demeanor different from the somewhat derisive spirit in evidence before the dance. Now begins a chant, at times a low hum, again rising to an impetuous note, as the two lines, facing each other perform a weaving dance which includes a brushing pantomime with the feathered wands. This ceases at 6:26.

Six women now enter carrying meal in flat baskets; the second from the left is an albino.[19] The Snake priests take the feathered wands in the left hand; one stoops at the kisi and brings out a large bull snake which

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[17] The tiponi or badge of office of the chief and assistant chief priests.

[18] Said to be the insignia hung on the ladder above the Snake kiva during the secret rites.

[19] There seems to be a strain of albinism amongst the Hopi; mention of albinos is frequent in past reports. At Mishongnovi in 1931 there were three, two middle-aged women and a girl of about seven. It was painful to see them in the bright sunlight with their eyes unprotected by dark glasses. See Bur. Am. Eth., Bull. 34, pp. 192-197.

he places in his mouth, holding it about eight inches from the head.[20] A second priest (the hugger) now joins him, the hugger on the right with his left arm around the carrier's neck. They dance southward from the kisi in the same direction as the original march. The Antelopes continue to chant and shake their rattles, furnishing the music for the dance. The Snake priests have divided into three pairs of two each; that is, a carrier and hugger, leaving two gatherers, one a stout, middle aged Hopi, the other the youngest boy in the dance, a novitiate. As each carrier passes the kisi he is handed a snake; just how this is done cannot be observed as the carrier blocks the view, and the priest within is not to be seen. The first three snakes out are all bull snakes about 4 ft. long. They are held in the mouth, while each carrier makes the circle one and a half times. They are then dropped on the ground and sprinkled with meal, after which they are picked up by the stout, older gatherer. Now there are six snakes out, all bull snakes; all so far are the usual Arizona, light-colored subspecies. Then comes the first rattlesnake, on the third round, followed immediately by a second. They are greenish-colored prairie rattlers, without light edges on the blotches. The carriers hold them about four inches behind the head. By the next round there is a total of three rattlers and seven bull snakes. Another rattler is brought out and is held six inches behind the head. When a snake is on the ground and is to be picked up by the gatherer, there is no attempt to use care in seizing it immediately behind the head; it is picked up at random, this being true whether the snake is a rattler or non-venomous. Usually the snakes on the ground are sprinkled with meal, and if they coil, are brushed with a snake-wand until they straighten out and attempt to escape. At the next round the total has become eleven bull snakes, two racers and four rattlers. By this time the stout gatherer has handed a number of snakes to the Antelope priests to hold, but it is observed that they will not accept rattlers, in consequence of which he still retains all four, holding them about four inches behind the head. One rattler shows a rather bad injury below. All of the snakes, whether rattlers or harmless, seem to have little energy. They hang without a struggle from the carrier's mouth, and there is no violence whatever in their conduct. A single rattler opens his mouth and makes a pass in the air which might be construed as a half-hearted strike; however, he does not touch the carrier's cheek; when the mouth is open the fang sheaths can be clearly seen. Most of the rattlers, when dropped on the ground, prior to being picked up by the gatherer, do not coil but merely try to escape. One, evidently dropped too violently, coils and rattles for a moment. It is brushed with the feather wand by the gatherer, and, as it straightens out, is picked up in the usual way, not immediately behind the head. It makes no attempt to bite, and subsequently receives no more attention than the others. One bull snake, when dropped, coils for defense, but is handled in the same

[20] My notes say that the snake's head was toward the carrier's left; my son differs on this point.

way. One or two snakes, particularly the racers, almost escape into the audience, resulting in squeals and confusion. A small rattler of the red Winslow form is now in evidence; it appears more spirited than those of the larger, greenish phase. The boy gatherer picks it up, in error I think, as several attempts to hand it to the Antelope priests to hold are refused, somewhat to the boy's discomfiture. Subsequently this rattler is seen to be held by the stout gatherer, as are all of the other rattlers used in the dance. An Indian not hitherto engaged in the dance, and not dressed in costume, now comes forward and stands at the north end of the Antelope line, to hold the overflow of snakes. At this time it is observed that the stout gatherer is holding four bull snakes, one racer and five rattlers, all close behind the head (a grip different from that of the early part of the ceremony). The next rattler out is one of the usual green specimens, followed by one smaller and olive-green, somewhat like those from the vicinity of Winona. The Antelope priests appear to be inexperienced in holding the snakes, and one has clutched a large bull snake so tightly that it appears to be dead.

Now the last snake is out, there having been counted ten rattlers, of which seven may be designated as large greens, two olive-greens, and one small red; six racers and twenty-five bull snakes. There may be an error of one or two in the bull snake count. Suddenly all of the snakes, whether in the possession of the gatherer or the Antelope priests, are thrown into a single, central pile. (The drawing of a meal ring was not noted by the writer, but was by his son). The women advance and sprinkle the remaining meal on the seething mass. The snakes go every which way, but are carried, or herded, back into the pile. Some almost reach the audience and shrieks and squeals of alarm result. Then the snakes are gathered up in hands-full by the Snake priests—whether all eight participate cannot be noted in the confusion—and they run rapidly in all directions out of the plaza. The Antelope priests now resume their circular march, somewhat interferred with by the dispersing crowd, many of whom go to the outer edges of the mesa, to watch the Snake priests running down the trails. Thus the dance ends.

We went to the south side of the mesa, and saw two of the Snake priests far below, almost at the lower edge of the cliff. They ran further out and were seen to stop not far beyond the base of the cliff, and then come slowly back up the trail. This was at 6:50. (Sunset at 6:42 per almanac). Unfortunately the time when the snakes were thrown into the pile was not noted. The Antelope priests were seen to go back into one of the kivas. The Snake priests had dropped their turtle rattles and some of the other paraphernalia at the top of the cliff. The two gatherers were seen to return and enter a kiva. The taking of the emetic, and its consequent result were not observed, although this part of the cermeony may have taken place. The crowd at this time was dispersing in all directions, and confusion and dust were everywhere.

THE DANCE FROM THE HERPETOLOGICAL STANDPOINT

We now discuss the dance from the viewpoint of the herpetologist, particularly considering how these Indians handle, in this seemingly careless fashion, snakes known to be dangerously venomous.

It would appear desirable, first, to describe in somewhat more detail the method whereby the snakes are captured and handled prior to, and during, the public ceremony; likewise the species and numbers of individuals employed.

It seems to be agreed by those who have made the most careful investigation of the ritual, that the ceremonial snake-hunts occupy four days; the hunting period of four days may begin with the first day of the nine as at Oraibi (Hotevila), the second as at Mishongnovi, or the third as at Walpi, the public snake dance taking place on the last day of the nine. These official snake-hunts (to the north, west, south and east on successive days) are conducted by the Snake priests after—and with—duly prescribed rites, and these four hunts evidently result in securing most of the specimens which are utilized in the subsequent dance. At the same time other specimens appear to be entirely acceptable, and there are numerous references (by observers who attended the secret ceremonies within the Snake kiva each day) to specimens of both rattlers and harmless species brought in by unofficial hunters; some by Snake priests not on duty, others by Hopi having no connection with the ritual, the latter having to be delivered to the Snake priests outside of the kiva. Whereas the priests, on their hunts, take with them bags of buckskin or canvas in which to carry their catches, the unofficial contributors brought in their donations tied up in their shirts or trousers, which they had removed for the purpose. It may be presumed that these unofficial catches result from chance contacts with snakes during the time when the accumulation is known throughout the village to be in progress.

Subsequent to the four days of the official hunts at the cardinal points of the compass, the Snake priests may engage in additional searches in any direction, particularly if the crop up to that time is deemed inadequate for the prospective rite.[21]

The ceremonial snake hunts are conducted, regardless of the heat, with great energy. Usually there are some eight to twelve priests engaged in the quest (often fewer on the first day); they scatter about over both mesas and the lowlands, generally in pairs, searching intensively from morning until the early evening. A late start is often necessary because of the lengthy ceremony which must be enacted before each day's snake

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[21] The Indians are noting with regret the indiscriminate destruction of snakes by whites, which is causing an increasing scarcity of material for the ceremony. The Hopi, although not free from fear of snakes, seldom harm them; whether this be due to their religious significance or whether the Indians appreciate the economic value of the reptiles in controlling the rodents which take toll of their crops, is not known.

hunt starts. (My own experience would lead me to expect the best hunting at from eight to ten in the morning in this area at this time of year).

Not only are snakes taken where found resting in the shade under bushes, but likewise a definite effort is made to secure them by following their tracks, and the Snake priests work energetically in excavating holes into which tracks give evidence that snakes have sought refuge. These excavations are made with Indian digging sticks, or more often in recent years with hoes; these tools can be used for no other purpose during the ceremony. Dorsey and Voth (1902, p. 183) observed that the Indians apparently had no fear in plunging their hands to the bottom of holes which were presumed to contain snakes.[22]

When a snake has been found, it is picked up immediately behind the head if outstretched; or, if it coils and shows fight, it is teased and brushed with one of the feathered snake-wands until it uncoils and attempts to escape, whereupon with great quickness it is seized behind the head and handled in a safe manner. The catches are deposited in the snake bags carried for the purpose. Many hunts result fruitlessly for numbers of the priests engaged, a situation which will gain the sympathy of the field herpetologist.

This description is a condensation of the reports of several writers, but it should be stated that few of these had an opportunity to accompany the hunters in the field, and smaller still was the number actually witnessing the capture of a snake. The details of the hunt must be considered largely the summarized statements of the priests themselves.

Throughout the reports of the hunts there is woven an evident and definite thread of dislike upon the part of the priests to permit observation of this phase of the ceremony. Whereas several of the ethnologists seem to have gained the confidence of the Indians and were admitted to practically all, if not all, of the so-called secret rites of the ceremony enacted in the kiva, these, when they endeavored to accompany the priests on the snake hunts, were discouraged so successfully that actual eye witnesses were indeed few. Some were told that no white man could keep pace with the Indians in their strenuous hunts afield; and, when they insisted on going, were allowed to accompany a pair of priests so old and with such poor eye-sight, that a fruitless search was a foregone conclusion. Other observers, although attempting to keep up, could not do so. Where witnesses have been able to accompany the Indians, those followed, on that day at least, returned empty handed. Only two seem to have been able to describe the catching of a rattlesnake from personal observation. Fewkes (1895) called the chief Snake priest's attention to a hole into which he had seen a rattler take refuge, but the chief would not dig it out "in my presence, so carefully do they preserve this one feature of the ceremony, the capture of the reptiles in the open."

There is evident, then, a decided preference upon the part of the Indians for catching their snakes unobserved. Whether this be due to

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[22] See Appendix 1, p. 68.

superstition, or to the defanging theory of Curtis (1922) which is presented elsewhere, is not known. Some question arises as to why the Indians should be so secretive in their hunts, if only for religious reasons, for these would apply equally to the other rites in the kivas, and to this extent the Curtis theory might be considered strengthened. However, on the other side it may be said that the ceremonial hunts are of such intense religious significance, and the disturbance of the ritual, by the intrusion of non-fraternity members, so fraught with danger of the most serious consequences, that during these four days the fields are virtually abandoned, and, in fact, the laity hardly dare to stir abroad from their homes.

After the snakes have been brought in the bags to the kiva, they are transferred to various sacred jars, which are similar to water jars, except that an extra hole, to facilitate handling, has been punched in the side of each. These jars, when full of reptiles, have the holes plugged with corn cobs. Occasionally open basins are used, these being inverted and the snakes kept beneath. The transference of the snakes to the jars for the first time is another rite of which the Indians are exceedingly jealous. Dorsey and Voth (1902) noted particularly how they were circumvented in their endeavors to see this done; they had only to leave the kiva for a few moments and on their return the snakes were found transferred.

Subsequent to this time, during the days of the ritual which intervene between the catching of the reptiles and their ceremonial washing at noon of the ninth day, there appears to be some variation in the method of keeping them. Fewkes (1894), Roosevelt (1913), and Curtis (1922) state definitely that the snakes are given at least partial freedom in the kiva on one or more days; other authors indicate that they are kept continuously in the jars. There is probably a difference in practice in this regard amongst the several towns. In any case the confinement brings them in close contact with human beings, for the kiva is occupied almost continuously by the priests, engaged in ceremony in the daytime and sleeping there (as is required by the ritual) at night.

Curtis (1922) states that the snakes are segregated by species in the jars; others report such a segregation when they are finally placed in sacks to be transported to the kisi. Some state that especially large specimens are selected by individual carriers prior to the ceremony, although it is not made clear how this could be done unless each carrier takes specimens to the plaza, which does not seem to be the customary procedure.

All observers agree that there is incautious (but not inconsiderate) handling of snakes within the kiva during these days of ceremony. Both rattlers and harmless species, when at liberty, roam about amongst the priests and have little or no attention paid to them. During certain of the rites they are herded to one side, usually by means of the snake-wands. When it is necessary to handle them, as, for instance, when they are returned to the jars, or during the final washing ceremony, no effort seems to be made to manipulate the rattlers safely by holding them immediately behind the head; on the contrary they are picked up quite at random. One photograph of the washing ceremony demonstrates definitely that the rattlers are not grasped behind the head. Mindeleff (1886 a) mentions

two small rattlers being handled in the kiva with no precautions of any kind. However, it must not be understood that the snakes are roughly handled in the kiva; while a certain indifference to danger is evident, care is used that the snakes are not injured in any way. This may be due to the part which the snakes play in the religious ceremony, or it may result from a desire to avoid accidents.

To the rule of gentle handling there is one exception which constitutes a part of the ceremony at Walpi. At this town, for the washing ceremony, there is erected a more elaborate altar,[23] including a sand mosaic, whereas in the other towns only a plain bed of sand is used for drying the snakes. After dipping the snakes in the sacred bowl at Walpi, they are hurled quite violently upon the mosaic, whereas in the other villages they are dropped or laid gently on the sand. But a single blow of this kind will be resented by a snake only momentarily, particularly if it senses thereafter a chance to escape. This has been verified with captured specimens in the laboratory.

After the washing ceremony the snakes are given the liberty of one end of the kiva for about two hours, before they are placed in the large bags for transport to the kisi. During this time they roam about without much restraint, unless they become too troublesome to the priests engaged in putting the final touches on their costumes. The snakes are generally tended by two or three of the neophytes, who thoroughly enjoy the duty. Those which stray too far are herded back with feathered snake-wands; a few of the more venturesome and persistent are picked up and redeposited at their end of the kiva, the boys handling the rattlers quite as freely as the racers or bull snakes.

In the dance itself necessarily less consideration is given to the snakes. It is impossible to hold, with lips or teeth, a heavy snake some six to eight inches behind the head without exerting considerable pressure, especially if participating in a dance at the time. However, even here they are handled as gently as is possible under the circumstances. Bourke (1884), Mindeleff (1886 a), and Scott in Donaldson (1893) report that the mouth of the carrier is filled with some substance like clay or meal, thus furnishing a greater bearing area on the snake, by which means pinching is reduced. This is not verified by subsequent writers. It may be very definitely stated, as noted by all observers, including the writer, that no attempt is made by the carrier to grasp the snake by what would be a safe hold, that is to say, immediately behind the head. On the contrary the grip is from four to ten or twelve inches behind the head, depending on the length of the snake, and this statement is true regardless of whether the snake be a rattler or non-venomous. Sometime two snakes are carried together; rarely a carrier has been seen to hold four in his mouth at once. Small snakes are carried with only the head protruding from

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[23] Not to be confused with the altar in the Antelope kiva, which always includes a sand mosaic, but which is not used for drying snakes.

the mouth. Only at the West Mesa dance[24] does the carrier use his hands to assist in supporting the snake; in the other towns it hangs unsupported in the carrier's mouth. Some writers believe the Oraibi method to be nearer to the ancestral form of the dance; this is indicated in some of the pueblos of the Rio Grande valley, where a modified snake dance is still practiced, the snakes being held in the hands only, and usually behind the head in such a way that there is no danger to the carrier, if indeed venomous snakes be used at all.

Some observers report that the snakes are rather carefully deposited on the ground when the carrier has finished with them; others state that they are dropped or thrown with a flirt of the head. Probably both methods are used. One writer reported that the snakes were dropped precipitately if they acted in a dangerous fashion. No doubt the shock of landing has an adverse effect upon the snakes' dispositions, in consequence of which they are more lively when it becomes the gatherer's duty to pick them up, than when in the possession of the carrier. This was quite clearly observed by the writer at Mishongnovi in 1931. However, this is partly because the snake senses, upon reaching the ground, a possible opportunity to escape.

Most observers agree that the gatherer, in picking up the snakes allotted to him, uses little care in seizing them, that is, to get such a grip on the rattlers as would protect him in case they desire to bite. Bourke (1884) and Curtis (1922) state that the gatherer picked up the snakes immediately behind the head. Other observers report that the individuals are seized in this way only if they show fight. Certainly in the dance observed by the writer this year, the gatherer was seen to pick up several rattlers at mid-body and subsequently they were held in this way, although, as previously noted, toward the end of the dance all of the rattlers were being held closely behind the head.

The number of snakes used in the dance varies from as few as twenty (McKee at Mishongnovi, 1929) to somewhat over a hundred at Walpi, the latter figure being given by a number of observers. It varies with the number of Indian participants. Townshend (1904) mentions one hundred and twenty; James (1900) gives the maximum number as one hundred and fifty, while Holder (1901) increases this to two hundred and fifty, but it may be presumed that an accurate count was not made. Bourke (1884) was told by an Indian that as many as five hundred were occasionally used, but this may be safely considered an exaggeration. Most observers state the proportion of rattlesnakes to be from fifty to sixty-five per cent of the total; however, Mindeleff (1886 a) gives the percentage as twenty, and Townshend about thirty. McKee, with an accurate count at Mishongnovi in 1929, noted thirty-five per cent rattlers. When I saw the dance in 1931 at the same town, the proportion of rattlesnakes was ten out of forty-one, or twenty-four per cent.

Some observers have stated definitely that the Indians prefer rattle-

[24] Formerly at Oraibi but now transferred to Hotevila.

snakes. No doubt they have a deeper significance in the rite, and it is stated that in the dramatic presentation of the myth upon which the dance is based, which takes place in the Antelope kiva, the reptile held by the Snake Youth is always a rattler.[25] It is my judgment that rattlesnakes are the commonest species found on the Hopi-Navaho plateau, and if the number of rattlers is not at least equal to the number of bull snakes it would indicate that, for the public ceremonial, the latter are preferred.

There is every evidence that the Hopi generally fear rattlers, although they seldom molest them. It was clearly to be observed at Mishongnovi in 1931 that the Antelopes would not touch the rattlers; however, this is rather to be expected, since it is stated that some Antelopes belong to that fraternity, rather than to the Snakes, on account of their fear of rattlers.

As to the Snake priests themselves, there is a general agreement that these, including the little boys lately initiated, show absolutely no fear of the rattlers during the ceremonies in the kiva, and I observed that neither carriers nor gatherers indicated the slightest disposition to be apprehensive of the rattlers at Mishongnovi in 1931. But several writers comment on the fact that the Snake priests evince this lack of fear only during the time of the ceremonial, and attribute this either to religious exaltation, or some protective remedy which the priests are presumed to possess.

As to the species used in the dance, all writers agree that they are primarily rattlers, bull snakes, and racers. Of the references consulted by the writer, only McKee (1929) gives these their scientific names, so that definite species are indicated only in this instance, except that Yarrow in Mindeleff (1886 b) identifies the rattler. Bourke (1884) states that an Indian told him that fourteen different kinds of snakes were used; he mentions the five principal ones by their Indian names and four by their common names, that is, rattlesnakes, bull snakes, racers, and water snakes. Edwardy (1889) mentions rattlesnakes of two colors, garter snakes, whip snakes, and common house snakes. Fewkes (1894) refers to rattlesnakes, ground snakes, and arrow snakes; he mentions a fourth species, but gives only the Indian name for this. Ford (1926) refers to the snakes as mostly rattlers and blue racers. Lawrence (1925) mentions several large rattlers, two or three bull snakes, racers, and whip snakes. Newcomb (1931) catalogs rattlesnakes, king snakes, red racers, and gopher snakes. Townshend (1926) lists rattlers, bull snakes, whip snakes, and racers. Voth (1903) states that bull snakes, rattlers, and racers are used. Roosevelt (1913) lists rattlers, bull snakes, and ribbon snakes; he also mentions sidewinders. Obviously the common names employed are too indefinite to warrant any fixed conclusions as to the species actually available.

The terms "bull snake" and "gopher snake" are known to be interchangeable; snakes of the genus *Pituophis* are generally referred to as gopher snakes in California, and parts of Nevada and Arizona, whereas

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[25] Fewkes (1894) reports a gopher snake used at Walpi in 1891.

further to the east, and particularly in Texas, they are known as bull snakes. Without question (as verified by the writer at Mishongnovi) the form used in these snake dances is the subspecies defined by Van Denburgh as the Arizona Gopher Snake (*Pituophis catenifer rutilus*),[26] this is the common gopher or bull snake of Arizona south and east of the Colorado River, which species is quite plentiful throughout that part of the State. (Plate 1, figs. 1-2.) Accounts of the dance mention specimens seven feet long, but this may be considered doubtful in northern Arizona; further south they undoubtedly reach that length.

The snakes which are usually referred to in the reports as racers, whip snakes, arrowheads, or ribbon snakes, are the Great Basin Striped Racer (*Masticophis taeniatus taeniatus*), which is widespread throughout the Great Basin at least as far south as central Arizona, and even ranges to the tableland of Mexico. (Plate 1, figs. 3-4.) There could be no doubt as to the identification of the six specimens which the writer saw at the Mishongnovi dance. This species reaches a length of somewhat under six feet.

These two species without question comprise the majority of the non-venomous snakes which are utilized; they were the only ones observed by McKee in 1929 or the writer in 1931; they are the only species which can be accurately identified from past photographs of the dance.

As to whether water snakes (i.e., garter snakes of the genus *Thamnophis*), or king snakes are employed cannot be stated with certainty. Both are, no doubt, possible, since they may be presumed to occur in the Hopi territory. The garter snakes, if used, might be either *Thamnophis eques*, the White-bellied Garter Snake, or *Thamnophis ordinoides vagrans*, the Wandering Garter Snake. Presumably the Indians would not use these often, first becase of their relatively small size; and secondly, their disagreeable odor and habits. Fewkes (1894) was told by the Hopi they would use any kind of snakes except water (i.e. garter) snakes.

As to the king snakes, three species may possibly occur in this vicinity, these being Boyle's King Snake (*Lampropeltis getulus boylii*), the Arizona Coral King Snake (*Lampropeltis pyromelana*), and the Western King Snake (*Lampropeltis triangulum gentilis*). If available at all, they are probably not often used, first because of relative rarity; and secondly, as suggested by McKee (1929) owing to their cannibalistic habits toward other snakes. The Hopi, for both religious and practical reasons, would certainly object to the king snakes attacking the smaller specimens of the other species, including rattlers.

One or two observers report red racers; this may result from confusion with the Great Basin Striped Racer, on account of the pink posterior under-body of the latter, or may indicate that the Hopi secure specimens of the true Red Racer (*Masticophis flagellum frenatus*).

The occurrence of this snake is doubtful in Tusayan. It would hardly

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[26] *Pituophis sayi affinis* of some herpetologists.

be popular with the Hopi, even though obtainable, on account of its notably vicious disposition. In this regard the readily available racer, the Great Basin Striped Racer, is fortunately much to be preferred, as it is distinctly less vicious than most other racers. The Blue Racer is mentioned in more than one account, but we have no evidence that the western subspecies of this form, *Coluber constrictor mormon* occurs in this area.

In the relatively inaccessible Hopi and Navaho reservations comparatively little herpetological collecting has been done and therefore one cannot by any means be certain what species of snakes may be found there, notwithstanding quite complete data available from adjacent areas, especially Arizona southward of the Santa Fe Ry. and Utah beyond the Colorado. Several of the moderate sized snakes which may possibly occur on the Hopi-Navaho plateau are the Western Hog-nosed Snake (*Heterodon nasicus*), Western Patch-nosed Snake (*Salvadora grahamiae hexalepis*), Western Faded Snake (*Arizona elegans occidentalis*), and Long-nosed Snake (*Rhinocheilus lecontei*). Other smaller and more insignificant species may likewise be found in the territory, as, for instance, the Arizona Ring-necked Snake (*Diadophis regalis regalis*), Spotted Night Snake (*Hypsiglena ochrorhynchus*), Ringed Ground Snake (*Sonora semiannulata*), and one of the Tantillas. These, however, if present, are so small that they probably would not be employed in the dance even if available. It is true that a number of observers have noticed Indians in the dance carrying one or more small snakes with heads protruding from their mouths. These may have been either small species, or the young of some of the forms ordinarily used in the dance, which would be born about the time of the annual ceremony. But these are speculations only.

Summarizing the known data on the non-venomous snakes used in the dance, we can make a positive statement only with reference to two species, namely, the Arizona Gopher (or Bull) Snake (*Pituophis catenifer rutilus*) and the Great Basin Striped Racer (*Masticophis taeniatus taeniatus*) which certainly comprise the majority of non-venomous snakes employed. The use of garter and king snakes, and other, rarer forms, is possible but not verified. Yarrow (in Mindeleff, 1886b), the only herpetologist to observe more than two non-venomous forms, unfortunately did not record the species.

Aside from rattlers, the only dangerously venomous snake occurring in the Great Basin is the Arizona Coral Snake (*Micrurus euryxanthus*). It has never been reported from the Hopi territory, and from what is known of its range[27] its occurrence there may be considered highly improbable.

We now come to the rattlesnakes, which are, from the spectacular standpoint, the most important reptiles used in the ritual; also it is stated that the Indians prefer rattlesnakes to the other species, as having a deeper religious significance. In fact, the word "snake" as used in the

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[27] Southern New Mexico, southern and western Arizona, with a doubtful record from southwestern Utah.

Indian tongue in describing the clan, fraternity, and ceremony, means rattlesnake, rather than the more generalized suborder. It occurs to me that the likeness of the sound of the rattle to the hiss of a heavy rain may also cause the Hopi to prefer rattlers.

The writers whose works I have seen on the dance merely refer to the venomous snakes used as "rattlesnakes" without naming the species, with the exception of McKee (1929) who notes them to be *Crotalus confluentus*, "of a greyer hue than those near the Grand Canyon," Yarrow (in Mindeleff, 1886 b), who refers to them as the Spotted Rattlesnake (*Crotalus confluentus*), and James (1899 b), who lists *C. confluentus* and *C. cerastes*.

Arizona contains the greatest number of species and subspecies of rattlesnakes (a total of 14) found in any territory of equivalent size. As these forms differ widely in adult size, disposition, venom-toxicity, etc., it is of importance to note which species is used in this dance. The situation is not as complicated as might be anticipated, for a careful investigation of the ranges, as far as at present known, of the rattlesnakes occurring in Arizona indicates that only a single subspecies is to be found in the Hopi-Navaho territory, this being the Prairie Rattlesnake (*Crotalus confluentus confluentus*). This was the only form used when positive identifications were made by Yarrow, McKee, and the writer.

Nothing contained in the descriptions by past observers leads one to suspect the use of any other species or subspecies, save certain references to size and some rather indefinite descriptive terms. A number of observers mention five-foot rattlesnakes, a length probably never attained by the Prairie Rattlesnake in Arizona. I have made measurements of 221 rattlesnakes of this subspecies, from Arizona and from western New Mexico, and the longest recorded was 39 inches, the majority being considerably shorter. A very large number of additional speciment have been seen alive and none of these, as far as my memory serves me, exceeded four feet, much less reaching five. I do not think any that I saw used in the dance could have exceeded three and a half feet. It is true that this subspecies reaches a somewhat larger size elsewhere in its range, especially in Kansas and Nebraska, but even there, a length of five feet is somewhat doubtful.[28] There is one rattler found in Arizona, the Western or Desert Diamond Rattlesnake (*Crotalus atrox*), which reaches a length considerably in excess of five feet, and three others, namely, the Mohave Rattlesnake (*Crotalus scutulatus*), the Pacific Rattlesnake (*Crotalus confluentus oreganus*), and the Blacktailed Rattlesnake (*Crotalus molossus*) which certainly attain four feet and may rarely reach five; but none of these has ever been reported from the Hopi-Navaho area, although all occur that far to the north in western Arizona. We therefore reach the conclusion that, unless rattlers are imported for the

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[28] "This rattlesnake (*C. c. confluentus*) grows to its largest size in the Upper Missouri region." E. D. Cope, American Naturalist, Vol. 13, p. 435.

ceremony from distant points, the statement that five-foot specimens were seen must be an exaggeration.

The only additional hints of other species are contained in the accounts Edwardy (1889), James (1899 b), Hough (1910), Roosevelt (1913), and Forrest (1929). Hough states that two species of rattlers are used, but gives no clue as to their classification. I am rather of the opinion that the two color phases of the Prairie Rattler, as described below, were meant.

Edwardy (1889) mentions small black rattlers; also yellow and brown rattlers. The darker colors of the younger snakes, or the stunted color phase discussed hereafter, would be sufficient to suggest this difference.

Roosevelt mentions "sidewinders." Knowing the looseness with which this term is employed in the southwest, and that it is likely to be applied to any small rattlesnake, we may assume that the true Sidewinder (*Crotalus cerastes*) was not thereby indicated, for this species occurs in Arizona only in the southern and western parts of the state. This also would explain the similar statement by James (1899 b).

Forrest refers to the rattlers as being the "desert sidewinder and the big desert diamond-backed rattler." I think by the latter name he is referring to the Prairie Rattler (*C. c. confluentus*), since otherwise he would certainly have mentioned this form, which, even if other species were available, would always be in the majority.

Thus we may conclude, as observed by Yarrow, McKee, and the writer, that *Crotalus confluentus confluentus* is the only rattler used in the ceremony.

The Prairie Rattlesnake, as it occurs in this plateau region, seems to consist of two rather distinct phases, which long ago would have been considered separate subspecies, were it not for the fact that they occupy, at least to a partial extent, the same territory, and that numerous intermediate specimens are to be found.

These two forms are what might be termed a large green and a small red. The large green, which does not differ greatly from the characteristic specimens of eastern Colorado and Kansas, except that it is somewhat greener and usually does not have a light line surrounding the dark blotches, is found widespread in western New Mexico, northeastern Arizona, and on the Coconino Plateau south of the Grand Canyon. (Plate 2, fig. 1). The small red form, which often takes on a grayish or brownish tint, centers in the Little Colorado Basin, and has been collected in large numbers about Canyon Diablo, Dennison, Winslow, and Holbrook. (Plate 2, fig. 2). A study of these specimens indicates that they are certainly not the young of the large green form, this being indicated both by the character of the rattles, and the finding of embryos in females of a size that would be immature amongst the large greens. About the periphery of this Little Colorado area are found snakes which appear to be intermediate between the large green and the small red phases. Some of these are pinkish-gray in color, others olive-green, and both might be judged intergrades between the two distinct phases. (Plate 3). This, of

course, is a situation indicating two definite and well differentiated subspecies; however, throughout the territory of the small reds there are to found occasional full sized greens and intermediate olive-greens as well. Thus we have a problem of relationship, which further study may elucidate; fortunately rather large series are already available.

As noted in the description of the dance, the writer observed at Mishongnovi in 1931 that, out of ten rattlesnakes employed, seven were large greens, two were intermediate olive-greens and one was a small red. The large green is without doubt the prevalent form about the Hopi mesas.

Whether, with more rapid means of transportation now available to the Indians, snakes are occasionally brought from greater distances is not known. Realizing that the priests will accept snakes prior to the day of the dance from outsiders, that is, non-fraternity members, it would be far from impossible for the small red and two intermediates to have been brought in by home-coming Indians from distant points. My son and I caught two fine specimens of the small red rattler on the way northward from Holbrook on the morning of the dance, and saw others crushed by prior cars.[29]

The possibility of the Indian snake ceremonies having in ancient times caused modifications of the ranges of some species is a matter of speculation. Dances of a type similar to the Hopi ritual were widespread amongst the Pueblo tribes; Aspejo noted in 1583 that the Indians "juggled with snakes" at Acoma (N. M.) and later writers have observed snake ceremonies in the Rio Grande Pueblos. On a less elaborate scale they have been noted in Mexico and in California. Lummis (1925) states that some of the Pueblo villages kept sacred rattlers which grew to a large size.

Having determined that the Prairie Rattler, in two color phases, is probably the only venomous snake available to, and used by these Indians, we may make certain comments on this form. *Crotalus confluentus confluentus* is to be considered a moderately dangerous snake amongst the rattlers. Hutchison (1930) reports on 781 cases of snake bite in 1928 and 1929, in which the species of snake causing the accident was known; of these 128 were *C. c. confluentus* or the closely related *C. c. oreganus* (the Pacific Rattlesnake). There were 8 fatalities, or somewhat over 6 per cent; most of the non-fatal cases, however, had the advantage of antivenin treatment; this is, therefore, not a fair indication of the mortality that might be expected amongst Indians.

The venom of *C. c. confluentus* is small in quantity but rather highly toxic as compared to other rattlers. I have found adults of this subspecies to yield, on the average, about 0.055 gram of venom (dry basis).[30] Other species, notably *C. atrox, C. molossus* and *C. ruber* yield far greater quantities.

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[29] See Appendix 2, p. 81.

[30] This is equivalent to 0.22 cc. of clear, settled liquid venom as removed from the snake.

The minimum lethal dose (M.L.D.) of *C. c. confluentus* venom, for 350 gram pigeons, has been determined by Githens and George (1931) to be 0.08 mg., as compared with 0.14 mg. for *C. atrox*, 0.4 mg. for *C. molossus*, and 0.6 mg. for *C. ruber*. Thus we see that the lack of quantity is partly compensated by definitely higher toxicity. The bite of a full grown specimen, with fully charged venom glands, would no doubt be quite serious and even dangerous, especially to children. This is indicated, not only by the results above cited, but by actual investigations of fatal and near-fatal cases.

These, then, are the data with which the final problem must be approached: The Hopi Indians handle freely and rather incautiously, in their religious ritual, snakes known to be dangerously venomous. To employ a current colloquialism: "How do they do it?"

Many have been the theories advanced and the definite statements made as to how this is done, with so few, if any, serious accidents. Some of these may be listed as follows:

A—CONDITIONS AFFECTING THE AUDIENCE

1. The audience is suffering from some form of group hypnotism.
2. The audience is not qualified to distinguish venomous from non-venomous species.

B—CONDITIONS AFFECTING THE SNAKE PRIESTS

1. The priests have taken an internal protective medicine prior to the dance.
2. They possess knowledge of antidotes, internal, external, or both, which taken after an accident, quickly render rattlesnake bite innocuous and even painless.
3. Sucking, cauterizing, and arresting the circulation by tourniquets are resorted to in case of accident.
4. The priests are so purified by the ceremonial emetic as to be immune.
5. They are smeared with a preparation so disagreeable to the snakes (as, for instance, in odor) that the latter will not bite.
6. They are covered with an invulnerable preparation, as, for instance, a thick paint.
7. They are so healthy from outdoor life that rattlesnake bite does not affect them.
8. They have an immunity resulting from a long fast prior to the dance.
9. They build up an immunity by increasing doses of venom, as is done with horses in the preparation of antivenin.
10. They have a mysterious hypnotic power over the snakes, akin to that said to be possessed by the snake-charmers of India.

11. They are fearless of snakes, which, therefore, are without power to bite them.

12. They are protected by the religious exaltation of the ritual.

13. They are actually bitten with serious results, of which outsiders are kept in ignorance.

C—Conditions Affecting the Rattlesnakes

1. The snakes' fangs, venom glands, or both have been removed.

2. Their mouths have been sewed closed.

3. They have expended their venom on harmless snakes or other objects in the kiva.

4. They have been milked of their venom in the kiva.

5. They are tame snakes used repeatedly in successive years.

6. They have been lately tamed by handling.

7. They are doped or hypnotized.

8. They are starved into submission.

9. They are blinded by the sacred meal, or paralyzed by the tobacco fumes from the ceremonial smokes in the kiva.

10. August is the blind season for rattlers; they cannot see to strike.

11. They are invariably held in such a way that they cannot bite.

12. The eagle feather snake-wands prevent their biting.

13 They cannot strike because they are not permitted to coil.

14. Rattlers are relatively innocuous anyway.

It is obvious that these suggested solutions are of varying degrees of plausibility; some are much more deserving of investigation than others. Further, many are to a considerable degree interrelated; they cannot be discussed individually without undue repetition. Therefore, in what follows, I shall not adhere to the order of this list, but will attempt to cover by groups some of the more important and logical theories.

First I think we may profitably group or summarize these theories as follows:

A. Conditions affecting the audience

B. Conditions affecting the priests

   a. Natural

   b. Acquired

C. Conditions affecting the snakes

   a. Natural

   b. Acquired

Under Bb would come all the various immunizers and antidotes that have been suggested. Under Ca may be discussed the natural condition

of the snakes, the actual degree of seriousness of a bite by this species (already mentioned), and their readiness to bite in the wild state. Under Cb would be treated the effect of captivity, and definite provisions for the prevention of accidents as, for instance, by defanging.

As to the conditions affecting the audience, these may quickly be dismissed. I only mention group hypnotism, as this is so often given as the solution of the boy-rope trick in India. With reference to distinguishing snakes, while we may readily agree that many people cannot distinguish rattlers from harmless snakes, and some, in fact, do not know what constitutes a rattle, or that all rattlesnakes possess this appendage,[31] nevertheless thousands of entirely competent witnesses can testify that the Hopi do carry live rattlesnakes in their mouths.

It will be advisable to depart from the order in which the several theories are grouped, and to consider, first, what might be expected of the rattlesnakes, both in the wild state and in captivity, eliminating the effects of either antidotes on the priests, or special preventive measures (as defanging) on the rattlers, except for such effects as captivity alone might produce. In other words: What are the dispositions of the rattlesnakes—how likely are they to bite and under what circumstances?

There is considerable public misapprehension on this point. It seems to be widely believed that rattlers always bite on the slightest provocation or, one might almost say, with none at all[32]—that merely to approach under any circumstances within striking distance of a snake invariably means a bite. This, of course, is far from the fact. Rattlesnakes have their venom primarily to secure their prey; its use in offense or defense is secondary, and they will not waste venom except for good cause. Rattlesnakes bite through fear in defense, rather than because of any inate vindictiveness. A truly aggressive rattlesnake (not one pictured as aggressive by a frightened passer-by who stumbles upon it) is rare indeed. The result of the usual chance encounter between rattlesnake and man is that both take to their heels, the one figuratively, the other actually. The rattler often faces his foe in the striking or defensive coil; but while in this posture he moves backwards or sidewards toward the nearest protective bush or rock. The fleeing man, glancing back over his shoulder to see if he is being followed, interprets this as aggression.

It is true that rattlesnakes differ in temperament considerably, not only between species, but amongst the individuals of a single species. From

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[31] Based on conversations overheard in the reptile house of a zoo.

[32] I have heard visitors at the reptile house express surprise that more than one rattler could be kept in a cage without their attacking each other; many people assume without question that they will attack harmless snakes. But I have never seen a rattler attack any snake, although he will put up a rather weak defense against an aggressive king snake or racer. Put a rat and a rattler in a cage together and, as often as otherwise, the rat will kill the rattler, particularly if the rattler is not in the mood for feeding, which it seldom is, in captivity. The rat will attack the rattler as soon as it becomes hungry; if other food is available it will pay no attention to the rattler.

observation of adult specimens, I would consider the Prairie Rattler as intermediate in temperament, falling between the generally nervous and occasionally aggressive Western Diamond Rattler (*Crotalus atrox*), and the notably placid Red Diamond Rattler (*Crotalus ruber*).

These remarks are applicable to rattlers as met in the wild state; it now becomes necessary to determine the effect of captivity, for it must be remembered that the rattlesnakes used in the dance have been kept in confinement for about a week. To do this let us first simplify the situation by divorcing the snake dance ritual of its exotic atmosphere and paraphernalia. Instead of a group of Indians carrying forward (with great sincerity and deep religious feeling) an ancient and picturesque rite, let us consider a similar group of white men. We assume these latter to have no mysterious hypnotic power founded on an age-old affinity of man and animal; they will have no secret knowledge of powerful protective herbs handed down through the centuries. Let our hypothetical group catch some snakes to the number of twenty or one hundred, of which from twenty to seventy per cent are Prairie Rattlers and the rest innocuous gopher snakes and racers. Let these snakes be kept in captivity for a week, with more or less incidental handling, but without other preliminary treatment, and then let the final dance ensue. Let these men be such as are accustomed to handling snakes without either particular fear of them, or the carelessness of ignorance. (There are many such who handle rattlers quite as a matter of course, as a part of their work or avocation). Under the circumstances of this matter-of-fact program what would be the result? Well, I should say that about once in two or three years, one of the participants would be bitten by a rattler, and the outcome therefrom would be painful but rarely fatal (assuming no modern treatment). And the results with these Indian dancers, seem to be about what would be expected with the white group, for occasionally a Hopi is bitten.

This difference between what might popularly be expected and the actual outcome is the result of two factors: First, the lack of inherent vindictiveness in the rattler, which bites only in retaliation of an injury or in the stress of fear; and, secondly, the notable effect of even a brief captivity and concurrent contact with man.

All observers agree concerning the lethargic and docile actions of the rattlers (and the harmless snakes as well) during the dance. A few attribute this to some opiate, presumed to have been given the snakes by the Indians, but most of the observers (and I think rightly) state that it is merely the result of the treatment received during the several days (from one to nine) they have been in captivity in the kiva, sometimes at large, but usually in close confinement in a water jar.

Almost all snakes, rattlers amongst the number, after confinement for a short time, particularly if they have been in contact with human beings, rapidly lose any disposition to show fight or even fear. This is a common observation in the reptile houses of zoological gardens. As far as I was able to note the specimens at Mishongnovi in 1931, they acted exactly as

do our specimens after a few days in captivity at San Diego. They showed no alarm whatever, nor any tendency to bite. When dropped to the ground by the carrier or otherwise seriously disturbed, there was a momentary flash of their old spirit and a tendency to coil for defense. Quickly discouraged by the use of snake-wands, they abandoned this in a natural endeavor to escape. Captive snakes seem to have a certain realization of the attitude of one who essays to handle them; fear or hesitation is likely to result in a hostile defense which is almost aggression, upon the part of the snake, while a calm assurance discourages any such attempt. I saw nothing, in my observation of the rattlers and non-venomous snakes at Mishongnovi that would cause me to suspect any doping, or treatment other than close confinement, and the handling which they are known to have sustained in the kiva.

Granting the Indians understand the handling of snakes and that we need look no further for an explanation of their docile attitude than that natural to captivity, it must be expected that there will be an occasional accident and that someone will be bitten. Analyzing the reports of twenty-six observers and eliminating statements based on hearsay only, that is those wherein some bystander saw a priest bitten, but not the writer himself, we find ten definite reports of participating priests being bitten. Mindeleff (1886 a) saw a boy of eight with a rattler fastened to his finger. He did not see the outcome of this case. Oliver (1911) saw a rattler strike a man just under the ear; it had to be pulled loose. Rinehart (1923) states that one boy was bitten several times; he seemed disconcerted and spoke to the older priests about it (however, this report does not state definitely that the snake was a rattler). Lummis (1906) saw a rattler five feet long work to get ten to twelve inches of neck loose. It then struck the Indian holding it on the right cheek; the man opened the snake's jaws and the snake hung clear to his feet by the fangs. Then the hugger unhooked the snake and it was dropped to the ground. There was no visible effect. Another snake bit a dancer on the back of the hand. Scott in Donaldson (1893) saw two men struck, one in the nose, the other in the upper portion of the arm. No ill effects were noted. Moran in Donaldson (1893) at another dance saw a rattlesnake strike a dancer in the right ear; it had to be torn loose; the ear did not swell. Macfarlane (1913) saw a snake plant a vicious jab in the cheek of a carrier; red marks appeared but there was no noticeable effect on the priest's participation in the ceremony. Supela, a priest, admitted to Fewkes (1895) that he had been bitten in the hand by a rattler. After the dance Fewkes could see no ill result. He himself had not seen the snake strike; it was reported to him by another observer.

With these few definite experiences we have exactly the same picture as follows where rattlesnakes are handled anywhere. The Indians, of course, are not alone in this freedom with snakes; for although they do not carry rattlers in their mouths, a large number of white persons are known to handle rattlesnakes with impunity. These snakes, of a variety of species, in laboratories, in zoological gardens, snake-shows, and the like,

are handled rather carefully, but usually quite fearlessly. Such rattlers are rarely defanged or have their venom glands removed, for the experienced keeper knows how brief will be their tenure of life in captivity as a result of such treatment. When one talks to those who thus take liberties with rattlers one hears always the same story: Long periods of immunity and then, inevitably, some untoward event—a snake dropped, the sudden appearance of a stranger, the slamming of a door—and a bite results. Almost always those who handle rattlers frequently, (I mean, of course, not holding them immediately behind the head, which is an entirely safe grip) have had two or three such experiences of snake-bite. So with the Indians in the course of their dance, accidents must occasionally happen, although by no means frequently. The snakes, normally docile and lethargic, sometimes are frightened or receive a sudden shock and a bite follows; in this the reports concur.

Having indicated that there is nothing unnatural or inexplicable in the actions of the snakes toward the priests, it remains to determine what means, if any, are used to mitigate the effects of such bites as do occur. Are the snakes rendered innocuous, or are the priests possessed of a powerful and effective antidote? Or is the bite of a rattler not sufficiently serious to require the Indians to take steps to minimize the effects?

As to the last point I have presented some data. I should say that the bite of the Prairie Rattlesnake, while not usually fatal, is serious and very painful, and would be particularly dangerous to some of the small boy-priests who take part in the ritual. As fatalities have not been definitely recorded, and even serious cases have not been personally observed by any who have reported on the dance, we are led to assume that some preventive measures must be adopted, to take care of the occasional bites which are known to occur.

First as to immunizers and antidotes: Practically all who have investigated the dance report that the priests have an antidote. By some it is reported to be taken prior to the dance for immunization, by others as an antidote after one has been bitten. There is, in some accounts, a confusion with the ceremonial emetic, but the more careful investigators state that the priests sharply differentiate these two preparations. The use of an antidote, to be employed only in case of snake bite, seems to be more definitely verified by investigators than the prior immunizer; the priests evidently claim the existence of the former, but not the latter. It is said to be an effusion of herbs which differs amongst the several villages. Some ethnologists maintain that the secret of the preparation is known only to one priest, who passes it along on his death-bed; others agree that it is known to several members of the Snake fraternity.

Of course the Hopi Indians are not alone in possessing cures of this kind; they are prevalent everywhere amongst primitive people, and, in fact, some not so primitive. Presumably every Indian tribe in North

America had such an antidote[33] for it would be inherent in the very existence of tribal priest and medicine man, that some steps be taken to mitigate an accident of this character. The Hopi cure has probably received more publicity than the others merely because one of their religious ceremonies involves the public handling of venomous snakes.

Times without number these native remedies have been tested upon animals (using untreated controls as checks) and invariably they have failed to demonstrate any efficacy.[34] One may inquire then, how these cures gain such wide credence. To answer this requires a discussion of two points: First, the identification of venomous snakes; and, secondly, the inherent variability in the result of a bite.

As to the first it may be said that rarely can natives anywhere distinguish between the venomous and non-venomous snakes of their region. There are no easy and universal criteria for such a classification. The popular theory that the venomous snake is short and thick-bodied with a broad triangular head is only true of some groups; there are slim and racer-like snakes which are dangerously poisonous, and short, heavy snakes with wide heads that are quite harmless. As a result of this difficulty in classification we find, in many areas, harmless snakes which are greatly feared,[35] and, concurrently, deaths from fear have resulted from the bites of such harmless snakes.[36] Such a case, with a near-fatal conclusion from heart failure, occurred in San Diego several years ago, the offending reptile being a harmless, but vicious, gopher snake.

The second point is the great variability in the results from the bite of a really venomous snake, owing to the number of indeterminate factors involved, as:

1. Size and health of victim, these being important in determining resistance to venom.

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[33] A few random references to such cures are as follows:

Creeks, Ann. Rep. Bur. Am. Eth., 42: 645; Mohegan, ibid, 43: 266; Chicasaw, ibid, 44: 264; Chippewa, ibid, 44: 333; Papago, ibid, 26: 264; Guiana Indians, ibid, 38: 710; Southern Calif. Indians, West. Am. Scientist, 7: 193; Mescalero, Bull. 34, Bur. Am. Eth., 237; Opata, ibid. 250; Otomi, ibid, 253. See also "Tales of the Rattlesnake: From the Works of Early Travelers in America" by Rheua V. Medden. Chapter on "Remedies." Bull. Antivenin Inst. of America, Vol. 4, No. 3, pp. 71-75.

[34] See for instance Fayrer, 1874, The Thanatophidia of India, p. 37, p. 42 et seq.; Fitzsimons, 1912, The Snakes of South Africa, p. 314; Brazil, 1914, La Defense contre L' Ophidisme, 2nd Ed., p. 221. I am here referring to internal and external applications of liquids or solids, not suction, or the use of a ligature to produce slow absorption of venom. With particular reference to reputed Indian antidotes, Barton stated over a century ago "It is certain, from the testimony of many persons, that the bite of the rattle-snake has often proved mortal to the Indians, and others, not withstanding the boasted specificks of these people." Trans. Am. Philos. Soc., Vol. 4, p. 81, 1799.

[35] Witness the terrible spreading-adder of the eastern United States, which is really the harmless and inoffensive Hog-nose Snake (*Heterodon*).

[36] F. Wall, 1928, The Poisonous Terrestrial Snakes of our British Indian Dominions and How to Recognize Them, Fourth Edition, p. 69.

2. Site of bite, which will be less dangerous in the extremities, or in tissue where absorption will be less rapid, as compared to a bite near the vital organs or penetrating a vein.

3. Species and size of snake, affecting venom toxicity, venom quantity, and (through length and strength of fangs) depth of injection.

4. Condition of venom glands, whether full or partly evacuated by reason of recent feeding, defense, ill health, or captivity.[37] The season of the year may also cause a variation.

5. Condition of fangs, whether entire or broken, lately renewed or ready for shedding.

6. Nature of the bite, whether a direct stroke on a normal surface with both fangs fully imbedded, or a glancing blow or scratch. In viperine snakes the fangs may not be fully advanced, and thus may be partly ineffective.

7. The length of time a snake holds on; it may withdraw or be torn loose before full injection takes place. This is likely to be more important with colubrine snakes, with their less specialized fangs, than with viperine snakes.

8. The number of bites; occasionally an accident involves two or more distinct strikes.

9. The extent of the anger or fear upon the part of the snake; it has the power to withhold some, or all of the venom contained in the glands.

10. The protection offered by clothing, which, by interposing thickness, will permit less depth of fang penetration, and will cause the external and harmless absorption of part of the venom.

11. The nature of the first aid treatment, if any, particularly suction, which is so natural as to be instinctive.

So in the case of snake-bite, there is no formula whereby the outcome can be predicted. First, the snake may have been harmless; secondly, if venomous, these variable factors may inhibit full effectiveness. Under such circumstances can we wonder that amongst primitive peoples many seemingly miraculous cures result from the use of native medicines? The failures?—well they are caused by improper application, or the enmity of the gods.

Returning to our western Indians, we may eliminate the validating of antidotes by the bites of harmless snakes. West of the Rockies all dangerously venomous snakes, except a single rare and secretive coral

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[37] We have noted at San Diego that snakes in captivity, particularly under unnatural conditions, renew their venom less rapidly than occurs in nature.

snake, are conspicuously advertised by the unique appendage of the rattle. The Indians would know this. But we still have the variable factors where the offending reptile is truly venomous, and no doubt these are the bases of the accepted native cures.

As to the Hopi antidote, Coleman (1928) secured a fresh specimen and experimented with its use in the protection of guinea pigs against rattlesnake venom (species not stated); he found it entirely ineffective. I think we may, without appearing unsympathetic or unduly skeptical, pass by the supposition that the Indians have a truly effective remedy for rattlesnake bite, particularly when this is claimed to be an internal remedy for a virulent and rapidly acting poison of the blood.

As a matter of fact, we are unfair to the Indians when we use the word antidote in referring to their snake-bite preparation, and consider it as having the physical attributes that such a term connotes to the physician or scientist. Mindeleff (1886b) points out that the Indians do not claim a physiological action for the antidote. Just as they do not connect the action of snake venom, as a physical liquid, with its harmful effect on the body of the victim, but prefer to consider the action one of evil spirit or witchcraft, so the beneficence of the antidote lies, not in the physical power of the herbs which it contains (for the Indians admit these are unimportant), but in the chants and ceremonies whereby it is consecrated. It is a protective charm, not an antidote. Fewkes points out that similar charms are used—roots, herbs, and effusions—in other rituals where no antidotes are called for. They are for the purpose of protection, and to carry out the theme and symbolism of the dance, rather than for a direct bodily effect. In a similar manner, an initiation into the Snake fraternity protects a witness to the ceremony of the snake washing, who would otherwise swell up and burst.[38]

As an amusing sidelight it may be recounted that a priest told Dr. Yarrow in 1883 that he preferred the Hopi cure to the physician's potassium permanganate syringe; the most recent investigators would probably agree that the Hopi was fifty years ahead of his time and had the better of the argument.

Nearly all observers state definitely that the snakes are not treated in any way, that is, that neither fangs nor venom glands are disturbed; that the snakes are neither stupefied nor drugged. To the latter we may agree, for the snakes in the dance do not act differently from other captive specimens. The proof of whether or not fangs, and particularly venom glands, have been tampered with is inconclusive, in the accounts to which I have had access, since the writers do not state whether the evidence is observational or hearsay, except in one or two instances, and in these no technical herpetological details, on which one might judge the accuracy

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[38] It is a fact that much of the secrecy of this and other ceremonies is not the result of a desire to conceal something disreputable, but is for the purpose of protecting the unwary observer or to avoid profaning the rite. See Appendix 1, p. 75.

of the observations, are given, save in a note by Mindeleff (1886 b).

Dorsey and Voth (1902), whose careful and complete investigations cannot be too highly praised, have stated that the snakes are not treated in any way, that any such treatment would be entirely contrary to the religion of the Indians and the symbolism of the dance. Since they observed practically all of the secret ceremonies, understood the language of the Indians, and were welcome in the kivas, their observations must be given due weight. However, this circumstance must be noted—that through one discouragement or another they failed to see any snakes captured in the field; and, also, it was only after considerably persuasion that they were able to see the initial transfer of the snakes from the field-bags to the storage jars in the kiva.

Lawrence (1925) suggests that the snakes may strike away their venom in the nine days in the kiva. McKee (1929) thinks the Indians might render themselves immune by the early innoculation of small doses of venom, but considers it more probable that the snakes may be permitted to expend their venom on each other.

Curtis (1922) raises the strongest dissenting voice concerning the treatment of the snakes; he considers it remarkable that there has been so little skepticism. He finally secured the confession of one of the priests, first through an interpreter and later directly, that the fangs of the snakes are broken off with the thumb nail when they are caught. He says this is not taught to the novices until they can be trusted, and he cites the instance of a youngster who was seriously bitten in picking up a wild rattler, before this part of the rite had been explained to him.[39]

There are certain objections to Curtis' theory. First, it is doubtful whether, in view of the fact that so many scientists have apparently secured the entire confidence of the Indians, this important secret could so long have been concealed. Again it will be remembered that Lummis reports a rattler hanging from the cheek of an Indian by its fangs. Had the fangs been removed it is doubtful whether a snake could have hung by the palatine and pterygoid teeth. Scott in Donaldson (1893) saw fang punctures in an Indian who had been bitten. James (1899 b) states that he examined the snakes before, during, and after the ceremony and found fangs and venom glands untampered with, but he does not give the nature of the examination nor how he determined the quantity of venom available. Longembaugh (1916) states that snakes have been examined after liberation, but gives no details either as to the extent of the tests or by whom made. Holmes (1910) says that "scientific observers have captured rattlers after their release by the priests and on examination the fangs were found intact, the poison sacs well filled with venom."

Most important of all is Mindeleff's report (1886 b) of the results of Yarrow. Dr. H. C. Yarrow was a thoroughly competent herpetologist. In 1883 he gained entrance to the Snake kiva prior to the dance and, selecting a large rattler at random, examined its fangs and found them

[39] See Appendix 1, p. 74.

intact. After the dance two rattlesnakes were chosen and forwarded to the National Museum, where they were examined by Dr. S. Weir Mitchell, the great authority on venomous snakes. Fangs were found intact and venom glands full. However, the latter test I do not consider as important as Yarrow's direct observation, since two weeks and probably more must have elapsed between the dance and the arrival of the snakes in Washington, and the venom would have been largely, if not entirely, restored in that time.

At Mishongnovi I observed a rattler to make a half-hearted strike with mouth open and the fangs were seen to be advanced, for the white sheaths were clearly in evidence; this could not have been the case had the fangs been removed or cut short. Later my son saw one of the rattlers, which the elder gatherer was holding close behind the neck, open its mouth, and he, likewise observed the fang sheaths to be advanced, as if supported by fangs. This was seen at a distance of about twelve feet. Neither of us saw what was noted by the other; the reports were independent.

The breaking off of the functional fangs as described by Curtis would be of doubtful efficacy in any case, unless the Indians likewise remove the reserve fangs, which involves a rather delicate operation. Wiley (1929) has found that rattlesnakes normally shed their fangs every twenty days; therefore if they were broken off at the time the snakes are caught, a considerable proportion would be restored at the time of the dance.

I think the weight of the evidence tends rather strongly against the Curtis theory. The Yarrow-Mitchell tests are probably the basis of the extensive white tradition that complete scientific investigations of the snakes have been made, for I have been able to locate no other reports in the herpetological literature. It seems to me that the case for the non-disturbance of the fangs is proven, but not the full venom glands.

We now discuss some of the miscellaneous theories listed on page 29 which have not already been covered.

Any idea of natural immunity of the Hopi may be discarded; reports agree that they are at times (but not during the dance) serious sufferers from rattlesnake bite. Fewkes (1894) cites a typical case of an Indian with a badly swollen arm, the bite not being incident to the dance ceremony. There is no evidence that fasting or the ceremonial emetic would be in any way effective.[40]

The snakes certainly have not had their mouths sewed closed, (this scheme is said to be resorted to by some of the fakirs of India) for, as has been stated, at least two rattlers were seen to open their mouths at Mishongnovi.

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[40] That some venom may be eliminated through the stomach has been shown by test (Stejneger: Poisonous Snakes of North America, Rept. U. S. Nat. Mus., 1893, p. 474). While this is so slight as not to be considered of importance in the modern treatment of snake bite, it may be the source of the supposed effectiveness of the emetic. An Indian told Yarrow that the emetic disposed of the saliva swallowed while carrying the snakes in the dance, which otherwise would cause them to swell up and burst. This is an effect often reported as the punishment for any deviation in the ritual and is not to be taken as reflecting the venomous effect of the snakes.

In view of the fact that snakes can live six months or more in captivity without feeding, their being without food during their detention in the kiva (involving a maximum of nine days) cannot be considered as having an important bearing on their actions.

Blinding by sacred-meal or tobacco fumes, if possible, was certainly not evident at Mishongnovi; the rattlers showed that they could see the gatherer approaching. As to the blindness incident to skin changing, this might occur in any month as well as August, for the snakes probably shed their skins at least three times per year; but in any case all the snakes would not shed simultaneously at the time of a dance.

While it cannot be said that snakes are without power to bite those who do not fear them (theory B 11) I repeat that fearless handling is of importance; it discourages an offensive attitude on the part of the snake, as one may readily demonstrate by experimenting with a vicious gopher snake or racer. Dorsey (1903) gives the same theory in somewhat different form when he says that throughout the ceremony the snakes are handled with such recklessness that their constant desire is not to strike, but to flee. That the snakes are tame because the same ones are caught each year cannot be considered a plausible theory. No doubt a few are repeaters, but I cannot believe that a snake's memory of the previous ceremony would remain vivid for two years.

There are some statements (Voth, 1903) to the effect that the Indians suck the wound in case of rattler bite; thus we have a known valuable remedy applied, as well as those, such as the mysterious antidote, of more questionable nature.[41]

The tickling by the snake-wand of the hugger cannot be regarded as being particularly effective, although so considered by a number of observers; it is not used for the protection of those who handle the snakes in the kiva, or during the final dash to the plain.

The theory that rattlers cannot strike unless coiled is not of importance in the present instance. Although a rattler cannot strike well unless in its fighting or defensive coil (and even then its aim is frequently bad), when held by a portion of the body, as it is by the mouth of the carrier in the dance, it can turn and bite with great accuracy whatever may be holding it. This is frequently demonstrated when handling snakes with a forceps. Any snake could unerringly bite the face of the Indian holding it, should it so desire. The relation of the strike and bite is misunderstood by some commentators. Fewkes (1894, p. 105) asks whether a snake can make an effective bite, with venom injection, when carried by the neck or other part of the body, thus interferring with muscular action. Those who have had much experience with rattlers know that they can bite when no movement of the body is possible, provided the mouth can be opened. The strike, which is a quick forward lunge from an S-shaped coil, is beneficial in attaining speed and distance; it allows the securing of

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[41] The Pima Indians are reported as using both suction and ligature. Ann. Rep. Bur. Am. Eth., 26: 264.

prey which would otherwise escape, and it is effective in defense against a larger enemy (Klauber 1927, p. 6). The bite is the culmination of the strike, and the penetration of the forward-pointing fangs is aided by the momentum of the lunge. But a bite can be secured with jaws alone, and the snake has sufficient muscle in the jaws to imbed the fangs in any yielding substance provided the mouth can be opened widely enough to permit erecting them and catching the object to be bitten beneath the points. And injection of venom will immediately follow by the operation of the appropriate head muscles used in wringing the glands. All this is proven in the process of venom removal for scientific purposes, wherein the snakes are held so rigidly that they can only move their jaws. A good venom discharge is then procured by pinching their tails to anger them (Klauber, 1928), although pressure on the glands is also used to insure evacuation.

And now to conclude with conjecture, rather than opinion based on observation. If I were an Indian engaged in this dance I would not be satisfied to take a chance on the admitted and known docility of the rattlers, especially having in mind the danger to some of the boys of eight years, or even less, who, as novitiate priests, take part in the ceremony. Without taking any step which would injure the snakes (even temporarily, as by the removal of the replacable fangs), I would use the simplest, least apparent, and safest method of rendering the snakes almost innocuous, that is, by thoroughly emptying the venom glands. This statement is based on a personal experience in the milking of well over twenty-five hundred rattlesnakes.

To my mind the removal of the venom, either at the time of catching the snakes or later in the kiva, would be so easy and safe, and so much more difficult to detect, that this is a more plausible explanation of how the Indians handle the snakes so fearlessly and with so few adverse effects, than the breaking off of the fangs themselves, as Curtis has suggested. If the fangs are broken off a snake can still make a considerable wound, into which some venom will find its way with painful, if not dangerous, results. On the other hand, the more or less complete removal of the venom by letting the snakes bite some soft object, or by manipulation of the venom glands, or both, would render the snakes relatively harmless, and this for several days at least. The greatly diminished venom then available to the snakes used in the dance would account for an occasional painful but not serious case, of just such a character as seems sometimes to occur, judging from the reports of the observers quoted.[42]

And so I conclude that, if any explanation of the Indians' apparent immunity from serious accidents be necessary, beyond the known docility

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[42] Venom removal would render the snake tamer than captivity alone; rattlers seem less ready to strike when their venom glands are evacuated. Whether this is a physiological effect of the empty glands or the result of the handling incident to venom removal, I cannot say. Yarrow noted the same effect many years ago; see Forest and Stream, Vol. 30, p. 327, May 17, 1888.

of snakes in captivity, it is to be found in the evacuation of the venom glands before the ceremony. The final word on this will not be spoken until some herpetologist has had an opportunity to examine carefully several of the rattlesnakes used in the rite, sometime between the ceremonial washing in the kiva at noon on the day of the dance, and the ultimate dispersal of these messengers to the gods at the foot of the cliffs after the ceremony.

ANNOTATED BIBLIOGRAPHY

This bibliography makes no claim to completeness; it merely cites the ethnological and some of the popular accounts of the dance to which the writer's attention has been directed. The many descriptions of the dance which have appeared as incidental chapters in books on the southwest are exemplified by some of the more typical and better known narratives. Newspaper stories, of which great numbers have appeared, are represented by two recent items; bibliographies of a few of the earlier and probably more important newspaper stories will be found in Fewkes (1894 and 1897).

The earliest published account of the dance seems to be that appearing in the Presbyterian Messenger in 1881. This was followed shortly by Bourke's work, which was printed in Edinburgh and published simultaneously in New York and London. Captain Bourke took full advantage of his opportunities, and his recital is unusually complete and accurate, having in mind the fact that he had no prior detailed information permitting him to plan a campaign of investigation. His work was widely and favorably reviewed and stimulated at once a great interest in the dance. He somewhat misinterpreted the meaning of the ritual, as he considered it snake worship, but for this he cannot be unduly blamed, as the Hopi do have an ophiological rite (Fewkes, 1900 b). The Bourke book has now become quite difficult to obtain.[43]

There followed shortly the intensive works of Fewkes, Voth and Dorsey who, indeed, left a small field of accomplishment for their successors. Aided by the confidence of the Indians, a knowledge of the language and adequate assistance, they chronicled every possible detail of the ceremonies, each act of the ritual, however minor, and a translation of each prayer and chant. Comparisons were made of the variations be-

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[43] I trust I may be pardoned for quoting the interesting inscription in my copy. "This rare volume (whose author was for a time my captain and whose one-time possessor—see foregoing autograph—was a comrade-in-arms to both of us in Indian campaigns) to my good friend L. M. Klauber; who understands snakes and has no prejudices against army officers.

Geo. H. Harries,
1926 Major General, U.S.A."

(The autograph referred to is that of Stephen C. Mills, U.S.A.)

tween towns. The most important of these contributions are the following:

J. W. Fewkes

1894 The Snake Ceremonials at Walpi.

(In collaboration with A. M. Stephen and J. G. Owens).

1897 Tusayan Snake Ceremonies.

(Shipaulovi, Shimopovi and Oraibi dances compared with each other and Walpi).

1900 a Tusayan Flute and Snake Ceremonies.

(The Mishongnovi dance).

G. A. Dorsey and H. R. Voth

1902 The Mishongnovi Ceremonies of the Snake and Antelope Fraternities.

H. R. Voth

1903 The Oraibi Summer Snake Ceremony.

Subsequent publications have been less detailed, and usually of a more popular nature. Mostly they have been personal impressions, without much of fundamental novelty.

In the compilation of this bibliography I have been much aided by institutions and individuals who have suggested leads resulting in the locating of new references; others have made possible the securing for examination of the works themselves. Acknowledgment is gratefully made to the San Diego Scientific Library, San Diego Public Library, Los Angeles Public Library, Los Angeles Museum, San Francisco Public Library, Stanford University Library, University of California Library, Library of Congress, New York Public Library, Library of Office of Indian Affairs, Bureau of American Ethnology, California State Library, California Academy of Sciences, Malcolm Rogers, Phil Townsend Hanna, Alice Klauber, Leda Klauber, Mrs. Ruth E. Creveling, and Mrs. Marge Edwards.

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PART A—THE INDIANS AND THEIR DANCE

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1927 Science Seeks Hopi Indians' Secret Antidote for Snake Bite. The American Weekly. Magazine Section of the Los Angeles Examiner, Sunday, March 6, 1927, p. 2, figs.

A typical example of the sensational type of newspaper story.

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The Indian character and mentality cleverly revealed in simple stories. "The Snake Priest's Trousers," "The Artists and the Snakes," and "Turtle Shells" touch on the Snake dance.

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The Snake dance pp. 145-167. A recent work by an authority on the southwestern ceremonials.

Fewkes, J. Walter

1889 A Study of Summer Ceremonials at Zuni and Moqui Pueblos. Bull. Essex Inst., Vol. 22, Nos. 7-9, pp. 89-113.

A preliminary study of the Snake and related rituals.

1890 A Contribution to Passamaquoddy Folk-Lore. Journal of American Folk-Lore, Vol. 3, No. 11, pp. 257-280.

Mention is made of a snake dance in this tribe (pp. 260-261) which may originally have had a religious importance similar to that of the Indians of the southwest.

1891 A Suggestion as to the Meaning of the Moqui Snake Dance. Journal of American Folk-lore, Vol. 4, No. 13, pp. 129-138.

The conclusion is drawn from the similarity between the

Snake and Flute dances that the former is not an ophiological rite; the snakes merely play a part in the ceremony.

1892 A Few Summer Ceremonials at the Tusayan Pueblos. Journal of American Ethnology and Archaeology, Vol. 2, No. 1, pp. 1-160, 32 figs.

Descriptions of the more important ceremonials not including the Snake dance which is reserved for a special monograph (Fewkes, 1894). Relation of Snake and Flute rituals.

1893 A Central American Ceremony which Suggests the Snake Dance of the Tusayan Villages. American Anthropologist, Vol. 6, No. 3, pp. 285-306, plates 1-4.

One of the many ceremonials having a similarity to the Hopi dance is discussed. "The facts here recorded look as if the Hopi practise a ceremonial system of worship with strong affinities to the Nahuatl and Maya."

1894 See under Fewkes, J. Walter (assisted by Stephen, A. M., and Owens, J. G.)

1895 a The Oraibi Flute Altar. Journal of American Folk Lore, Vol. 8, No. 31, pp. 265-284, plates 1-2.

The Walpi dance of 1895 (pp. 273-282) is compared with the two previous biennial rites in the same town.

1895 b A Comparison of Sia and Tusayan Snake Ceremonials. American Anthropologist, Vol. 8, No. 2, pp. 118-141.

Comparisons of Hopi with non-Hopi ceremonials, with remarks on the probable common origin of the rites.

1896 The Tusayan Ritual: A Study of the Influence of Environment on Aboriginal Cults. Ann. Report of Smithsonian Institution to July, 1895, pp. 683-700.

A summary of two Hopi rituals (one, the Snake dance) showing how environment affects religion and ceremonials.

1897 Tusayan Snake Ceremonies. 16th Ann. Report, Bureau American Ethnology, pp. 267-311, plates 70-81.

Detailed accounts of the dances at Shipaulovi, Shongopavi and Oraibi, their variations, and differences from that at Walpi. An important technical article.

1898 Hopi Snake Washing. American Anthropologist, Vol. 11, pp. 313-318.

The washing ceremony at Mishongnovi compared with that at Walpi.

1900 a Tusayan Flute and Snake Ceremonies. 19th Ann. Report, Bureau American Ethnology, Part 2, pp. 957-1011, plates 45-63, figs. 42-46.

A detailed account of the dance at Mishongnovi in 1897; also the Walpi dance compared with the three previous rites in the same town. The accurate and detailed observations of a professional ethnologist.

1900 b A Theatrical Performance at Walpi. Proc. Washington Acad. of Sci., Vol. 2, pp. 605-629.

Describes the Great Serpent Drama of the Hopi, a spring festival which "has nothing to do with the celebrated Hopi Snake dance, which contains dramatic elements of a different nature." This reference is mentioned to prevent confusion.

1903 Hopi Katcinas Drawn by Native Artists. 21st Ann. Report, Bureau of American Ethnology, pp. 3-126, plates (col.) 2-63.

Contains important material on the Hopi ceremonial calendar.

1907 (Article on) Hopi (in) Handbook of American Indians North of Mexico, F. W. Hodge, Editor. Bureau of American Ethnology, Bulletin 30, Vol. 1, pp. 560-568, 4 text figs.

A brief but authoritative synopsis of the Hopi Indians, their history, clans, archaeology, characteristics and customs.

Fewkes, J. Walter, assisted by Stephen, A. M. and Owens, J. G.

1894 The Snake Ceremonials at Walpi. Journal of American Ethnology and Archaeology, Vol. 4, pp. VI+126, 40 ills., map.

The first of the five most important technical treatises on the subject and the only one on the Walpi dance, which has more participants and is in some ways more dramatic than the ceremony as practiced in the other villages. Important early bibliography.

Ford, J. A.

1926 Hopi Snake-Dance as a Magnet for 2500 Motorists. Literary Digest, March 6, 1926, pp. 50-52.

Synopsis and quotations from a popular article in Motor Life (Latter not seen).

Forrest, Earle R.

1923 The Snake Dance in the Painted Desert. Travel, Vol. 40, No. 3, pp. 16-20, 36, 14 text figs.

A brief account with illustrations.

1929 Missions and Pueblos of the Old Southwest. Their Myths, Legends, Fiestas, and Ceremonies, with Some Account of the Indian Tribes and their Dances; and of the Penitentes. Cleveland. Vol. 1, pp. 1-386, 32 plates; Vol. 2, pp. 1-209, 46 plates.

A good account of the public ceremony, with a number of original illustrations. Describes the tribal schism which resulted in the founding of Hotevila; the last dance at Oraibi (Chapter 17, The Land of the Snake Dance, pp. 277-330).

Frenzeny, P.

1882 Snake-Charmers of Central America. Harper's Weekly Vol. 26, No. 1318, pp. 183-184, full page plate.

A short article on a dance evidently related to the Moqui dance. The name given above is that of the artist; the author's name is not given.

Garland, Hamlin

1896 Among the Moqui Indians. Harper's Weekly, Vol. 40, No. 2069, pp. 801-807, 5 text figs.

A complete and accurate account, notable for its sympathetic tone. Probably the best of the purely descriptive and non-technical articles on the dance.

Hewett, Edgar L.

1930 Ancient Life in the American Southwest. Indianapolis. Pp. 1-392.

A standard work on the Indians of the southwest. The Snake dance pp. 334-340.

Hodge, Frederick W.

1896 Pueblo Snake Ceremonials. American Anthropologist, Vol. 9, No. 4, pp. 133-136.

A discussion of the probable derivation and present extent of non-Hopi Snake dances.

Holder, Chas. F.

1901 The Snake Dancers of Tusayan. New England Magazine, Vol. 25 (N.S.), No. 4, pp. 512-519, 5 text figs.

A short account, somewhat exaggerated in details and strained in verbiage.

Holmes, E. Burton

1910 Moki Land. Burton Holmes Travelogues, Vol. 6, pp. 227-336.

The Snake dance description (pp. 276-316) is accompanied by an unusually fine series of photographs to the number of 44.

Hough, Walter

1900 The Moki Snake Dance. A Popular Account of the Unparalleled Dramatic Pagan Ceremony of the Pueblo Indians of Tusayan, Arizona, with Incidental Mention of their Life and Customs. Passenger Dept., Santa Fe Route, Chicago. Pp. 1-58, 64 text figs., map.

A brief account of the dance and the Hopi people by an authority on the subject. A first edition (not seen) published in 1898.

1910 (Article on) Snake Dance (in) Handbook of American Indians North of Mexico. F. W. Hodge, Editor. Bureau of American Ethnology, Bulletin 30, Vol. 2, pp. 604-606, 3 text figs.

A synopsis of the dance contained in an authoritative handbook.

1915 The Hopi Indians. Cedar Rapids, Iowa (Little Histories of North American Indians, No. 4). Pp. 1-265.

A popular account of the Hopi tribe by the Curator of Ethnology of the United States National Museum. The Snake dance pp. 148-156.

1919 The Hopi Indian Collection in the United States National Museum. Proc. U. S. Nat. Mus., Vol. 54, pp. 234-296, plates 19-53, figs. 1-48.

The arts and industries of the Hopi Indians.

James, George Wharton

1899 a The Snake Dance of the Moquis. Scientific American. Part 1 in Vol. 80, No. 25, pp. 403+408-409, 8 figs; part 2 in Vol. 81, No. 11, pp. 161+167, 6 figs.

A complete account by one who saw the dance and photographed it on many occasions.

1899 b What I Saw at the Snake Dance. Wide World Magazine, Vol. 4, No. 21, pp. 264-274, 17 figs.

The author states that the Indians' freedom from injury is due to fearless, but gentle, handling of the snakes, which have both fangs and venom intact.

1900 The Hopi Snake Dance. Outing, Vol. 36, No. 3, pp. 302-310, 13 text figs.

An excellent general account of the ceremony, including the secret ceremonials, by one who had the opportunity to see and photograph them. Moderate and accurate.

1903 The Indians of the Painted Desert Region. Hopis, Navahoes, Wallapais, Havasupais. Boston. Pp. XXI+268, 40 plates.

Chapter VII, The Hopi Snake Dance, pp. 102-123.

1915 Our American Wonderlands. Chicago. Pp. 1-297.
Contains a chapter (pp. 115-135) on the Hopi dance.

Keam, T. V.

1883 An Indian Snake Dance. Chambers Journal, Jan 6, 1883, pp. 14-16.

A short but accurate description; probably the second to be published.

Keane, A. H.

1884 The Snake Dance of the Moquis of Arizona. Academy, No. 655. pp. 336-337.

A review of Bourke's work "which forms a valuable contribution to the study of native American ethnology."

Keller, N. C.

1905 Moqui Indian Snake Dance. Women's Home Companion, Vol. 32, pp. 18-19, March 1905.

Not seen.

Kidder, Alfred V.

1924 An Introduction to the Study of Southwestern Archaeology, New Haven. Pp. VII+151, plates 1-50, figs. 1-25.

Southwestern archaeology, with an extensive bibliography.

Lawrence, D. H.

1924 The Hopi Snake Dance. Theatre Arts Monthly, Vol. 8, No. 12, pp. 836-860, 6 plates.

An impressionistic account by the well-known British novelist. An attempt to elucidate the dance in terms of the Indian's religious philosophy.

1925 The Hopi Snake Dance. Living Age, Vol. 325, No. 4213.
The same account, extracted from The Adelphi, London, Jan. and Feb., 1925. (Latter publication not seen).

1927 Mornings in Mexico. New York. Pp. 1-189.
The Hopi Snake Dance, Chapter VII, pp. 139-179, is a reprint of Lawrence (1924) above. (The London edition is pp. 1-178, with the Snake dance pp. 133-169).

Longembaugh, May M.

1916 The Snake Dance at Chimopovy. Overland Monthly, Vol. 68, No. 4, pp. 280-288, 6 text figs.

An account with several novel statements.

Lummis, Chas. F.

1892 Some Strange Corners of Our Country. III. The Snake Dance of the Moquis. St. Nicholas, Vol. 19, (April, 1892) pp. 421-425, 5 figs.

A brief account for children.

1906 Some Strange Corners of Our Country. The Wonderland of the Southwest. New York. Pp. XI+270, 49 figs.

Chapter 4, The Rattlesnake Dance, pp. 43-57, 3 figs. An account containing several inaccuracies.

1924 Is the Snake Dance a Fake? Sunset Magazine, Vol. 52, p. 32.

A note denying that the rattlers used in the dance are defanged.

1925 Mesa, Canyon and Pueblo. New York. Pp. XVI+517, 49 figs.

A chapter on the dance (pp. 144-158) by an authority on the southwest. However, the account differs in important particulars from all other descriptions.

Macfarlane, Peter Clark

1913 Bull Moose and Rattlesnakes. Colliers, Vol. 52, No. 2, pp. 5-6, 28-30, 8 text figs.

A journalistic account of the Walpi dance of 1913, which was enlivened by Theodore Roosevelt's presence.

McKee, Barbara H.

1930 The Hopi Snake Dance. Grand Canyon Nature Notes, Vol. 4, No. 10, pp. 63-64.

A brief summary of the dance and legend.

McKee, Edwin D.

1929 Snakes as Mediators. Grand Canyon Nature Notes, Vol. 4, No. 1, p. 5.

The Mishongnovi dance of 1929. As seen by the Park Naturalist of Grand Canyon National Park.

Messinger, H. J.

See under Stephen, Alex. M.

Mindeleff, Cosmos (Mendelieff, Kosmos)

1886 a An Indian Snake Dance. Science (Supplement), Vol. 7, No. 174, pp. 507-514.

A complete and, on the whole, accurate description, the first on the Mishongnovi dance to appear.

1886 b An Indian Snake Dance. Science, Vol. 8, No. 178, pp. 12-13.

A reply to some comments made on his previous paper. This is the first paper in which the treatment of snakes is discussed and is the best on the subject which has yet appeared. The experiments of Drs. H. C. Yarrow and S. Weir Mitchell are mentioned.

Moffet, T. C.

1914 The American Indians on the New Trail. Presbyterian Dept. of Missionary Education, New York.

Not seen.

Monroe, Harriet

1905 To the Snake Dance. Fortnightly Review, Vol. 78, No. 466, pp. 665-667.

An account, more interesting of the trip to the dance before the days of the automobile, than of the dance itself.

Monsen, Frederick

1907 Festivals of the Hopi: Religion the Inspiration, and Dancing an Expression in All their National Ceremonies. Craftsman, Vol. 12, No. 3, pp. 269-285, 8 plates.

The significance of the dance in the Hopi religion.

Moran, Geo. Newell

1913 Kwahu, The Hopi Indian Boy. New York. Pp. 1-237, 12 plates, 67 figs.

The life of a Hopi Indian boy told in story form, from birth to marriage.

Murphy, Matthew M.

1928 The Snake Dance People and their Country. Hopi Ceremonies. Oakland. Pp. 1-14, 6 figs.

A brief account of the Hopi and their ceremonials by a former U. S. Allotting Agent for the Hopi reservation.

Newcomer, E. D. (as told to Douglas, E.)

1931 Debunking the Snake Dance. Los Angeles Times Sunday Magazine, Aug. 9, 1931, pp. 7-8.

A recent newspaper account.

Oliver, Marion L.

1911 The Snake Dance. National Geographic Magazine, Vol. 22, No. 2, pp. 107-137, 31 ills.

A brief account containing several good illustrations.

Owens, J. G.

See under Fewkes, J. W., assisted by Stephen and Owens.

Parsons, Elsie Clews

1925 A Pueblo Indian Journal, 1920-1921. Introduction and Notes by Elsie Clews Parsons. Memoirs of the American Anthropological Association, No. 32, pp. 1-123, figs. 1-41.

A diary of Hopi life by Crow-wing of Sichumovi, transcribed with notes by Mrs. Parsons. Snake dance entries pp. 101-106.

Philips, Paul Orville

1903 The Moqui Indians and Their Snake Dance. Era, Vol. 11, No. 2, pp. 115-129, 21 figs.

"The hair is disheveled to signify rain clouds, and as the dance proceeds the deep guttural song of the priests represents the sighing of the winds and the murmer of falling rain . . . . The rattlesnake is the best omen for rain, for his forked tongue is the emblem of lightning, his rattling tail of thunder, and his spotted sides of clouds."

Powell, J. W.

1891 Introduction to 7th Annual Report of the Bureau of Ethnology (for) 1885-1886, p. XXIX.

A note on Dr. H. C. Yarrow's investigation of the Snake dance.

Prudden, T. Mitchell

1907 On the Great American Plateau. New York. Pp. VIII+ 237, 40 ills, map.

"To him who has come to know the participants in their daily walks and realizes that the crude barbaric exhibition is but the expression handed on through centuries, of sincerely cherished and profoundly religious conceptions, . . . the Snake Dance ceremonial has a more absorbing and abiding fascination than its crude dramatic features can awaken."

Rinehart, Mary Roberts

1923 The Out Trail. New York. Pp. 1-246.

A brief description of the dance (pp. 85-111) by a popular authoress.

Roberts, Edward

1886 A Moqui Indian Fete. Overland Monthly, Vol. 8 (2nd Ser.) No. 45, pp. 261-266.

"It was a sight to make one's blood run cold—a disgusting, revolting spectacle."

Roosevelt, Theodore

1913 The Hopi Snake Dance. Outlook, Vol. 105, No. 7, pp. 365-373, 3 text figs.

A straightforward narrative by one who saw the snake washing as well as the dance itself.

1916 A Book-Lover's Holiday in the Open. New York. Pp. XIV +373, 3 ills.

Chapter III, The Hopi Snake Dance, pp. 63-97, is a reprint (in part) of the previous item.

Rust, H. N.

1896 The Moqui Snake Dance. Land of Sunshine. Vol. 4, No. 2, pp. 70-76, 6 text figs.

One of the early popular magazine articles.

Saunders, Chas. F.

1912 The Indians of the Terraced Houses. New York. Pp. XX+ 293.

A brief account (pp. 203-219) by one familiar with the southwest.

Shaw, Clarence H.

1901 The Snake Dance of the Moqui Indians. Phoenix, 1901.

Not seen.

Sheldon, Chas, M.

1904 The Hopi Snake Dance. Independent, Vol. 57, No. 2918, pp. 1026-1031, 7 text figs.

A plea for the prohibition of the dance as a pagan rite.

Shufeldt, R. W.

1891 Snake Dance of the Mokis. Great Divide, Oct. 1891.

Not seen.

Stephen, Alex. M.

1888 Legend of the Snake Order of the Moquis as Told to Outsiders. Journal of American Folk-Lore, Vol. 1, No. 2, pp. 109-114.

A variant of the legend differing greatly from subsequent accounts. Possibly the same myth is not intended. Paper published by W. Matthews.

(See also under Fewkes, J. W., assisted by Stephen and Owens, 1894).

Stephen, Alex. M., and Messinger, H. J.

1889 The Snake Dance—Barbaric Religious Festival of the Moqui Indians—"The World's" Expedition Witnesses the Ceremonies—Indian Braves Dance with Writhing Rattlesnakes in Their Teeth—Weird Invocations of the Gods of the Underworld—Shocking Religious Rites in the Wilds of Arizona — The Strange Legend Held Sacred by the Superstitious Moquis. New York World, Sunday, Sept. 8, 1889, p. 9, 10 figs.

Notwithstanding the startling headlines above quoted, the article is complete and accurate, and is a worthy contribution to newspaper enterprise of 40 years ago. It apparently contains the only account by an eye-witness of the catching of a rattlesnake on one of the ceremonial snake hunts.

Stevenson, Matilda Cox

1892 Tusayan Legends of the Snake and Flute People. Proc. Amer. Assn. for the Adv. of Science, 41st Meeting, pp. 258-270.

A brief summary of the dance, followed by a complete version of the myth upon which the ceremonial is based.

1894 The Sia. 11th Ann. Rept. Bureau American Ethnology, pp. 3-157, plates 1-35, figs. 1-20.

Contains an account of a snake ceremonial in one of the New Mexican pueblos.

Taylor, Chas. A.

1881 The Great Snake Dance of the Moquis. Rocky Mountain Presbyterian, Vol. 10, No. 4, p. 276, 2 figs.

A brief account, said to be the first published on this dance.

Taylor, Frank J.

See under Tillotson, M. R.

Tillotson, M. R. and Taylor, Frank J.

1929 Grand Canyon Country. Stanford University. Pp. VIII+ 108, 22 ills. map.

The Snake dance briefly described, pp. 44-46. Mention is made (p. 18) of Jacob Hamblin, the Mormon explorer, having reported as early as 1862 on Hopi ceremonials to bring rain, by which he was probably referring to the Snake dance.

Tinsley, H. G.

1920a The Mokis Dance to Propitiate the God of Rain. Dearborn Independent, 20th year, No. 46, Sept. 11, 1920, p. 12.

A highly inaccurate account.

1920 b Dancing with Rattlesnakes to Incline the Gods to Send Rain. Literary Digest, Vol. 57, No. 3 (Whole No. 1591, Oct. 16, 1920), pp. 58-61.

Abridged from the article in the Dearborn Independent.

Townshend, R. B.

1904 The Snake-Dancers of Mishongnovi. Nineteenth Century and After, Vol. 55, No. 325, pp. 429-443.

A straightforward, well balanced story by a British traveler who spent many years in this country.

1926 Last Memories of a Tenderfoot. New York. Pp. XI+270.

A reprint of the article of 1904 at pp. 192-255.

Voth, H. R.

1903 The Oraibi Summer Snake Ceremony. Field Columbian Museum, Pub. No. 83. Anth. Ser., Vol. 3, No. 4, pp. 263-358, plates 148-219.

An exceedingly detailed account by a missionary-ethnologist who had the confidence of the Indians, spoke their language and witnessed nearly all the secret rites. One of the five essential technical records.

1905 The Traditions of the Hopi. Field Columbian Museum. Pub. No. 96, Anth. Ser., Vol. 8, pp. III+319.

Hopi myths and legends as told to Voth and transcribed by him. The Snake legend, pp. 30-35.

(See also under Dorsey, George A.)

Whiting, Lilian

1907 The Land of Enchantment. Boston. Pp. XII+347, 35 ills.

A brief account of the dance, pp. 258-261.

Wissler, Clark

1922 The American Indian, An Introduction to the Anthropology of the New World. Second Edition. New York. Pp. XXI+474, figs. 1-81.

A summary of anthropological research in the New World; extensive bibliography.

PART B—HERPETOLOGICAL REFERENCES.

Amaral, Afranio do

1927 Notes on Nearctic Poisonous Snakes and Treatment of Their Bites. Bull. Antivenin Institute of America, Vol. 1, No. 3, pp. 61-76, figs. 1-30.

Summary of the snake-bite situation.

Coleman, George E.

1928 Rattlesnake Venom Antidote of the Hopi Indians. Bull. Antivenin Institute of America, Vol. 1, No. 4, pp. 97-99.

The results of tests on guinea pigs with rattlesnake venom, using the Hopi preparation as an antidote.

George, I. D.

See under Githens, Thos. S.

Githens, Thos. S. and George, I. D.

1931 Comparative Studies of the Venoms of Certain Rattlesnakes. Bull. Antivenin Institute of America, Vol. 5, No. 2, pp. 31-34.

Determination of the minimum lethal dose, for pigeons, of the venom of different species of rattlesnakes.

Hutchison, R. H.

1929 On the Incidence of Snake-Bite Poisoning in the United States and the Results of the Newer Methods of Treatment. Bull. Antivenin Institute of America, Vol. 3, No. 2, pp. 43-57.

A summary and analysis of snake-bite reports for year 1928.

1930 Further Notes on the Incidence of Snake-Bite Poisoning in the United States. Bull. Antivenin Institute of America, Vol. 4, No. 2, pp. 40-43.

Snake-bite statistics of 1929.

Klauber, L. M.

1927 Some Observations on the Rattlesnakes of the Extreme Southwest. Bull. Antivenin Institute of America, Vol. 1, No. 1, pp. 7-21, figs. 1-9.

Remarks on rattlesnake habits.

1928 The Collection of Rattlesnake Venom. Bull. Antivenin Institute of America, Vol. 2, No. 1, pp. 11-18, figs. 1-9.

Methods of handling snakes and of extracting venom.

1930 a New and Renamed Subspecies of *Crotalus confluentus* Say, with Remarks on Related Species. Trans. San Diego Society of Nat. Hist. Vol. 6, No. 3, pp. 95-144, plates 9-12, map.

Discussion of the relationships of the Prairie Rattlesnake (the subspecies used in the dance) ; range map.

1930 b Differential Characteristics of Southwestern Rattlesnakes Allied to *Crotalus atrox*. Bull. Zool. Soc. San Diego, No. 6, pp. 1-58, plates 1-6, maps 1-3.

The character and range of the Western Diamond Rattlesnake.

Ortenburger, Arthur I.

1928 The Whip Snakes and Racers: Genera *Masticophis* and *Coluber*. Mem. Univ. Michigan Museums, Vol. 1, pp. XVIII+ 247, plates 1-36, figs. 1-64.

Treats, amongst others, the Great Basin Racer, which is employed in the Snake dance.

Van Denburgh, John

1922 The Reptiles of Western North America. Occas. Papers Calif. Acad. Sci., No. 10, Vol. 1, Lizards; Vol. 2, Snakes and Turtles, pp. 1-1028, plates 1-128.

The standard treatise on western reptiles.

1924 Notes on the Herpetology of New Mexico, with a list of Species Known from that State. Proc. Cal. Acad. Sci., 4th Ser., Vol. 13, No. 12, pp. 189-230.

The reptiles known from the area to the east of the Navaho-Hopi area.

Wiley, Grace Olive

1929 Notes on the Texas Rattlesnake in Captivity with Special Reference to the Birth of a Litter of Young. Bull. Antivenin Institute of America, Vol. 3, No. 3, pp. 8-14, figs. 2-6.

The handling and taming of rattlers in captivity.

1930 Notes on the Neotropical Rattlesnake (*Crotalus terrificus basiliscus*) in Captivity. Bull. Antivenin Institute of America, Vol. 3, pp. 100-103, fig. 1.

Data on handling rattlesnakes in captivity.

Willson, P.

1908 Snake Poisoning in the United States: A Study Based on an Analysis of 740 Cases. Archives Institute of Medicine, Vol. 1, pp. 516-570.

Important in showing fatality ratios before the advent of modern systems of treatment.

Woodbury, Angus M.

1931 A Descriptive Catalog of the Reptiles of Utah. Bull. University of Utah, Vol. 21, No. 5, pp. X+129, figs. 1-58.

Descriptions of the snakes found to the north of Tusayan.

MAP REFERENCES

1878 10th Ann. Report, U. S. Geol. and Geogr. Survey of the Territories, Plate 73 (large map of 3 mesas of Tusayan).

1886 (Reprint, 1921) U. S. Geological Survey, Topographic Maps of the U. S.: Arizona, Tusayan Sheet.

1923 Topographic Map of the State of Arizona. Prepared by N. H. Darton, Geologist U. S. Geological Survey, in cooperation with the Arizona Bureau of Mines.

—— Map of Principal Automobile Roads within the Navajo and Hopi Indian Reservations, including the Grand Canyon and Southern Utah Regions. Automobile Club of Southern California.

Interesting maps will also be found in Donaldson (1893), Fewkes (1894), Anon. (1915), and Crane (1925 b).

APPENDIX 1

ANTHOLOGY OF THE HOPI SNAKE DANCE

Selections from authoritative descriptions of various features of the ritual.

THE SIGNIFICANCE OF THE CEREMONY

The Snake Dance is an elaborate prayer for rain, in which the reptiles are gathered from the fields, intrusted with the prayers of the people, and then given their liberty to bear these petitions to the divinities who can bring the blessing of copious rains to the parched and arid farms of the Hopi.

J. W. Fewkes (assisted by A. M. Stephen and J. G. Owens), 1894, The Snake Ceremonials at Walpi, p. 124.

When one makes the Tusayan ritual a special study he finds it wonderfully complicated in the development of details. No Hopi priest lives who understands the meaning of all these details, nor does he care for an explanation of them. There are two fundamental factors, however, which he can comprehend, and these are always on his lips when an explanation of the ritual is solicited. "We cling to the rites of our ancestors because they have been pronounced good by those who know. We erect our altars, sing our traditional songs, and celebrate our sacred dances for rain that our corn may germinate and yield abundant harvest."

J. W. Fewkes, 1896, The Tusayan Ritual, pp. 698-9.

CALENDAR OF EVENTS

The following tabular summary or calendar of events is abridged from Fewkes' description of the Walpi ceremony (Fewkes, 1894, pp. 10-11) the technical terms being omitted. The numbers indicate the serial days of the ceremony:

1 a Making of charm liquid by the Antelopes.
  b Preparation of sand mosaic in Antelope kiva.

2 a Making of prayer sticks in Antelope kiva.
  b Consecration of same by singing of 16 traditional songs by Antelopes in their kiva.

3 a Ceremonial delivery of prayer sticks by chief Antelope to chief Snake priest in Antelope kiva.
  b Snake hunt to north.
  c Antelope ceremony of 16 traditional songs.

4 a Ceremonial delivery of prayer sticks to chief Snake priest.
  b Snake hunt to the west.
  c Antelope ceremony of 16 traditional songs.

5 a Ceremonial delivery of prayer sticks.
b Snake hunt to the south.
c Antelope ceremony of 16 traditional songs.
d Ceremonial notification sign hung on Antelope kiva entrance ladder.

6 a Ceremonial delivery of prayer sticks.
b Snake hunt to the east.
c Antelope ceremony of 16 traditional songs.

7 a Making of sand mosaic in Snake kiva.
b Making of charm liquid and medicine pellets.
c Antelope ceremony of 16 traditional songs.
d Initiation of novices in Snake kiva with dramatic rites.
e Singing at the sun spring.

8 a Antelope race (public).
b Antelope ceremony of 16 traditional songs with dramatization of Snake myth.
c Renewal of charm liquid.
d Antelope or Corn dance (public).

9 a Antelope ceremony of 16 traditional songs with dramatization of Snake myth.
b Ceremonial of novices in Antelope kiva.
c Snake race (public).
d Washing of snakes in Snake kiva.
e Snake dance (public).
f Purification by emetic.
g Feast.

10 a Ceremonial of purification of Snake priests.

Then follow four days of games and celebration.

It should be understood that this calendar by no means exhausts the items of the ritual; it lists only the outstanding events. There are many other observances of a minor, but essential, character, and when not otherwise engaged the priests are busy with the manufacture of prayer sticks and religious paraphernalia, repairs to their costumes, ceremonial smokes, etc.

The calendar is not the same in the several villages. For example, the first ceremonial snake-hunt at Mishongnovi occurs on the second day; the Antelope sand mosaic is made on the fifth day; there are eight ceremonial songs which are first sung on the sixth day, and on this day the drama of the myth is held, to be repeated on the seventh and eighth days.

But the complexity of the ritual and the general character of the arrangement are similar in all the Hopi towns.

It will be observed that the so-called nine-day ceremony really runs over to the tenth day. Also the official announcement of the dance, involving some ceremony, takes place eight days before the first official day of the rite and in the intervening time certain ceremonial preparations and meetings are held.

SELECTING THE DATE

August 2. This is the first morning the Snake chief watches the sun. The chief says the sun is going so fast it is coming close to the place, he wants to call out right soon. The people are saying that it is too early; but the Snake chief says that he wants to call out as soon as the sun gets to the place. So he has to watch very closely. He wants to do what is right. He wants to do his best.

August 3. The people are trying to have the Snake chief watch the sun very closely and so to call out at the right time. Sometimes, if the Snake chief does not watch the sun right, they dance early, then it freezes early too. That is the reason why they must try and watch the sun very closely. Also they have to watch the crops. If the crops are not growing fast, they can wait for four or eight days before calling out.

August 4. The Snake chief and the Antelope chief (Honawox, of the Snake clan) are both watching the sun, and they say that the sun is now getting to the place, and they will soon call out. They say, too, that the crops are getting along very well, so they think they will have their smoke in three days, at night. So the Snake dance will be soon.

Elsie Clews Parsons, 1925, A Pueblo Indian.
Journal, pp. 101-102.

THE ANNOUNCEMENT

(Made eight days in advance of the nine day ceremony)

"All people awake, open your eyes, arise,
Become Talahoya (child of light), vigorous, active, sprightly.
Hasten clouds from the four world quarters;
Come snow in plenty, that water may be abundant when summer comes.
Come ice and cover the fields, that after planting they may yield abundantly;
Let all hearts be glad;
The knowing ones will assemble in four days;
They will encircle the village dancing and singing their lays * * *
That moisture may come in abundance."

J. W. Fewkes, 1896, The Tusayan Ritual,
p. 699.

THE SNAKE HUNT

The Search

Arriving at the top of the mesa the snake hunt began in earnest. The sight was an exceedingly pleasing one, as the three men began an eager search here and there, one going in one direction, another in another, coming, going, now all together, now widely separated, but always moving at a rapid rate, beating the sage brush with their digging sticks and never ceasing in their earnest search for a moment. All three of the men were entirely naked except for a scant loin cloth and moccasins. The hair was permitted to hang freely from the head. One man was followed on this hunt until late in the afternoon, when, owing to the excessive heat and the failure to provide food and water, the author was obliged to abandon the hunt and return to the village. During that time, however, it was not learned that any of the men had been successful in their search for snakes, and they were evidently becoming very restive under the belief that their lack of success was due to the presence of a stranger. At one time early in the search a hole was discovered which it was thought might conceal a snake, whereupon the priest Choshnimtiwa, dropping upon his knees, began digging, first with his hands and then with the digging stick, at a furious rate. The excavation was continued to the depth of about three feet, when, the hole growing larger, he was able by thrusting his arm into the hole up to his elbow to reach the end of the hole. This being found empty was abandoned. It is worthy of note in this connection that the arm was repeatedly thrust into the hole, there being absolutely no fear shown as to any possible evil consequences.

G. A. Dorsey and H. R. Voth, 1902, The Mishongnovi Ceremonies of the Snake and Antelope Fraternities, pp. 182-3.

Finding a Rattler

Presently they (Snake priests) broke into groups of two and three and began cautiously to peer and poke among rocks and bushes for the snake mother's children. In a short time a low call came from a man who was thrusting his stick into a dense clump of greasewood, and as the hunters gathered there it was found to be a large rattlesnake lying in the heart of the thicket. Without hesitation they at once proceeded to cut away the bushes with their hoes, and strangely enough, although the snake lay in coil and watched them, it made no rattling or other display of anger. One of the twigs fell upon it, and the man nearest stooped down and deliberately lifted the branch away.

Each one then sprinkled a pinch of meal upon the snake, and the man who had found it bent over and tapped it lightly with the feathers of his snake-whip. It swayed its head a little and then straightened out to make off, but just as it relaxed from coil, the hunter, using the right hand, in which he held his snake-whip, instantly seized it a few inches back of the

head. Holding it out, he gave it quick shake, and then proceeded to fold it up, and put it in one of the small bags carried for this purpose, showing no more concern in its handling than if it had been a ribbon.

A. M. Stephen and H. J. Messinger, The Snake Dance, New York World, Sept. 8, 1889, p. 9.

THE DRAMATIZATION OF THE MYTH

Meanwhile, each fraternity constructs an altar in its own kiva, the Antelope priests using symbols of rainclouds, lightning, and maize in altar sand paintings. On the sixth day the rite of the Snake Youth and the Antelope Maid is begun. Very early in the morning a Snake priest brings a young man to the kiva and one of the Antelope priests brings a maiden —a relative of some member—both of whom are attired in beautiful costumes to impersonate their parts in the ancient drama. Standing at the rear of the altar, there is placed in the hand of the Maid an earthenware vessel which contains stalks of growing corn and vines of melons; in one hand of the Youth is a tiponi, the insignia of the Society, and in the other a rattlesnake. The priests smoke, blowing toward the altar, over which a specially prepared liquid is sprinkled. Many prayers are uttered and chants of great antiquity are sung. When the seventh song is reached, the priest lights an ancient cloud-blower filled with native tobacco, and, as the priests sing their invocations to the yellow clouds of the north, to the green clouds of the west, to the red clouds of the south, and to the white clouds of the east, he forces billows of smoke from the pipe upon each of them and invokes one after the other.

Mary Roberts Coolidge, 1929, The Rain Makers, pp. 133-134.

THE SNAKE WASHING

Precisely at noon the chief priest sends one of his men to announce that all in the village must retire into their houses, as the washing of the snakes is about to begin. I am told formerly this injunction was very promptly and scrupulously heeded, but of late this seems to be less so. The men in the kiva are very solemn. When all is ready, the older men squat down on the north side of the sand field, two or three of the younger men on the south side east of the ladder, two west of and close to the ladder opposite the two bowls or broken jars. The large bag with the snakes is brought forward and placed in about the center of the kiva, and one of the men takes a place near by between the sack and the bowl with the yucca suds. All except the two men near the bowls hold in their right hand snake whips. Their attire consists of the snake kilt and moccasins only.

When all is ready, the man near the sack puts his right hand into the

sack, draws forth a snake, and hands it to the man opposite the bowl containing the suds. He dips it into the bowl, and holding it in one hand, draws it through the other and then hands it to his companion, who repeats the operation with the reptile in the other bowl, and then places it on the sand field; another snake follows, and then another, etc. The men have in the meantime lit pipes and are solemnly smoking, handing the pipes from one to the other, exchanging terms of relationship. The snakes, of course, try to escape, but are herded, and sometimes pushed back with the whips. The smoke, drawn from the pipes, is constantly blown towards the snakes. But in spite of all these measures the snakes make desperate efforts to escape, not only the racers that glide and shoot swiftly up and down, but also the bull and rattle snakes. They crawl over and between the nude legs of the men, up their arms, etc., so that it often becomes necessary to take them with the hand and lay them back. As the number of reptiles increase it becomes more difficult to control them and keep them on the small place assigned to them, and for a time the men are kept very busy. The snakes, finding all their efforts to escape frustrated, finally huddle together in the two corners. It is simply appalling with what apparent unconcern those men handle the reptiles.

One has followed the other until all have gone through the two baths and been placed on the sand field. When the snakes see that they cannot escape they finally pile up in the corner on the floor and on the banquette, enjoying the sunshine that falls on those places through the hatchway just at that time. Occasionally one tries to escape, especially the racers, but usually one or two boys, who are left in charge, can manage them. When the washing is completed, the three men who handled the snakes carefully wash their hands and then the chief priest and one or two others usually utter a brief prayer, whereupon all seat themselves around the fireplace and smoke, exchanging terms of relationship. The snakes are left in charge of one or two of the small boys.

H. R. Voth, 1903, The Oraibi Summer
Snake Ceremony, pp. 339-342.

The older priests assembled in a circle around the hearth, where they engaged in fraternal smoking, the care of keeping the snakes confined to the sand field being left to three or four of the smallest boys. This they did for two hours with unfailing pleasure and delight. These boys, barefooted and otherwise entirely naked, sat down on the stones and with their whips or naked hands played with the snakes, permitting them to crawl over and under their feet, between their legs, handling them, using them as playthings, paying no more attention to the rattlesnakes than to the smallest harmless whip-snake, forming a sight never to be forgotten. It must be admitted, however, that owing to the absolute abandon and recklessness used by the boys in handling these snakes, all of one's preconceived notions of the dangerousness of the rattlesnake entirely disappeared. Occasionally, one of the snakes, being tossed to a distance of four

or five feet, would apparently resent the insult, but before the snake had had sufficient time to coil it would be straightened out by one of the other boys or tossed back to its original position, and so the sport (for it was nothing less to these boys) continued, as has been stated, for more than two hours.

G. A. Dorsey and H. R. Voth, 1902, The Mishongnovi Ceremonies of the Snake and Antelope Fraternities, pp. 247-248.

THE DANCE

The Entrance of the Priests

Suddenly into the plaza, with rude, intense movements, hurries a little file of men. They are smeared all with grey and black, and are naked save for little kilts embroidered like the Sacred dance-kilts in other pueblos, red and green and black on a white fiber-cloth. The fox skins hang behind. The feet of the dancers are pure ash-grey. Their hair is long.

. . . . . .

There are only eight men—the so-called Antelope priests. They pace round in a circle, rudely, absorbedly, till the first heavy, intense old man with his massive grey hair flowing, comes to the lid on the ground, near the tuft of kiva-boughs. He rapidly shakes from the hollow of his right hand a little white meal on the lid, stamps heavily, with naked right foot, on the meal, so the wood resounds, and paces heavily forward. Each man to the boy, shakes meal, stamps, paces absorbedly on in the circle, comes to the lid again, shakes meal, stamps, paces absorbedly on, comes a third time to the lid, or trap door, and this time spits on the lid, stamps, and goes on. And this time the eight men file away behind the lid, between it and the tuft of green boughs. And there they stand in a line, their backs to the kiva-tuft of green; silent, absorbed, bowing a little to the ground.

Suddenly paces with rude haste another file of men. They are naked, and smeared with red "medicine," with big black lozenges of smeared paint on their backs . . . . These are the so-called snake priests, men of the Snake clan. . . .

They pace rapidly round, with that heavy wild silence of concentration characteristic of them, and cast meal and stamp upon the lid, cast meal and stamp in the second round, come round and spit and stamp in the third.

D. H. Lawrence, 1927, Mornings in Mexico, pp. 155-8.

The Chants

Then they (the Snake priests) formed in line before the kisi, face to face with the line of Antelope men, and with ordered waving of the

snake whips, and shaking of the knee-rattles, and stamping of the feet they chanted in unison a weird, unearthly song. Its words, of course, were unintelligible to us; and it may be that they were not entirely understood by themselves, for while the language of savages changes by degrees from century to century, and its archaic forms, passing out of common use, swiftly begin to be forgotten, a few still linger on in the songs devoted to the gods, and are piously chanted by priests, who can no longer interpret what they mean.

R. B. Townshend, 1904, The Snake Dancers of Mishongnovi, p. 436.

The Snake Carrying

The Snake men then thrust their snake whips behind their belts and, while they again hummed a song, at the same time stepping forward and backward, the Antelope men rattling, some of the Snake men began to detach themselves in threes from the line, going to the kisi where a snake was handed to one of them by a Snake priest who did not participate in the ceremony, but was called from among the spectators on the house tops for this purpose.

The dancer having been handed a snake, placed it between his lips and moved slowly forward being accompanied by another priest who had placed his arm around the dancer's neck occupying, as it were, with his snake whip, the attention of the snake, warding off the latter's head from the dancer's face as much as possible. As soon as these two had described the circuit in front of the kisi the snake was dropped and picked up by the third man. The two again approached the kisi, received another reptile and went through the same performance. The gatherers held sometimes as many as four, five and even more snakes in their hands, and it has been observed that on several occasions a dancer would take more than one reptile at a time between his lips.

As soon as a snake is dropped the gatherer concerns himself with it, either picking it up at once or first letting it glide away a short distance. If the reptile be a rattlesnake and threatens to coil, the man touches it with the points of his snake whip, moving the latter rapidly. A rattlesnake, already coiled up and ready to fight, even the most experienced priest will not touch until he has induced it to uncoil. A pinch of meal is always thrown on the snake before it is picked up. It is astonishing, however, with what complete unconcern the dancers will move about among the snakes that are being constantly dropped, even if they are coiled up and apparently ready to strike at the foot or leg of the man who passes in close proximity to them. None seem to be more reckless in handling the snakes than the smaller boys .

When all the snakes have been "handled," the chief priest goes to one side and sprinkles a circle of meal on the ground and in it a meal line from the north, west, south, east, northeast and southwest towards the

center. The Snake men are standing at one side of the circle, a line of women and girls standing on the other side holding trays with cornmeal in their hands. This meal they throw on the meal circle, whereupon the Snake men rush to the circle, throw all the reptiles on it and immediately thrust their hands into the wriggling, writhing mass of snakes, grabbing with both hands as many as they can get hold of; then they dash away with them to the four cardinal points, some going to the north, some to the west, and so on, where they release them at certain points, preferably behind rocks, called snake house, depositing with them the long black bahos, which they held in their hands with some cornmeal during the dance. After the Snake men had left, the Antelope priests again made the four circuits on the plaza in the same manner as when they came and then returned to the kiva.

G. A. Dorsey and H. R. Voth, 1902, The Mishongnovi Ceremonies of the Snake and Antelope Fraternities, pp. 251-2.

THE SNAKE MYTH

(It is impossible, within the scope of this paper, to give a version of the legend which follows the hero through all his strange adventures. For an extended account see especially Voth, 1903, pp. 349-353; Voth, 1905, pp. 30-35; and Stevenson, 1892, pp. 261-265.)

The legend relates that a youth, having the curiosity to know where the waters flowed, embarked in a hollow log, closed except a small orifice and went down the Great Colorado to its mouth. . . . Here he found the Spider Woman, who prompted him in his dealings with the people living there. After many strange adventures, during which he was taught the rites now practiced by the Snake Society, he won the daughter of a Snake chief and brought her to his country. The first fruits of this union were snakes, who bit the Hopi and who were driven away on this account. Later children were human, and with them originated the Snake clan, whose wanderings brought them at last to Walpi; and tradition affirms that they were among the first arrivals there.

Walter Hough, 1915, The Hopi Indians, pp. 155-6.

THE ANTIDOTE

(It is obviously impossible to cite extracts giving all of the various theories which have been put forward to explain how the snakes are handled without accident. I therefore give three: Dorsey, representing the usual matter-of-fact theory; Curtis, who differs from almost all other commentators; and Voth, who reports the ideas of the Indians themselves.)

The Usual Theory

Naturally, there is one topic above all others: How is it that these priests, some of whom are mere infants, are not bitten and do not die from wounds of the rattlesnakes? This much may be said with confidence: There is absolutely no attempt on the part of the Hopi to extricate the fangs or in any other way whatsoever to render the snakes harmless. In the second place, so far as is known, the Hopi have no antidote for poison. They neither rub their bodies nor take an antidote with them before going upon the hunt, while the drinking of the emetic and the vomiting immediately after the dance is a purification rite, pure and simple. Yet no Hopi Snake priest has ever been known to suffer from the bite of a rattlesnake. There seems to be but one answer to the question, and that is, that the Hopi Snake priests understand the ways of the rattlesnake, and are careful never to pick him up or to handle him when he has assumed a striking attitude. When a snake falls from the mouth of a carrier and coils, the whip is waved over it, whereupon it is picked up. It is also quite possible to believe that from the very moment the rattlesnake is ruthlessly seized in the field until he is released at the conclusion of the ceremony, he is handled with such recklessness that his constant desire is not to strike, but to flee. Again, it must be admitted that as soon as the snakes enter the kiva they are kept in tightly closed jars, hence by the end of the ceremony are probably in a dazed condition. But the rattlesnake, during the greater part of his captivity, is treated with the utmost unconcern.

Geo. A. Dorsey, 1903, Indians of the Southwest, pp. 154-5.

The Curtis Theory of Defanging

The extremely dramatic performance of the last day, in which the priests dance publicly with rattlesnakes in their hands, about their necks, and even between their lips, has generally been accepted as a remarkable and inexplicable exhibition, the triumph of primitive philosophy, or craft, or courage, or what-not, over one of Nature's most venomous reptiles. But the most remarkable aspect is that so little skepticism seems to have been aroused. The Snake priests do handle rattlesnakes. But the rattlesnakes have first been rendered absolutely harmless by the removal of their fangs before a hand is laid on them. For the truth of this statement we have only one man's word; but as that man is a Snake priest of many years' standing, there need be no hesitation in accepting it. The roots of broken fangs in a snake drop off in the course of a few days, so that a majority of the rattlesnakes are probably quite fangless at the time of the dance. However, the rattlesnake possesses a considerable number of rudimentary fangs, one pair of which pushes forward to supply the deficiency, and not long after their release the snakes used in the dance are as well armed as ever.

Edward S. Curtis, 1922, The North American Indian, Vol. 12, The Hopi, p. 136.

The Charm Effect

There seems to be a deep-rooted conviction among the members of the Snake and Antelope Fraternities that they are immune from the effects of snake poison and from the snake charm while they are engaged in the ceremony. One of the Snake priests, now an old man, was once struck by a rattler while he ran with handfuls of snakes from the plaza at the conclusion of the ceremony. He says he held the snake about midway of the body, and it swung back its head and struck him in the hand. A young man was bitten on the plaza a few years ago, which, however, I did not find out until lately. A third man told me that he was once bitten—I think he said while trying to take a snake from the pot in the booth. It has already been stated on a previous page that formerly the snakes were kept in a covered pot instead of a sack on the plaza. In none of these cases was any special treatment resorted to, because, I was told, that was not considered necessary in the case of members of the Fraternity during the time of the ceremony. Of course such immunity is claimed only for those whose "hearts are good"; where this essential quality does not exist the bite of a venomous reptile may prove just as dangerous, and even fatal, as in the case of any other mortal.

H. R. Voth, 1903, The Oraibi Summer Snake Ceremony, p. 357.

APPENDIX 2

THE AMPHIBIANS AND REPTILES OBSERVED AND COLLECTED ENROUTE

The entire trip to the dance occupied a few hours over a week, the start being made at noon, August 15th, with return to San Diego on the evening of the 22nd.

The itinerary and daily mileage were as follows:

Aug. 15 San Diego to Needles, via San Bernardino, Victorville and Barstow .....366 miles

Aug. 16 Needles to Williams, via Oatman, Kingman and Seligman .....202 miles

Aug. 17 Williams to Grand Canyon (El Tovar and Hermit's Rest); return to Flagstaff.....170 miles

Aug. 18 Flagstaff, Winslow, Holbrook, Petrified Forest (National Monument), Holbrook, Painted Desert Inn, Holbrook .....191 miles

Aug. 19 Holbrook to Mishongnovi, via Indian Wells and Keams Canyon and return.....188 miles

Aug. 20 Holbrook to Prescott, via Flagstaff and Ashfork, with side trip to Meteor Crater.....217 miles

Aug. 21 Prescott to Phoenix via Wickenburg.....117 miles

Aug. 22 Phoenix to San Diego via Yuma.....384 miles

Total mileage for the trip.....1,385

This allowed some time for sight seeing and collecting en route. With no prearranged schedule as to stops, except to reach Mishongnovi on the 19th, we were able to investigate any likely looking hunting grounds, when time and weather permitted. As is usual in northern Arizona in mid-summer, sporadic rainstorms were encountered in the afternoons.

The customary uncertainties of collecting were noted. Some of the most favorable appearing localities yielded few specimens, while others proved unexpectedly prolific; unfortunately many had to be traversed at a time of day when no specimens could be expected. We had planned our trip, both for collecting reasons and personal comfort, to cross the Mohave Desert outbound, and the Colorado Desert on the return, in the evening and night hours. But whereas I am sure we could have secured a number of specimens of desert night-snakes had the trip been made in May, none were found. The heat was oppressive even at midnight, and, from the lack of dead specimens on the road, it would seem that the snakes must practically aestivate in mid-summer. At any rate, just as the peak of the collecting season for diurnal specimens in San Diego County is May, so also on the desert, the same month will probably yield the greatest number of nocturnal specimens.

Similarly lizard collecting, which is always best at mid-morning (except for a few species) was disappointing in the desert area northeast of Topock, where on another trip in late May a number of species had been seen in almost unexampled profusion.

On the northern Arizona plateau conditions were better. In the Winslow-Flagstaff area, where reptile activities are no doubt limited to the summer and early autumn months, we probably saw the country at its best. Further east, in the somewhat lower Winslow-Holbrook section, lizard hunting was good in the mornings, although the heat was somewhat oppressive.

Everywhere it was noted that lizard hunting in the afternoons was relatively nonproductive, although a few were taken on the desert at Sentinel, and in the early afternoon near Yarnell. In consequence, in the afternoons we passed over much interesting territory, where not a specimen was noted. The experienced collector will schedule his field work for the mornings (the more desert the country, the earlier the field work) reserving the afternoons and evenings for traveling.

In the following list of species noted, all localities are in Arizona unless otherwise stated.

AMPHIBIANS

Scaphiopus hammondii (Western Spadefoot Toad)

Specimens were collected five miles east of Canyon Padre, Coconino Co., and at Kirkland Creek (intersection with U. S. 89), Yavapai Co. At the latter point juveniles were collected about a small pool, all stages from tadpoles up being noted (Aug. 21).

Bufo cognatus (Great Plains Toad)

A single specimen was collected in a moist spot on the desert near Topock, Mohave Co., at noon. This was a juvenile. Two others were lost in a shallow prospect hole.

Rana pipiens (Leopard Frog)

This specimen was found very common along the banks of an irrigating ditch near St. Joseph, Navajo Co. It was, however, very difficult to secure even with a net, the water being opaque with silt. Our progress along the banks was always preceded by a series of "plops" about 20 feet in advance.

The leopard frog was also seen at a road-side pool 5 miles north of Yarnell, Yavapai Co.

LIZARDS

Dipsosaurus dorsalis dorsalis (Northern Crested Lizard)

This common desert species was collected at Needles, San Bernardino Co., California; and at Topock, Mohave Co., and Sentinel, Maricopa Co., Arizona. At the latter point it proved unexpectedly common at about 4 P. M.

Crotaphytus collaris (Collared Lizard)

This lizard was always observed in rocky areas. It was collected or seen at Oatman, west edge of Sacramento Valley (on U. S. 66), and Hualpai, Mohave Co.; Keams Canyon, Navajo Co.; and 4 miles south of Kirkland Junction and Yarnell, Yavapai Co.

Crotaphytus wislizenii (Leopard Lizard)

Specimens were noted run over on the road at Hodge, San Bernardino Co., and Midway Well, Imperial Co., California.

Sauromalus obesus (Chuckwalla)

The Chuckwalla was seen at Oatman, Goldroad, Kingman and Hackberry, Mohave Co. It was much less plentiful than on a previous occasion in May. The Arizona specimens are amorphously banded with red across the back, where the California specimens are usually grayish white.

Some one told me that these lizards could be caused to back out of their rock refuges by repeated tappings on the nose (if it could be reached); this was tried and found effective.

Callisaurus ventralis ventralis (Desert Gridiron-tailed Lizard)

Seen at Topock, Mohave Co., and Sentinel, Maricopa Co. At the former locality one of these lizards was observed chasing a *Uta stansburiana stejnegeri.* Both pursuer and pursued moved with great rapidity, doubling and twisting like a dog and rabbit. The outcome was not seen, as they disappeared behind a bush.

Holbrookia maculata approximans (Western Earless Lizard)

Canyon Padre (at U. S. 66), 4 miles east of Canyon Padre, Two Guns, Canyon Diablo (at U. S. 66), 1 mile south of Meteor Crater Junction, Coconino Co.; 10 and 25 miles north of Holbrook, Navajo Co.; and Kirkland Creek (U. S. 89), Yavapai Co., were points of collection.

This lizard is undoubtedly the most common found on the rocky plains area between Winona and Winslow. Twenty-four were collected in a half hour east of Canyon Padre. They run through the short grass with a zig-zag course for a short distance and then stop suddenly like *Callisaurus,* but are much easier to follow with the eye. They do not seem to take to ground holes readily.

Holbrookia texana (Band-tailed Earless Lizard)

This larger earless lizard was found plentiful in the boulder-chaparral area south of Yarnell, Yavapai Co.

Uta ornata symmetrica (Arizona Rock Uta)

This lizard, although called by Van Denburgh the Arizona Tree Uta, was found to frequent rocks. Specimens were observed at Dennison, Two Guns and Meteor Crater, Coconino Co. In this area they perch on the small stones scattered over the plain. At Yarnell, Yavapai Co., where there are large granite boulders, they run about over the rocks and take refuge in the crevices; they were quite common here. Although similar in form to *Uta graciosa* of the desert (a shrub-branch species) they seem to have quite different habits.

Uta stansburiana stejnegeri (Desert Brown-shouldered Lizard)

This common desert form was seen only at Topock and Kingman, Mohave Co.

Sceloporus consobrinus (Striped Swift)

This was the common lizard of the Williams-Flagstaff area. Where rocks and logs are present it seems to prefer the latter. It was particularly common on the sandstone outcrops in the vicinity of Winona, and on the granite boulders at Yarnell, but is also found in the plains area. It was collected at the following localities: 12 mi. south of El Tovar, Winona, Canyon Padre and 5 mi. east of Canyon Padre, Coconino Co.; 10 mi. north of Holbrook, Navajo Co.; and at the summit south of Prescott, Glenoaks and Yarnell, Yavapai Co.

Phrynosoma douglassii hernandesi (Arizona Short-horned Horned Toad).

A specimen was found dead in the road eleven miles west of Williams.

Xantusia arizonae (Arizona Night Lizard)[44]

Six specimens of this new species, the first of the genus to be discovered in Arizona, were found under granite slabs on the granite-chaparral hillside one mile south of Yarnell, Yavapai Co. The Arizona species, while having the habits and, to a certain extent, the bodily form of *X. henshawi,* seems more closely related to *X. vigilis,* which it resembles in lepidosis and color. Naturally the finding of this novel form constituted the outstanding feature of the trip, as far as collecting was concerned. The discovery was not entirely accidental; the likeness of the terrain about the type locality, and particularly the spalled granite boulders, to the habitat of *X. henshawi* in southern California caused us to engage in a search for *Xantusia,* using the appliances and technique developed in pursuit of *X. henshawi* in San Diego County.

Cnemidophorus sexlineatus perplexus (Sonoran Whiptail Lizard)

This moderate sized whiptail is the common form of the elevated areas of north-central Arizona. It was collected 5 mi. east of Canyon Padre, at Two Guns, 1 mi. south of Meteor Crater Junction, and Canyon Diablo, Coconino Co.; 3 and 10 mi. north of Holbrook, Navajo Co.; and Yarnell and Kirkland Creek, Yavapai Co. At the last point, juveniles, evidently recently hatched, were especially common.

Cnemidophorus tessellatus tessellatus (Desert Whiptail Lizard)

The desert whiptail is widespread in the lowland areas of Arizona. Specimens were noted at Topock, 10 mi. northeast of Topock, Oatman and Goldroad, Mohave Co.; and Sentinel, Maricopa Co. A specimen from the last point is much lighter at the throat than those from Mojave Co.

SNAKES

Masticophis taeniatus taeniatus (Great Basin Striped Racer)

A specimen was taken at Yarnell. It was found stretched on a rock pile with head 10 inches above the ground.

Pituophis catenifer rutilus (Arizona Bull [or Gopher] Snake)

This form and *Crotalus confluentus confluentus* evidently share the distinction of being the commonest snakes in central Arizona. Specimens of the gopher snake were noted at the following points:

Locality	*Size*	*Association*
Nelson, Yavapai Co.	Medium	Grass and juniper
4 mi. east of Seligman	Large	Grassy plain
Crookton, Yavapai Co.	Medium	Grassy plain
ElTovar, Grand Canyon	Medium	Rocks, brush
Williams, Coconino Co.	Medium	Grass, trees
Canyon Padre	Large	Plain, scattered rocks
Two Guns	Medium	Rocky plain
3 mi. west of Dennison	Medium	Rocky plain

[44] Described in Trans. San Diego Soc. Nat. Hist., 1931, Vol. 7, No. 1, pp. 1-16.

All of these were auto casualties, found on the road, except the Grand Canyon specimen, which was found alive in a bush on the Canyon edge. They seem less distinctive in coloration, with less red than specimens from southwestern Arizona.

Lampropeltis getulus boylii (Boyle's King Snake)

In San Diego County, Calif., specimens were noted dead on the road at Lake Hodges (fields) and Bonsall (brush). There was also a dead specimen of medium size at Palo Verde, Maricopa Co., Arizona; here were cultivated fields on both sides of the road. This individual had narrow, clear white rings.

A specimen was seen in captivity near Hot Springs Junction, Maricopa Co., which was said to have been taken there. The light rings were narrow, but it appeared nearer *boylii* than *yumensis*.

Hypsiglena ochrorhynchus (Spotted Night Snake)

Dead specimens were noted on the road at Dennison, Coconino Co., and three miles west of this point. This was on a rocky plain.

Thamnophis ordinoides vagrans (Wandering Garter Snake)

A small specimen was found dead on the road four miles west of Williams, Coconino Co., in a forest association.

Thamnophis eques (White-bellied Garter Snake)

Three specimens of this form were found at Kirkland Creek (intersection with U. S.89) near a small pool. Two were crawling in the grass at mid-day, the third was under a rock. One had eaten no less than thirteen small *Scaphiopus hammondii,* some with and some without tails. Two of these snakes died from the heat before we reached Phoenix that evening.

Crotalus molossus (Black-tailed Rattlesnake)

A specimen was seen dead in the road at Ashfork, but this locality must not be considered definite, as the snake had a string around its neck, showing that it might have been carried some distance. I had previously received the species from Welch, about ten miles to the east, and from Drake, Yavapai Co., eighteen miles to the south. A museum specimen from Sedona, Coconino Co., was seen at Flagstaff.

Crotalus atrox (Desert Diamond Rattlesnake)

At the Reptile Inn, west of Mohawk, Yuma Co., we saw a brood of six of this species born the night before (Aug. 20th). We were told the young are generally born late in August. In this area *atrox* is usually found along the Gila River bottom. One was reported taken several feet up in a mesquite tree. O. D. Herron, who operates the service station here, had a number of fine rattlers of this species in captivity. He handled them all readily, but with care and delicacy. It was noted that a large specimen, which seemed to pay no attention to Mr. Herron s handling, was definitely afraid of a stranger.

The Herron collection, all caught in this vicinity, showed extensive color variations in grays and browns, some appearing quite as gray and dark as the average Texas specimen.

Crotalus scutulatus (Mohave Rattlesnake)

We found a juvenile of this species squirming on the road (having just been run over) at Todd, San Bernardino Co., Calif., at 7:40 P. M., this being the only snake seen dead or alive on the Mohave Desert.

In a museum at Flagstaff there was a stuffed specimen taken at Sedona, Coconino Co.

A roadside casualty was found at Congress Junction (desert association).

At Phoenix, in the exhibition of C. L. Evans, we saw a brood of six of this species, which had just been born (August 21st). Four were dark and two light. One was born dead and was kindly presented to the writer.

O. D. Herron at the Reptile Inn, who readily distinguishes this species (he had none in captivity at the time), stated that they were found with *C. atrox* in the Gila wash. I have a number of preserved specimens from that locality.

Crotalus confluentus confluentus (Prairie Rattlesnake)

This subspecies is without doubt the most common snake between Winona and Adamana and probably further east as well. West of Winona it is much less common, and may, indeed, be absent at Flagstaff, although it certainly occurs north of the San Francisco Peaks and at Valle and Anita, Coconino Co.

I was much interested in seeing a number of specimens from the neighborhood of Winslow and Holbrook, in order to get all possible data on the relationship of the stunted, red snakes found in that vicinity, with the larger green specimens found both to the east and west.[45] Notwithstanding a large series of specimens available, I am still undecided as to the status of this stunted form.

The specimens seen were as follows:

Locality	*Character*	*Association*	*Remarks*
6 mi.E. of Flagstaff	Olive-brown, medium	Forest	DOR[46]
7 mi. W. of Two Guns	Red-brown, stunted	Rocky plain	DOR
6 mi. W. of Two Guns	Red-brown, stunted	Rocky plain	DOR
5 mi. E. of Canyon Padre	Gray-brown, stunted	Rocky plain	Caught
Two Guns	Gray-brown, stunted	Rocky plain	In captivity
4 mi. N.W. of Meteor Crater	Red-brown, stunted	Rocky plain	DOR
Meteor Crater	Dark brown, stunted	Rocks	Purchased
Dennison	Olive-green, large	Sandstone, grass	DOR
6 mi. W. of Winslow	Dark olive, medium	Grass	DOR
3 mi. N. of Holbrook	Brown, stunted	Grass	DOR
6 mi. N. of Holbrook	Red, stunted	Grass	Caught
22 mi. N. of Holbrook	Red, stunted	Grass, rocks	Caught

[45] Trans. San Diego Soc. Nat. Hist., 1930, Vol. 6, No. 3, p. 126.

[46] Dead on the road.

The last three points are in Navajo Co., the others in Coconino Co.

We were told, both at Flagstaff and Two Guns, that the small stunted specimens were known locally as sidewinders. A considerable variety of rattlers are given this popular name in California and Arizona, in localities where the true sidewinder, *C. cerastes,* does not occur.

Crotalus confluentus oreganus (Pacific Rattlesnake)

A specimen was noted run over on the road at San Marcos, San Diego Co., California (fields, orchard).

A second, large specimen found dead at Crookton, Yavapai Co., was of special interest, as it was found out on a grassy plain, without nearby mountains or rock outcrops. This seems to prove that it is the heat, rather than the lack of rocks and brush, which restricts this form to the mountains of southern Arizona, giving way to other species in the lowlands just as it is replaced by *C. scutulatus* in the Antelope Valley and Mohave Desert in California.

In the Dean Eldredge Museum at Flagstaff two freshly collected skins of this species were seen; one was from Oak Creek Lodge and the other from Long Valley (northeast of Pine), both points being in Coconino Co. These skins were of the usual dark, Arizona type.

Crotalus confluentus mitchellii (Bleached Rattlesnake)

I was told both at Wickenburg and Mohawk, from which points I had previously received specimens, that this species is found only in rocky hills and not on the desert flats. Eight miles southeast of Wickenburg a specimen was seen in captivity; it was said to have been collected at that point and was of the reddish color characteristic of this snake in this area.

Crotalus cerastes (Sidewinder)

This species is common around Mohawk, Yuma Co., where specimens were seen in captivity. They are usually caught by following up their tracks early in the morning.

PLATE 1

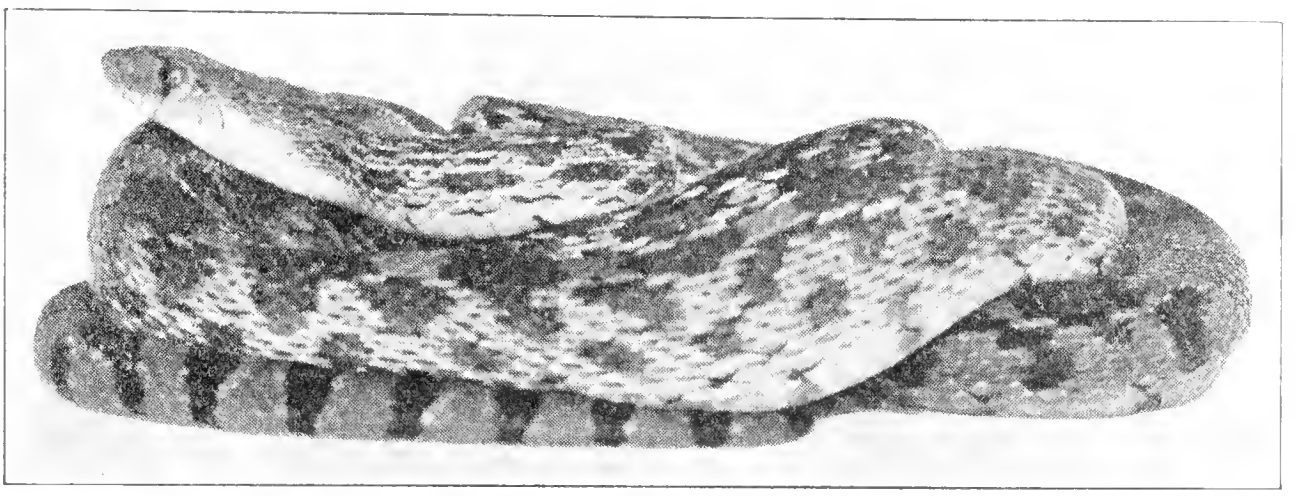
Photographs by Dr. J. Van Denburgh and J. R. Slevin.
Published through courtesy of the California Academy of Sciences.

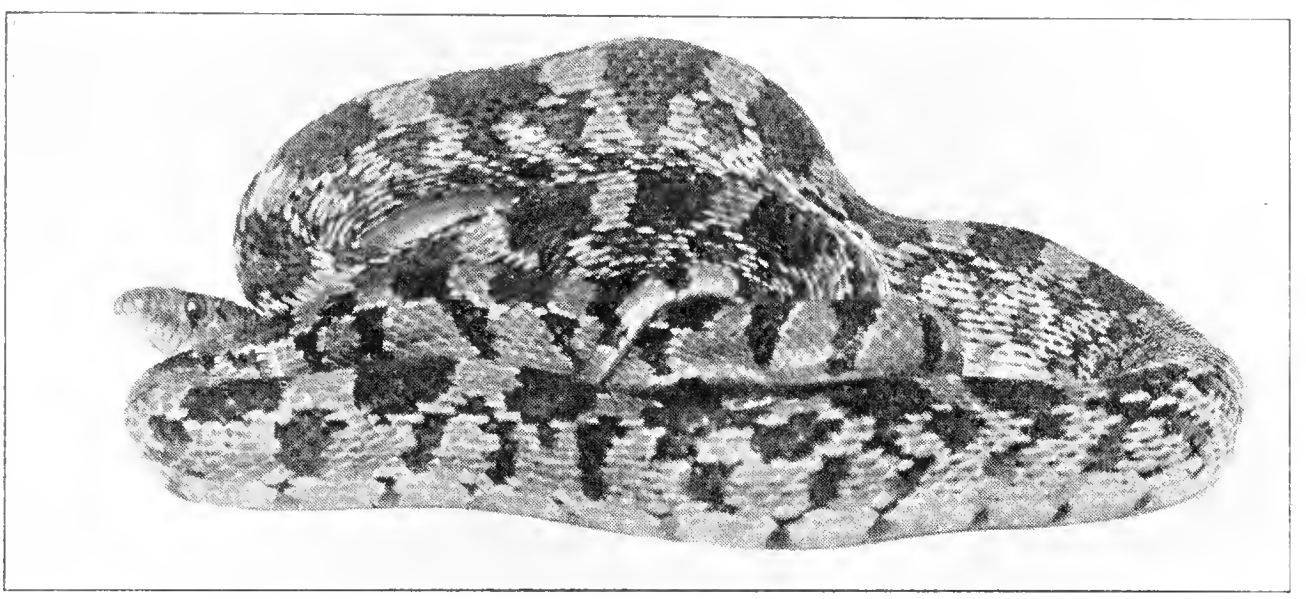
FIGS. 1-2. ARIZONA BULL (OR GOPHER) SNAKE
Pituophis catenifer rutilus

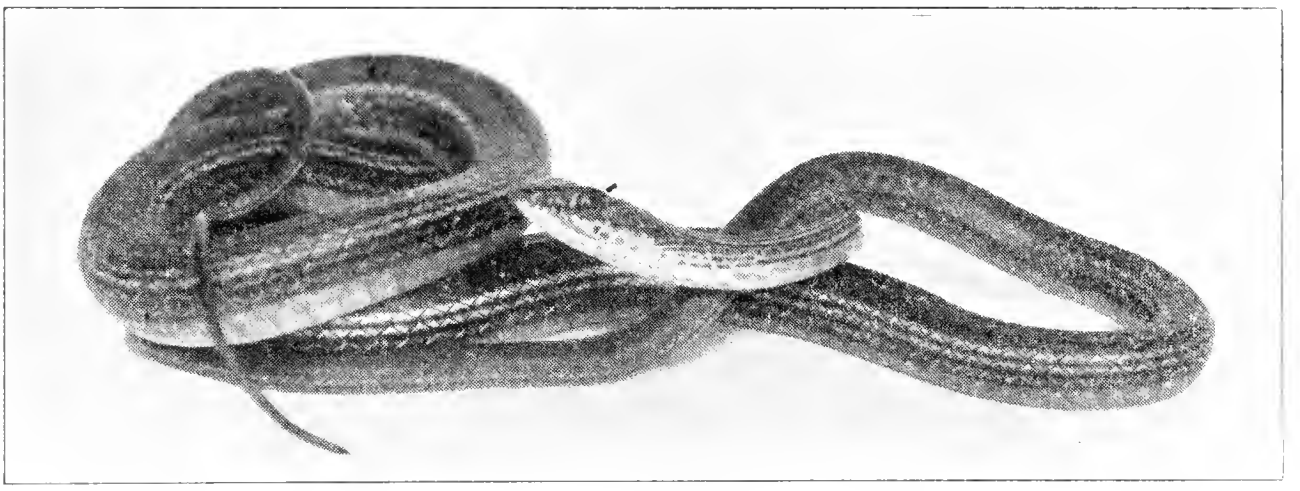
The largest of the non-venomous snakes used by the Hopi in the Snake dance.

FIGS. 3-4. GREAT BASIN STRIPED RACER
Masticophis taeniatus taeniatus

Another species of non-venomous snake commonly used.







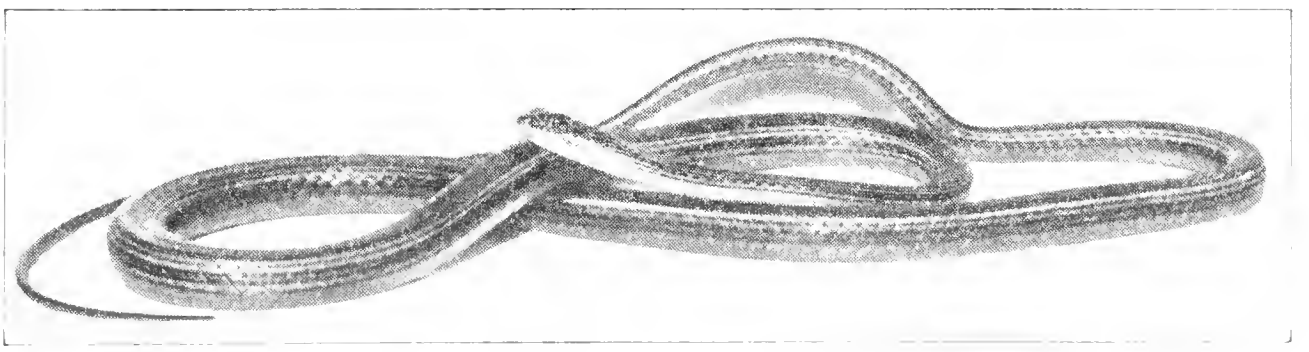


PLATE 2

Photographs by L. C. Kobler and L. M. Klauber

FIG. 1. PRAIRIE RATTLESNAKE
Crotalus confluentus confluentus

The "large green" phase characteristic of northern Arizona. This form of rattlesnake predominates in the ceremony.

FIG. 2. PRAIRIE RATTLESNAKE
Crotalus confluentus confluentus

The larger specimen is from Kansas; the smaller is one of the "stunted red" phase characteristic of the Winslow-Holbrook area in Arizona. Both are adults. The small red snake occasionally appears in the dance.

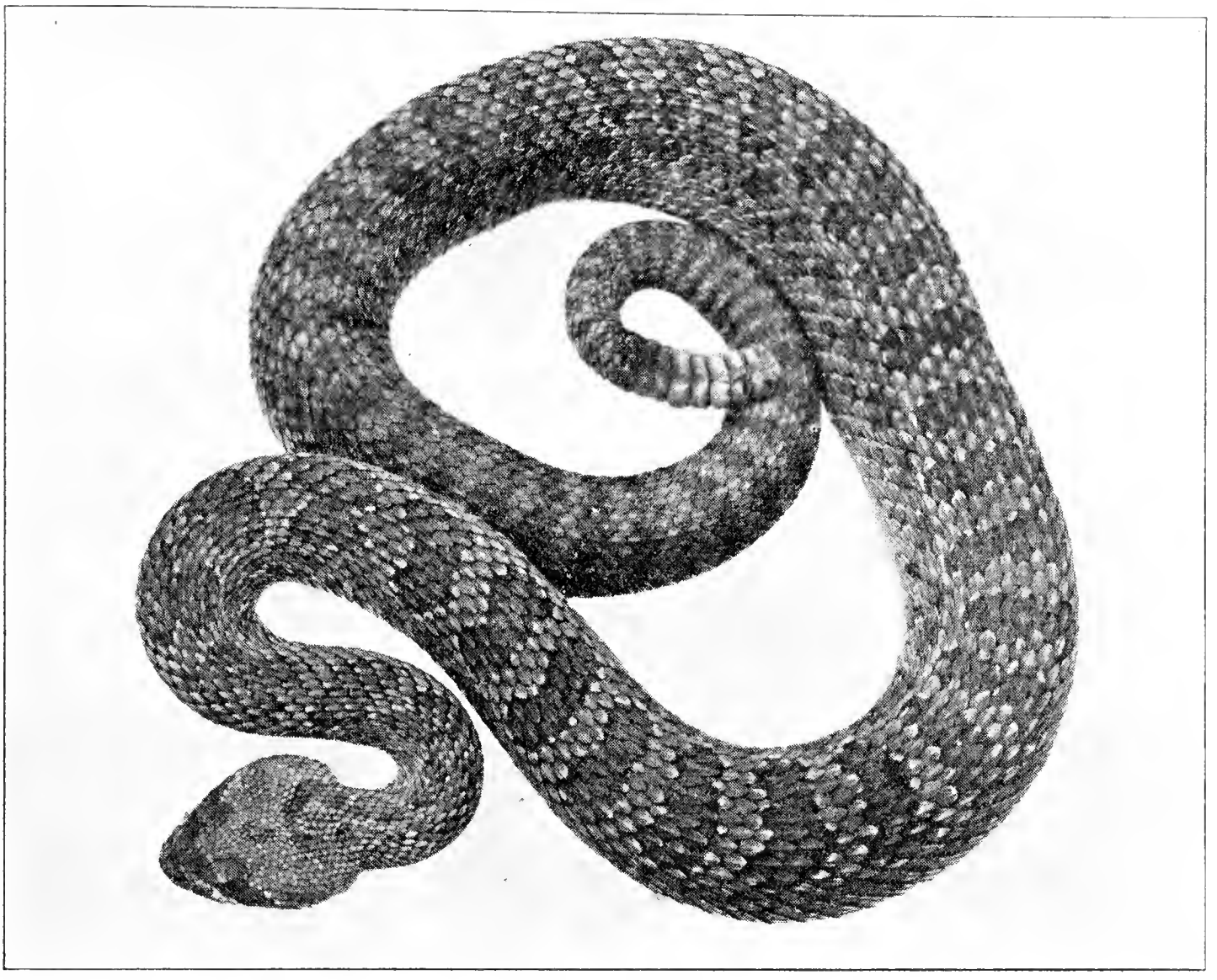


PLATE 3

Photograph by L. C. Kobler and L. M. Klauber

PRAIRIE RATTLESNAKE

Crotalus confluentus confluentus

The intermediate or "olive-green" phase characteristic of the Winona area in Arizona.

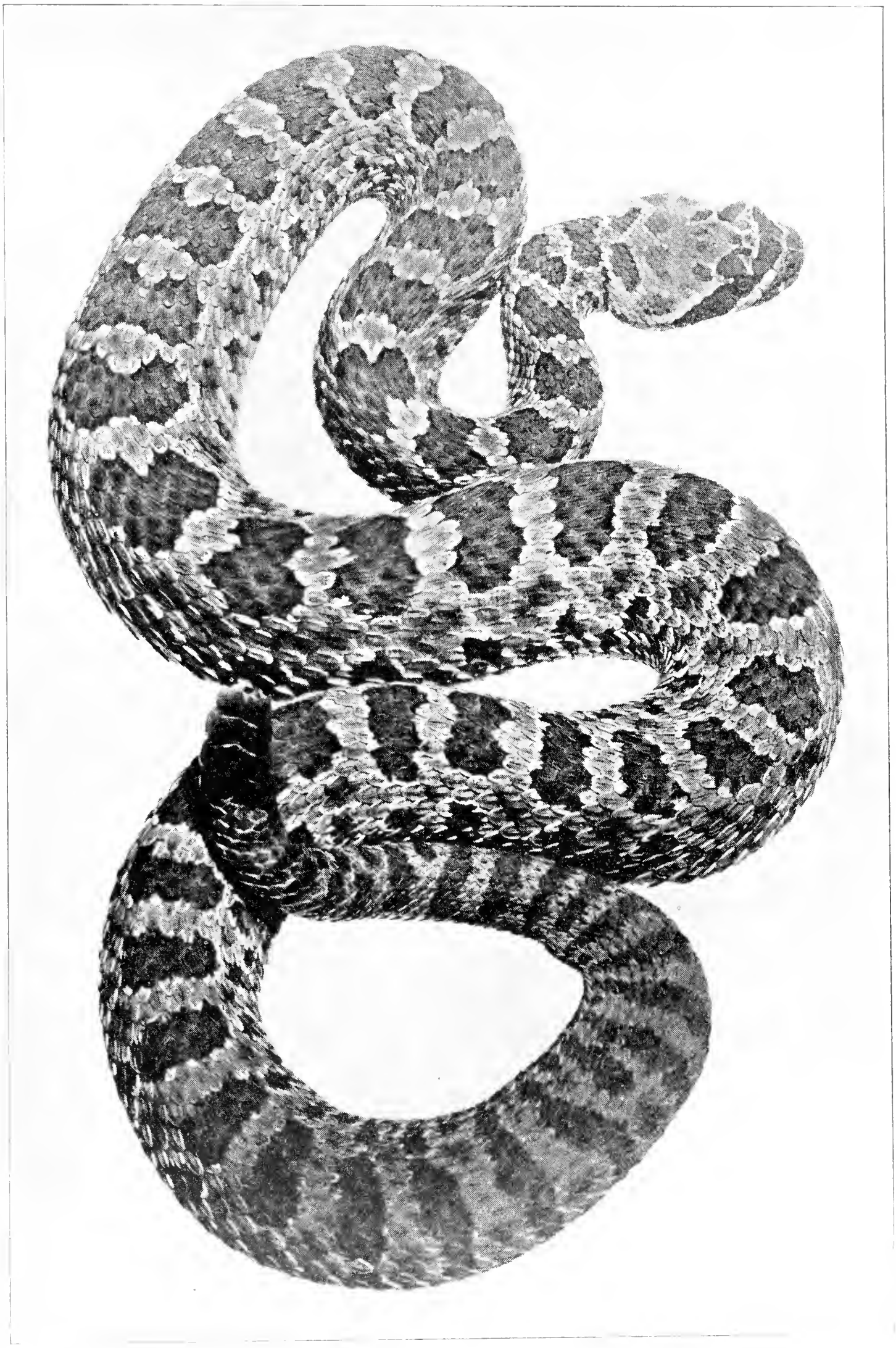


PLATE 4

Photographs by Dr. P. M. Jones. Published through courtesy of the Museum of Anthropology, University of California.

FIG. 1. THE ORAIBI DANCE, 1902

A carrier is seen in the center foreground. The snake, while held in the teeth, is steadied with the hand, a characteristic of the West Mesa dance. The Antelope priests are on the right, lined up before the kisi, or cottonwood bower. The white objects which they hold are buckskin rattles.

FIG. 2. THE ORAIBI DANCE, 1902

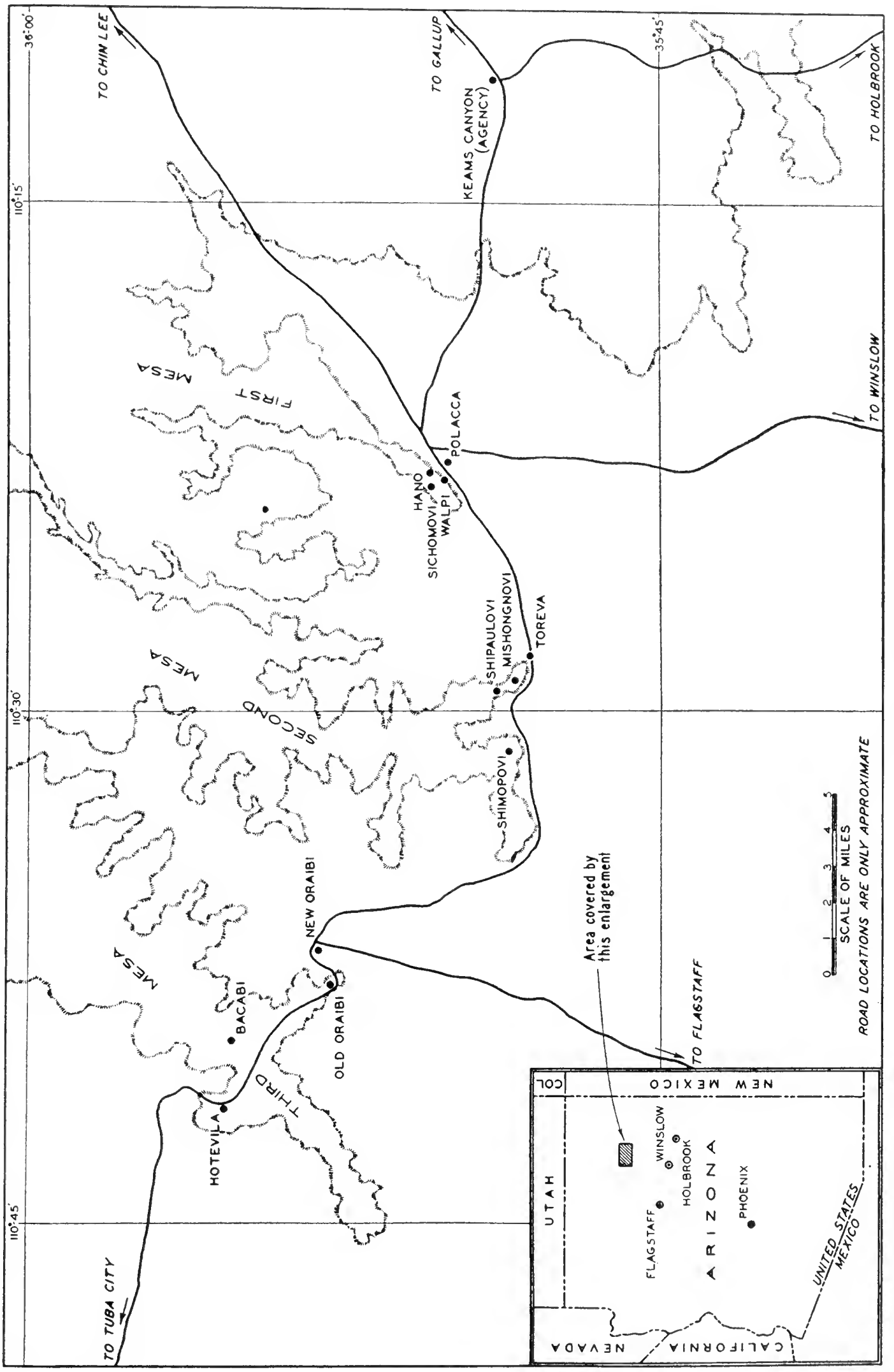
The kisi, and the Antelope priests. The central figure is a gatherer holding snakes.

HOPI SNAKE DANCE

PLATE 4

PLATE 5

MAP OF TUSAYAN



MAP OF TUSAYAN