Collected Papers
IN HONOR OF
Lyndon Lane Hargrave

Albert H. Schroeder,
Editor

Contributors:
Harold S. Colton
Herbert W. Dick
Florence H. Ellis
Hildegarde Howard
Norman G. Messinger
Allan R. Phillips
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Papers of the Archaeological
Society of New Mexico: 1

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CONTENTS

Preface v

Lyndon Lane Hargrave: A Brief Biography
*Herbert W. Dick and Albert H. Schroeder* 1

Frontiers of the Sinagua *Harold S. Colton* 9

Typology, Technology, and Activity *Joel L. Shiner* 17

A Burial Bundle from Coahuila, Mexico *Walter W. Taylor* 23

An Interpretation of Prehistoric Death Customs in Terms of Modern Southwestern Parallels *Florence Hawley Ellis* 57

Six Historic Pottery Types from Spanish Sites in New Mexico *Herbert W. Dick* 77

Birds and Feathers in Documents Relating to Indians of the Southwest *Albert H. Schroeder* 95

Limb Measurements of the Extinct Vulture, Coragyps Occidentalis; With a Description of a New Subspecies *Hildegarde Howard* 115

The Instability of the Distribution of Land Birds in the Southwest *Allan R. Phillips* 129

A Hairy Woodpecker from Petrified Forest National Park, Arizona *Norman G. Messinger* 163

Ponderosa Pine, Climatic History, and Conifers as Pioneers *Erik K. Reed* 165
LIST OF FIGURES, MAP, AND TABLES

Frontispiece: Lyndon Lane Hargrave  vi

Fig. 1. Coyote bundle burial, Coahuila, Mexico  37
Figs. 2-4. Multiple bead and cord pendants  38-40
Fig. 5. Gourd bottle with engraved design  41
Fig. 6. Shell pendants  42
Fig. 7. Shell bead, pair of sandals, and stone projectile point  43
Fig. 8. Sling  44
Fig. 9. Banded netting strip  45
Fig. 10. Checker netting strip  46
Fig. 11. Checker and banded netting strips  47
Fig. 12. Banded netting strips  48
Fig. 13. Designed netting textile  49
Figs. 14 -18. Woven strips  50-54
Figs. 19 -20. Woven robe  55-56
Fig. 21. Cut and broken grave goods from shrine of the dead, Jemez Pueblo  61
Fig. 22. Native drawing of deceased woman and grave goods  61
Fig. 23. Casitas Red-on-brown and Powhoge Polychrome sherds  88
Fig. 24. Casitas Red-on-brown jars, bowl profiles, and flange plate profiles  89
Fig. 25. Casitas Red-on-brown shapes, decorative patterns  90
Fig. 26. Powhoge Polychrome jar designs, interior flange plate, and small jar exterior  91
Fig. 27. El Rito Micaceous Slip sherds, exterior, and interior; and Kapo Black  92
Fig. 28. Carnué Plain upper jar forms and jar shapes; Powhoge Polychrome flange plate  93
Fig. 29. Carnué Plain rim sherds and Petaca Micaceous sherds  94

Map 1. Sinagua Areas  11

Table 1. Principal sites on the west and north Sinagua frontiers  12
Table 2. Northeastern Sinagua frontier sites  14
Tables 3-9. Measurements of Limb Bones of Pleistocene and Recent Coragyps  117-121
Table 10. Comparison of Skeletal Proportions in C. occidentalis and C. atratus  123
Table 11. Size of Coragyps occidentalis mexicanus Compared to C. occidentalis occidentalis  125
PREFACE

The Board of Trustees of the Archaeological Society of New Mexico, at the May 1967 Annual Meeting held in Albuquerque, unanimously approved a motion to publish a series of papers, or honor periodically a Southwestern archaeologist who has made significant contributions to the field, and that the person selected be presented with a book containing articles written by colleagues who have been associated with his particular areas of interest over the years.

It is with pleasure that the Society dedicates its first volume to Lyndon Lane Hargrave, known as Lyn to his friends, a man recognized for his taxonomic approach to Southwestern ceramic classifications, for his role in helping to close the gap in the Southwestern dendrochronological sequence of prehistoric times, and for his development of the field of archaeo-ornithology in the Southwest beyond the restricted limits of identification.

The papers contributed by Hargrave's associates reflect his interests in archaeological detail, taxonomy, and association, all of which are basic to good interpretation.

Lyn, who presently is trying to keep up with new archaeo-ornithological material submitted to him for study while attempting to produce manuscripts on completed work, will understand that several others approached to submit articles were unable to do so because of the press of prior commitments. We partially are to blame for having, in June 1967, set a date of December 1967 for submission of papers.

We are grateful to the contributors for their rapid response in meeting deadlines. Our special thanks are extended to Jack D. Rittenhouse and Richard L. Polese of the Museum of New Mexico Press. Their experience in publishing cleared the way to final publication with a minimum of delay. We also are indebted to George Ewing, Curator, Laboratory of Anthropology, Museum of New Mexico, for his cooperation throughout. For the numerous typing chores, we are grateful to Mrs. Caroline W. Baxley and Miss Ortencia Gonzales and for final copy to Mrs. Sarah Lee Chavez. And many thanks go to Mrs. Elizabeth T. McKinney and my wife, Ella M. Schroeder, for assistance in proofreading.

January 1968

Albert H. Schroeder
LYNDON LANE HARGRAVE
LYNDON LANE HARGRAVE

A Brief Biography

by

Herbert W. Dick and Albert H. Schroeder

Lyndon Lane Hargrave has an impressive record in the development of research tools in the early phases of modern archaeology in southwestern United States. He also has influenced students in archaeology and biology with special emphasis on ornithology and its ecological implications. In archaeology, the cultures of northern Arizona were the first to come under his close scrutiny through systematic excavation and interpretation. Among his early, important achievements were the systematic description and ordering of pottery, the first in the Southwest; first hand experience in early phases of tree ring study; and the recognition of the importance of ecological studies based on faunal remains recovered from excavations in ancient ruins.

Today, as in the past, Mr. Hargrave is very active in archaeo-ecological studies and is particularly concerned with ornithology and its place in interpreting the environment of ancient man. He has just finished one of the most complete and important treatises ever written on the Mexican Macaw in Southwestern Indian cultures of the past. A number of other specific studies are in various stages of completion.

Hargrave, an innovator and leading researcher during the opening period of modern research in Southwestern archaeology, was born in Franklin, Georgia on May 30, 1896. Later his family moved to North Carolina.

His leanings toward archaeology and natural history developed at an early age. The Georgia region contained Indian mounds which led to his first interest in archaeology. He recalls finding chipped stone blades up to a foot in length. He also had a passing interest in the birds of the region.

In 1914, at the age of 18, Hargrave entered Smithdeal Business College in Richmond, Virginia, where he studied for two years. After business college he continued his education at Western Carolina Teachers College, enrolling in the fall of 1916 and obtaining a degree in the spring of 1917. During his residence at college he started a chapter of the Audubon Bird Society. He also had an active interest in collecting and preserving Indian
artifacts and natural history items, which were exhibited at the college.

Both his father, a teacher, and his mother exerted a great deal of influence on his proclivity for study and research.

If it had not been for World War I and an uncle in the Southwest, it is likely that he might have remained a teacher in the South. In August 1917, he enlisted in Company D, 113th Field Artillery, United States Army and later transferred to the Signal Corps. He arrived in Europe August 1918 and served in both Belgium and France for the duration of the war. While still in Europe waiting to be rotated home, word came from the uncle, who was Superintendent of Roosevelt Dam, that a position as hydrographer for the Salt Valley Users Association was being held open for him. Mr. Hargrave assumed the position of hydrographer in October 1919 and continued until September 1926.

During his tenure at Roosevelt Dam his interest in ornithology lagged due to a lack of publications on Arizona birds. His primary interest now shifted to the Indian sites exposed during periods of low water impounded behind Roosevelt Dam. His work drew the attention of Dr. Byron Cummings, then chairman of the Department of Anthropology at the University of Arizona, who urged him to enter the University, which he did in the fall of 1926.

Hargrave was a member of the university group headed by Dr. Cummings which in 1926 excavated a mammoth skull near the Double Adobe School, 12 miles northwest of Douglas, Arizona. This marked one of the first of the paleo-Indian finds in the Southwest.

In 1927, Hargrave participated in a river salvage program, perhaps one of the first of its kind in the Southwest, as a member of a University of Arizona group working on sites to be flooded by Coolidge Dam near Bylas on the San Carlos Indian Reservation.

In the spring of his senior year, 1928, he spent several months in the Hopi villages as a member of the Second National Geographic Society Beam Expedition directed by Dr. A.E. Douglass. The project staff collected a sample of every beam possible in the ancient but still inhabited villages. It was while collecting in the Jeddito Valley site of Kawaiku that the feasibility of dating a piece of charcoal was demonstrated. The first date was A.D. 1365-1420. Since charcoal was much better preserved and more plentiful than unburned timbers in prehistoric sites, this discovery gave promise of good return.

In February 1929, Hargrave left graduate work at the University of Arizona to become Field Director and Curator of Archaeology at Dr. Harold S. Colton’s embryonic institution, the Museum of Northern Arizona. Hargrave by now had developed a method of using ceramics as a useful guide for determining the relative age of sites. He worked again for Dr. Douglass as a member of the Third National Geographic Society Beam Expedition. The main objective was to locate a site that would produce tree ring material to fill a gap in dates prior to A.D. 1260 and after a long series of unknown dates derived from earlier prehistoric sites. One of four possible sites, located at
Showlow, Arizona, was selected for excavation because it exhibited pottery
types that fit in the relative ceramic sequence between both ends of the gap.
On June 11, 1929, Hargrave with Emil W. Haury, then a student at the Uni­
versity of Arizona, left Flagstaff to excavate a ruin in Mr. Edison Whipple’s
backyard in Showlow. On June 22, the famous charred log HH39, the 39th
specimen recovered by Hargrave and Haury and which could be considered as
the “Rosetta log” of Southwestern tree-ring dating, provided the data to span
the gap.

In 1930, the Museum of Arizona released Hargrave on a half time basis to
teach anthropology at Arizona State Teachers College in Flagstaff. The dual
role of researcher and teacher continued through 1931.

During the field seasons of 1930, 1931, and 1932, he directed excavations
in pit houses and pueblos at sites in Medicine Valley, Arizona, and undertook
some additional work in Walnut Canyon in 1932. Also in 1931, Mr. Hargrave
published a paper entitled “The Influence of Economic Geography Upon the
Rise and Fall of Pueblo Culture in Arizona,” which marks the beginning of
the shift in his research emphasis toward ecological details.

It was in the early 1930’s that he actively began collecting birds for compara­
tive studies with similar material recovered from Indian ruins. Dr. Alex Whet­
more of the Smithsonian Institution, a leading ornithologist, exerted consider­
able influence during a visit to Flagstaff, and a close, working relationship con­
tinued over the years. Hargrave’s comparative collection has since grown to
over 300,000 individual bird bones, not counting prepared skins and feather
samples; many are rare specimens. By 1932, aside from his archaeological publi­
cations, six papers were devoted to birds.

In the spring of 1932, his “landmark” paper, “Guide to Forty Pottery Types
from the Hopi Country and the San Francisco Mountains, Arizona,” was pub­
lished. This was the first effort in ordering, naming, and describing pottery types
of the Southwest. The paper served as a pattern for the scientific ordering of one
of the archaeologist’s most important tools. Out of this early volume grew the
still classic work by Colton and Hargrave, “Handbook of Northern Arizona Pot­
tery Wares,” published in 1937.

In 1933, Hargrave began excavations at Wupatki (now Wupatki National
Monument) and from June until September was in charge of the field parties of
the first Rainbow Bridge-Monument Valley Expedition whose purpose was to ex­
amine some 3,000 square miles of hitherto scientifically unexplored territory in
northeastern Arizona and southwestern Utah. Seventy-three individuals were in­
volved, representing the fields of archaeology, geology, zoology, botany, and
engineering.

Excavations were resumed at Wupatki in December 1933 and closed down
in May 1934. In July and August he again was in charge of excavations for the
second Rainbow Bridge-Monument Valley Expedition.

In 1937, he continued field research in the Kayenta, Arizona district, exca­
vating a Basketmaker III and Pueblo I site.
In the spring of 1938 he conducted a Museum of Northern Arizona archaeological survey in northwestern Arizona, principally in the Hualapai Indian area, with the aid of the AT & SF Railroad who supplied the services of Mr. George Davis and Miss Sara J. Tucker who had an extensive knowledge of the literature of the region. The summer was spent excavating Cohonina sites a few miles north of Williams, Arizona. On the basis of the survey and the excavations, Hargrave proposed the term "Patayan", meaning the "old people" in the Hualapai language, to cover these northwestern Arizona prehistoric patterns.

Early in 1939, Mr. Hargrave left the Museum of Northern Arizona to seek help to pursue studies in ecology and climate but had little success. Throughout both summer and winter of 1939 and 1940 he was in the field studying Merriam's turkey as a leader of the Pittman-Robinson project in the Black River area of the White Mountains in Arizona. This project gave him the opportunity to prepare himself in depth for future studies of the western turkey in relation to prehistoric Indian culture. All of this has borne fruit in some new concepts and conjectures in a recently completed, but unpublished paper.

On June 16, 1940 Mr. Hargrave entered business in Benson, Arizona, which he successfully continued for 16 years. It was during this time that he married a childhood friend and widow, Mrs. Beth Moore Hunter, whose understanding later contributed much towards Hargrave's return to the field. During this period in business, his spare-time efforts concentrated on Arizona bird studies, working with Dr. Allan R. Phillips and Dr. Herbert Brandt, two leading authorities on North American birds.

On May 1, 1956 he accepted an appointment as a National Park Service collaborator without compensation to continue researches in archaeology and ornithology, concentrating on matters of ecology and osteo-ornithology, in the National Park Service research facilities at Globe, Arizona. Two objectives have since been achieved—the development of a leading center for bird bone identification and the investigation, through macro and micro studies, of feathers which are so frequently found in dry caves in the Southwest. The plea Hargrave made 30 years ago in the publication, "A Plea for More Careful Preservation of All Biological Material from Prehistoric Sites," had not fallen on deaf ears.

During his time with the National Park Service, Hargrave helped to obtain specimens for the visitor center museum at the Grand Canyon, was laboratory director for the Museum of New Mexico highway salvage project in the Prewitt district in western New Mexico, and undertook archaeo-ornithology studies of material recovered from the excavations at Picuris Pueblo, the Wetherill Mesa project in Mesa Verde National Park, and the Amerind Foundation investigations at Casas Grandes, Mexico, to mention a few. The accompanying bibliography provides a measure of Lyndon Lane Hargrave's activities and contributions over a long and still active career.
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Hargrave, Lyndon L. and Harold S. Colton


Hargrave, Lyndon L. and Allan R. Phillips


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The Comparative Osteology of Mexican Macaws and the Occurrence of Macaws in Southwestern Archaeology. (National Park Service)
At the present time nearly 10,000 prehistoric sites are recorded in the archaeological survey, begun in 1916 and continued by the Museum of Northern Arizona for 51 years. On each of these sites, most of which lie within 100 miles of Flagstaff, a sample of potsherds was collected which form a permanent collection in the Museum. This material was first studied by L. L. Hargrave (1932) and the pottery types determined. In addition, a large number of significant sites have been excavated.

We can now recognize certain pottery types as having been manufactured by a particular group of prehistoric people called by Gladwin (1934) a branch, which represents a prehistoric Indian tribe producing distinctive objects of material culture. Although many household objects made by the Indians are perishable, pottery can withstand weathering on the surface of the ground and underground for long periods of time. Therefore, pottery is the best available indicator of the culture or the branch that produced it (Tables 1, 2).

Among the prehistoric people of northern Arizona is a branch called Sinagua (Colton, 1946). Sinagua means “without water.” Of course the people needed drinking water, but some of these Sinagua lived in dense concentrations a long distance away from any present source of water—a spring, natural tank, or a living stream. Thus, the name is now appropriate, though water sources in the past might have been quite different.

The utility pottery that the Sinagua manufactured in great quantity was a plain red or brown ware, in rare cases decorated with coarse white lines, which distinguishes it from the pottery of neighboring branches. These latter people, the Kayenta on the northeast, the Cohonina on the northwest, and the Cibola on the east, made gray utility pottery. Although the Mogollon to the southeast and the Salado to the south made brown or red utility pottery, the types may be distinguished from those of the Sinagua.

In architecture the various branches also differed in early times. Later, when they all lived in masonry pueblos, the Kayenta branch to the north and the Cibola branch to the east of the Sinagua constructed circular and rectangular ceremonial rooms separate from the pueblo called kivas, with a ventilator and deflector in front of the fireplace. The Sinagua pueblos on the other hand
had ceremonial rooms usually included among the dwelling rooms, not detached. The Cohonina seem not to have had distinctive ceremonial rooms or structures (McGregor, 1951; 1967).

The Prescott branch on the southwest seems to be more like the Sinagua in their late architecture, but little study has been made of this group. Some of the Prescott branch might have joined the people on the northern Sinagua frontier between 1100 and 1200 A.D. (King, 1949, p. 146). However, the pottery with mica temper is very characteristic. This character may be due more to the granite environment than to culture. The Hohokam branch appeared in the Verde Valley prior to A.D. 900 with distinctive jacal type architecture found in the Salt River Valley, along with the same red-on-buff pottery, but these people were superseded by the Sinagua about A.D. 1125.

Most of these various tribes or branches were separated from the Sinagua by natural barriers (Map 1). A great ponderosa pine forest, including the San Francisco Peaks and O’Leary Mountain, formed a boundary between the Cohonina and the Sinagua. Neither the Sinagua nor the Cohonina had habitations far within the forest as agriculture was impossible.

At the Coconino Divide, a pass in the San Francisco Mountains, a strong Cohonina fort (NA 862) with walls four feet thick was built in PII times, apparently in defense against the Sinagua. This structure shows evidence of having been destroyed by fire (Colton, 1946, p. 81) and represents a true frontier building. Three other Cohonina frontier forts in the same vicinity have not been studied, but another on a volcanic crater near Williams, Arizona was excavated by Hargrave (1933, p. 49).

The big ponderosa pine forests of the Tonto Rim country separated the Sinagua from the Salado to the south and the Mogollon to the southeast. Another frontier of the Sinagua, with very few sites, lay to the east between East Clear Creek and Chevelon Creek, separating them from the White Mountain cultures. The important frontier sites in this direction are the PIII and PIV sites in Chavez Pass. Also east of the Sinagua, but farther north, lies an arid, uninhabited strip about 14 miles wide along the west side of the Little Colorado River valley from East Clear Creek northwest to beyond Deadman Wash, separating the Sinagua from the Kayenta.

Only in one instance did the Sinagua penetrate beyond these natural borders. In late PII times some of the Sinagua expanded south through a narrow forest barrier and moved down Oak Creek into the Verde Valley. Here they adopted Hohokam irrigation technology and remained until about A.D. 1400.

Most of the frontiers of the Sinagua to the west and south are deep forests of ponderosa pines, but to the east it is a wide, arid, almost uninhabited land with little available water. To the north, however, the mountainous forest is broken by an open strip about 13 miles wide, leaving no natural boundary between cultures. Here the Sinagua, Kayenta, and Cohonina mingled. In this locale we find mixed sites such as that beside Heiser Spring and another site called Juniper Terrace, each house of which exhibits a different culture. These
sites were excavated in 1931 and 1932 by L. L. Hargrave (Colton, 1946, pp. 128, 145).

Although there is no natural boundary between the cultures in this area, an invisible boundary separates the remains of the Kayenta culture from the Cohonina to the west. However, a triangular area north of O’Leary Peak, extending nearly to the Citadel, contains sites with components of all three cultures.

Other frontier Kayenta sites to the east, such as Wukoki, Grand Falls, and Burned Pueblo, border on the Sinagua. Facing these Kayenta sites are a series of Sinagua sites extending to the southeast, such as Wood House Mesa, Wupatki, the Sinagua components at Heiser Spring, Ridge Ruin, Wilson Pueblo, Kinnikinick, and Chavez Pass.

From Wupatki, the Sinagua-Kayenta border runs in a northwesterly direction to Doney Mountain, then west following approximately the boundary between
Northwestern Frontier:
area north of O'Leary and the
Coconino divide on U.S. 89
north, east to Doney craters,
west to beyond Mt. Floyd, and
north to Grand Canyon.

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<td>E</td>
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<td>PIII</td>
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<td>PII It.</td>
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<td>PII It.</td>
<td>1050-1100</td>
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* Also  Prescott Gray Ware
(1) 9% Prescott Gray Ware  (3) 10% Prescott Gray Ware  KEY:  It- late  TR- Tree Ring  gr- grams  T- Trace
(2) 1% Prescott Gray Ware  (4) 28% Prescott Gray Ware

**FRONTEIRS OF THE SINAGUA**

Principal sites on the west and north Sinagua frontiers showing percentages of Cohonina, Kayenta, and Sinagua utility pottery sherds. These data are based on the sums of the percentages of sherds of Deadmans Gray and Deadmans Fugitive Red for the Cohonina culture; Tusayan Corrugated and Moenkopi Corrugated for the Kayenta culture; and Rio de Flag Brown, Turkey Hill Red, Sunset Red, Angell Brown, and Winona Brown for the Sinagua culture.
Northeastern frontier (with no barrier): east of the foothills of O’Leary Peak there are no geographical barriers to the spread of the Sinagua Culture. Contact is direct with Kayenta with some Cohonina infiltration.

<table>
<thead>
<tr>
<th>NAME OF SITE</th>
<th>STRUCTURE NA NO.</th>
<th>CULTURE STAGE</th>
<th>DATE A.D.</th>
<th>TOTAL NUMBER SHERDS</th>
<th>COHONINA</th>
<th>KAYENTA</th>
<th>SINAGUA</th>
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<tr>
<td>Crack-in-rock</td>
<td>Pueblo</td>
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<td>1150</td>
<td>37</td>
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<td>TR 1308</td>
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<td>2603</td>
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<td>PIV</td>
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<td>226</td>
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<td>38</td>
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<td>Circular Kiva</td>
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<td>1314 gr.</td>
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<td>Pithouse</td>
<td>PI</td>
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<td>1788</td>
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<td>Kiva and Pueblo</td>
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<td>1150 +/-</td>
<td>1859</td>
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<td>TR 1269-1308</td>
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(1) Prescott Gray Ware 35%
(2) Prescott Gray Ware 9%

KEY: TR-Tree Ring gr.-grams T-Trace
Wupatki National Monument and the Coconino National Forest to about U.S. Highway 89. North of this line lie the three PIII Kayenta sites, NA 680, 681, and 682, excavated by Watson Smith in Big Hawk Valley (1952), and the Citadel Group (excluding NA 358, Nalakihu) which appears to have as large a component of Sinagua as it does Kayenta.

West of U.S. Highway 89 the line separating the Cohonina from the Kayenta runs north to the high land at Grandview Point on the Grand Canyon rim, according to surveys by Gladwin and the Museum of Northern Arizona. All sites west of this line, such as those excavated by McGregor in the vicinity of Red Butte (1951), are Cohonina. The sites east of the line, such as Tusayan Ruin in Grand Canyon National Park, excavated by Haury (1931), are Kayenta.

CONCLUSION

We can see that natural barriers isolated the Sinagua; pine forests on the west and south and an arid strip to the east. The northern frontier, between the Kayenta and Sinagua, was an imaginary line which appeared to be more or less permanent during PII and PIII times, a period of 300 years, across which the cultures mixed. The ceramic methods on which this study was based were inaugurated about 1930 by Lyndon Lane Hargrave and published in 1932 as “Guide to Forty Pottery Types from the Hopi Country and the San Francisco Mountains, Arizona,” Bulletin No. 1, Museum of Northern Arizona. This work was revised in 1937 by Colton and Hargrave and titled “Handbook of Northern Pottery Wares.”

Museum of Northern Arizona
Flagstaff, Arizona
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Smith, Watson

INTRODUCTION

There is a great deal being written these days about the "new archae­ology." Most of the essays concern new ways of ordering data, new approaches to models and new applications of the statistical method. While these innovations are highly desirable, they nevertheless require a significant sample of behavioral traits in order for the conclusions to be valid. Many of the earlier writers have not described significant numbers of behavioral traits, particularly for the Paleo-Indian and Archaic sites. Later settlements, such as Pueblo ruins and Neo-American sites, for instance, show abundant ceramics, frequent examples of architecture, and a more varied array of stone tools.

There are several reasons why inadequate samples have been collected at some of the earlier sites. Among these are the relatively small size of some of the occupation areas, budgetary problems, and restrictions placed on those persons doing salvage archaeology. One principal reason, however, is the failure to realize that technological and activity studies are legitimate sources of information.

This paper will be limited to a discussion of chipped and flaked stone objects, realizing that these artifacts are only one category of things to which technological and activity studies might be applied. For the technological aspects, I generally follow Francois Bordes, University of Bordeaux (1961). Use studies follow the work of Semenov, Academy of Sciences, U.S.S.R. (1964).

TECHNOLOGY

Too often archaeologists believe that they are able to recognize stone technology by studying only the finished tool. I submit that the process of manufacture should be the heart of stone technology studies. The process can be understood only in terms of cores, debitage, tools, and debris. From a study of all these, one may arrive at the step by step process.

Although the potential importance of such studies has been stressed by numerous authors, few Americans have followed the Old World examples.
V. Gordon Childe wrote “just bashing two stones together is not likely to yield a usable flake or core tool. To produce either, the blow must be struck with precisely the right force and at the correct angle on a flat surface—the striking platform. The latter must in turn make an acute angle with an adjacent side of the lump and the blow must fall at the proper distance from the edge thus formed” (in Fried, 1958, p. 318).

A lead was offered by Colton and Hargrave in their ceramic studies but few persons seem to have noticed it—“First, the identification of materials used...characteristic of certain regions: second, recognition and knowledge of certain techniques of manufacture which make it possible to trace genetic relationships in time and space (another stable character since it is inherited): and third, characters acquired through personal contact as revealed in vessel form, style of design, and in methods of ornamentation which reflect such factors as trade relations and vogue” (1937, xi, xii). Though they admitted that technology might not work with stone, stone was not their milieu at the time. The lesson was obvious, typology equates with form and design while technology equates with materials and process.

Even earlier, starting in 1912, an American, H.L. Skavlem, made intensive technological studies as described by Alonzo Pond (1930).

Until some comparative studies have been carried out, using Paleo-Indian or Archaic materials, there is no way of knowing which technological attributes will prove to be useful. Cores may be considered to be pebbles, cobbles, or pieces of rubble from which flakes or blades have been removed. In this sense, the core is the means and not the end. Some cores are extensively prepared before the first desired flake or blade is detached. The flakes or blades thus removed are debitage until something else is done to them. This particular point will be enlarged on a bit later.

The finished tools are made from the debitage by consistent patterned forms of retouch, or they may be made directly from a pebble, a cobble, or a piece of rubble. With thin biface foliates, the debris may be the only clue to process. Thus, the debris will be the scraps or manufacturing waste that remain.

The following are only some of the observations that have been demonstrably significant in Europe, Asia, and Africa:

1. Cores: size, shape, number of platforms, preparation of platform, use for flakes or blades.
2. Debitage: flakes or blade length, shape, ratio of flakes to blades.
4. Debris: quantity, frequency of primary flakes, material ratios, debitage-debris ratio.

In the initial sorting there are a few problems, but there should be no real difficulty with the cores. The tools can be removed from the other artifacts using typological techniques, that is, consistent patterns of retouch. With ex-
perience, most of the debris can be sorted out. All three categories will receive further attention and study.

Debitage is a category that is not really subject to initial sorting. After the cores, typological tools, and the debris have been removed, there remains a group of flakes and blades, some of which might have been potential tools but were never deliberately retouched. Others might be flakes and blades that had been used as tools without prior retouch. If the residual scratches, nicks, or polish can reasonably demonstrate that the latter were used as tools, then they should be called tools. They are of a different order from the typological tools, but not necessarily of less significance.

ACTIVITY

The work of Semenov (1964) points the way toward the eventual recognition of the activity or use to which stone tools were put. Through microphotography and experimentation, Semenov is attempting to demonstrate that particular ways of using a tool leave particular marks on the edges or surfaces. Witthoft (1967, p. 383) has shown us the nature of some of the polished surfaces. Gerald Dawson is experimenting, not only with tool use, but with use areas within Paleo-Indian sites near Albuquerque, New Mexico (personal communication). There is no doubt but what this approach has a great potential, and that it will become standard practice in the future.

Because there are, potentially, ways of determining tool use, there is all the more reason for collecting the whole range of stone material in the site, not just the typological tools.

CONCLUSIONS

Now we have three perspectives for artifact study:

1. The traditional typological studies which should be based on form, but which unfortunately have frequently fallen back on assumed use.
2. Technological studies, based on the step by step process of making tools.
3. Activity studies based on residual use marks on both typological tools as well as on unretouched flakes or blades.

All of these studies should provide learned behavioral traits that are patterned and therefore cultural. Typological studies can be improved if we can worry a little less about assumed use. Technological studies have yet to be widely applied in North America but have yielded highly significant results in Europe and Africa. Using technological data, we were able to seriate many of the prehistoric sites within the Asway Reservoir of Egypt and Sudan (Wen-
dorph, 1965, xxx, xxxii). Activity studies are just in their infancy as this paper is being written.

The application of the latter two perspectives, technology and activity, should aid significantly in treating such hypotheses as the following.

1. Two sites are similar because they were occupied by members of the same ethnic group, or because of active trade, or because of environmental pressures.

2. Two sites are different because of distinct seasonal activity, because of separate ethnic affiliation, or because of a time factor.

All of these possible considerations need to be studied in terms of far more data than is usually available from collections of finished tools. Any application of the three perspectives is going to require the collection, transportation, and analysis of at least ten times as much material. I do not, however, recall any recent innovations in method that has not required more and harder work than we have done before.

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_Dallas, Texas_
Childe, V. Gordon

Colton, Harold S. and L. L. Hargrave

Pond, Alonzo W.

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Wendorf, Fred
1965 Contributions to the Prehistory of Nubia. Southern Methodist University Press, Dallas.

Witthoft, John
In 1941, while working at the United States National Museum on archaeological materials from the State of Coahuila, Mexico, I was assigned the task of opening and studying a burial bundle (USNM Accession no. 9462, Catalogue no. 45581). This bundle had been found in Coahuila—but over fifty years before! It was one of a collection of "two or more mummies left [in Monterrey, Nuevo Leon, with Ignacio] Galindo and sent to the U.S.N.M. by Ed Palmer." The accession notes further state that this particular bundle came from Coyote Cave in the vicinity of the city of Torreon, which lies in the so-called Laguna District of southwestern Coahuila. Coyote Cave (CM-88 in the Coahuila Survey of the U.S.N.M.) is one of those from which Edward Palmer, the famous "plant explorer" (McVaugh, 1956), had obtained the fabulous collection of cave materials now housed, but lying unstudied these long years, in the Peabody Museum of Harvard University (Studley, 1884; Hooton, 1930; Woodbury and Woodbury, 1935; Cosgrove, 1947; Aveleyra, et al., 1956). The site is one of the storied burial caves of Coahuila (Portillo, 1886) which have been visited and vandalized for many years but about which there is only one extensive, though partial, professional publication: Cueva de la Candelaria (Aveleyra, et al., 1956; for related bibliography, see Taylor, 1966).

The opening and study of the bundle took, as I recall it now, on the order of two months. The textile wrappings which formed the bulk of the packet were found to be in a remarkable state of preservation, somewhat faded as to color but virtually intact except for the side on which the bundle had evidently rested during its long sojourn in the cave. This side, that covering the right of the enclosed body, was badly stuck together, compacted, and decomposed, undoubtedly from the action of body juices draining downward from the decaying corpse. Textile fibers on the other three sides, even those of the "soft" variety, were firm and retained colors that are easily differentiated one from another, although in some places it is no longer possible to identify with any certainty what those colors may have been in aboriginal times. Specimens other than those of fiber were in practically mint condition,
although rodents had displaced a few objects and probably are responsible for the disappearance of pieces of what originally were quite surely complete artifacts.

The skeleton was found to be without skull, and the body had been wrapped and buried in that condition. On numerous occasions in northern Coahuila, I have heard rumors of sheltered sites in which skulls without other bones have been discovered; but if such sites do indeed exist, I have not been able to find one. Thus, it is not possible at present to say whether or not skull burial and/or skull-less burial is common in Coahuila. On the other hand, it is certain that complete bodies were often bundled and buried, both in the north and in the Laguna District as witness the findings of Palmer, Aveleyra, myself, and others. As for the post-cranial skeleton, the bones are well preserved and were in natural position, except for a few of the smaller hand and foot bones which had probably been carried off by the rodents. Support for this inference lies in the rodent nest which lay in the pelvis-ankle region and very close to which, if not demonstrably in it, were found several out-of-place cultural objects. The corpse had been flexed and the forearms placed between the legs. As far as I am presently aware, no study has been made of the bones (Fig. 1).

Several artifacts were found inside the bundle (Figs. 2-7). Some of these are undoubtedly ornaments which had been attached to the textile wrappings, but because of deterioration and post-burial disturbance it has not been possible to determine with positive assurance their original position upon the body. Nevertheless, by a process which may be called "inference by seriation," it is possible to develop at least some hypotheses concerning this matter. In the first place, no. A 3 is definitely tied to stranded material (no. F 2) although it was found, unattached to the main mass of that material, in the pelvic area close to the rodent nest; the tie-cord of no. A 2 was found between cords of stranded material and knotted so as to form a toggle to keep the pendant in place; and no. A 1 was among stranded material with its tie-cord free but knotted precisely as that of no. A 2. Thus it seems that all three multiple bead pendants were probably attached to the stranded material. The shell pendant (no. C 2) is also tied to cords of stranded material and was found with pendant no. C 3 below the body in the region of the chest; although neither no. C 1 nor 3 are fastened to stranded material, their tie-cords are identical to that of no. C 2 and could have been so fastened before the ties rotted or were chewed off; no. C 1 was found near the rodent nest, where no. A 3, tied to stranded material, was also discovered. It appears very probable that all six pendants were once attached to stranded material and that the three shell ones were located in the pectoral region; it is possible that the three beaded pendants were also located there.

The engraved gourd (no. A 4) was found between the folds of the woven robe (no. F 7); it lay at the shoulders just in front of where the face should have been. The projectile point (no. S 1) came from beneath the body in the pelvic area; it is impossible to say whether rodents brought it there or whether
(as agent of death?) it was actually embedded in the body at time of burial. The pair of sandals (no. F 6) were found on the feet of the body; the left foot lay on the right foot, and the toe-tie of the former still ran between the great toe and the next, while the heel-tie was over the calcaneus.

There can be no doubt as to the order in which the body had been wrapped. First, the stranded material (no. F 2) was wound around the headless body (which had only a pair of sandals as mortuary clothing) and fastened by a hitch (type?) and a square-knot to hold it in place; the exact technique involved could not be worked out because of the stiffness, brittleness, and compaction of the fibers. Next the woven strips (no. F 5) were wrapped around the thoracic and lumbar regions extending to the area of the shoulders. The woven robe (no. F 7) was the third wrapping; the body was probably placed on the robe with the feet more or less in the center, and the robe was pulled up tightly around the corpse so that it was stretched somewhat out of shape over the feet; how it had been fastened at the head end could not be learned. Over the robe and drawn tightly around the ankles was a sling (no. F 1). Next, a netting textile (no. F 4) had been wrapped around the lower parts of the body; one of its long selvage edges was drawn around the soles of the feet leaving an uncovered oval space through which the underlying robe could be seen (Fig. 1). As the final wrapping, netting strips (no. F 3) were wound around and probably fastened, but it has not been possible to learn more of the way in which this was done.

In the following pages, the specimens will be described only insofar as the details have not been provided in the accompanying illustrations. Some comparative information will also be given in order to bring out certain facts which are deemed of special interest or significance. Full comparative studies will not be attempted.

No. A 1 - Multiple bead and cord pendant (Fig. 2). The wrapping cords and those securing the beads are of hard fiber (Agave lechuguilla). The orange-colored tie-cord, however, is of soft fiber (Gossypium). Identification of the shell in this specimen and in others of the collection was made by Dr. Harald A. Rehder, then Assistant Curator, Division of Mollusks, Department of Biology, U.S. National Museum; for these and other courtesies, sincere thanks are given to Dr. Rehder. According to him, the shell bead “is Marginella apicina Menke, a common West Indian shell, which is also found along the shores of Mexico and Central America.” Explanation should be given here of the meaning of the notation which pertains to cordage and which appears on many of the illustrations: “1 @ .007” means that there is one twist of the constituent plies in 7 millimeters; “2 @ .003” means that there are two in 3 millimeters; a “twist” is defined as that portion of a ply-cord between its appearance on, and disappearance from, one side of the finished cord, thus:

![Diagram of a twist in a rope]

25
Taken together with the diameter of the finished cord, this measurement can be used to calculate an “index of tightness of twist” (Taylor, ms. a). This specimen and the other two multiple bead and cord pendants are remarkably like those found by Aveleyra in Candelaria Cave (Aveleyra, et al., 1956, Lam. 22-24); there can be little doubt but that the two sets of objects are indicative of the same cultural function and meaning—to use Linton’s terms (1936, pp. 402ff).

No. A 3 - Multiple bead and cord pendant (Fig. 4). Of this specimen, Rehder wrote: the long, double-holed beads (no. 1, 3, 5, 6, 7) are “pieces of shell carved to resemble the *Olivella biplicata* Sowerby of the Pacific coast of Mexico. The simulation is very well executed and the model from which they were copies is unmistakable.” It is notable that here we have a Pacific shell, while the shell of no. A 1 had come from Atlantic waters.

No. A 4 - Gourd bottle with engraved design (Fig. 5). This bottle was crushed and several pieces were missing. However, most of the design remains, although unfortunately the place where the lines of design intersect was not found. The workmanship of the engraving is rather crude, but the individual lines are quite sharply defined. The inside of the bottle was quite clean, indicating that it had probably contained no material substance when put in the bundle; on the other hand, it could have held water. We recognized no clues as to the idea(s) behind its inclusion, whether they might have had to do with sustenance in an after life, ornamentation, property values, or as surrogate for the missing head. It is worthy of note that Aveleyra makes much of the gourd fragments which he encountered in Candelaria and Paila caves (Aveleyra, et al., 1956, pp. 156 ff., 190, Lam. 10). He identifies them as being from a cultivated plant and recalls that the archival sources do not mention any cultivated plants for the Laguna District in aboriginal times, although they do mention the use of empty gourds as breathing devices in the underwater pursuit of aquatic birds (vide Martinez del Rio, 1954, p. 65). I am not aware of any evidence anywhere else in Coahuila for prehistoric agriculture. It is, of course, entirely possible that gourds were traded into the Laguna District: the valleys of both the Rio Nazas and the Rio Aguana del provide excellent avenues of approach to the Laguna from areas of Mesoamerican and other agricultural peoples (Taylor, n.d., ms. b).

No. C 1-3 - Shell pendants (Fig. 6). According to Rehder, these “are probably derived from specimens of *Busycon perversum* L., which is found along the Gulf coasts from Florida to Texas and probably also along the Mexican shore.” No. C 3 was drilled upward from the convex face; the drill broke through, leaving flake-scars on the concave surface.

No. C 4 - Shell bead (Fig. 7). This object has been so altered in the process of manufacture that biological identification is impossible. It was found in the vicinity of (or actually in?) the rodent nest; as with no. A 3 and no. C 1, it was probably carried there from its original position.

No. F 1 - Sling (Fig. 8). This is an unusual specimen, not only because of its uniqueness within the cultural inventory of pre-Columbian North America but also because of its preservation and completeness. Ethnographically, slings
have been reported from the American Southwest to the northern parts of South America; but particularly in the Southwest and northern Mexico there seems to be some doubt as to whether it was present aboriginally. On the other hand, padre Francisco Arista, writing at the end of the 16th century shortly after the first entradas into the Laguna District, says that slings were used in that region to kill aquatic birds (Alegre, 1841, p. 417; see also: Beals, 1932, table 94; Bennett and Zingg, 1935, p. 115; en contra, see: Russell, 1906, p. 120). However, preliminary perusal of archaeological publications on North America has failed to produce a single example.

Detailed study and analysis have revealed the method by which this sling was made. The first procedure was to make the three-strand braid which would serve as the pocket of the sling. This was then looped and, although it is possible that the cord to the finger-loop was made next, it is more probable that the cord to the tasseled end was the second step. The fibers which had already been used to make the braid were twisted upon each other to form an undecipherable number of multiple-ply cords which were in turn twisted together to make one large multiple-ply cord. At this point, another multiple-ply cord was brought in and twisted with the first creating a rather large, two-ply compound cord. However, one ply of the new cord was left free at the end nearest the braid and was used to bind the open end of the braid loop to form the pocket and reinforce it. The technique here was to use six half-hitches or button-hole stitches, three on top and three on the bottom. The large, two-ply compound was then further twisted but, by gradually eliminating fibers, was reduced in diameter and tapered as the work proceeded from the braid loop. This tapered segment was then whipped by 20 turns of a very fine two-ply cord that was both started and finished by being tucked under one of its own twists.

The main, two-ply cord, now smaller and of constant diameter, was continued for approximately .80 meter. At this point, the end of the artifact, a tassel was made by inserting untwisted fibers into the twists of the main cord and further securing them by a winding and finally a criss-crossing of the main cord. Precisely how this was accomplished could not be learned, but it is certain that at least one end of the main cord ends in an overhand-knot which serves as a toggle to hold it firmly in place among the fibers of the tassel.

At the other end of the artifact, a two-ply cord was strung through the loop of the braid pocket and then twisted upon itself to form a two-ply compound cord. Using the loop as a pivot, this one-ply cord was also twisted upon itself to form a two-ply cord which ended in a finger loop. The latter was formed by turning the cord back upon itself and inserting it twice between the twists of its own plies.

From all of the above, it is obvious that the manufacture of this sling was an intricate and integrated act which required over-all planning and the performance of a series of necessary and sequential operations. From this and what follows in describing the other textiles, it is plain that considerable technical skills were involved and, above all, that there was an obvious desire to create a
finished design (e.g., the tassel) and produce a well-made product (e.g., the taper of the main cord and its reinforcement by the whipping). A serviceable sling could probably have been made with much less trouble and with much less planning. There is a suggestion of virtuosity here and a feeling that value must have been placed upon workmanship for its own sake. As I have pointed out before (Taylor, 1967, p. 158), this contrasts quite sharply with a very apparent unconcern with precision and symmetry in operational (or only decorative?) wholes (e.g., no. A 4, no. F 4, and the patterns of bands, blocks, and colored warps of no. F 3a and b, no. F 7). Technological virtuosity and planning are contrasted with absence of these characteristics in decorative matters.

No. F 2 - Stranded material. This material was the innermost wrapping of the bundle and was encountered without apparent order from shoulder to pelvis. It consisted of a mass of originally soft and pliant, orange-colored twisted cordage. Whether this mass had originally been divided into sets or hands could not be told, although at present the cords do adhere in bunches, possibly due to action of the body juices during decay. However, the ends of two bunches are tied together by a square-knot; these cords are also seen to pass through at least one loop of a double or “figure-eight” loop made of identical cordage and self-wrapped in the middle to squeeze an original loop into a double one. The cordage is multiple-ply and compound. The primary cords are two-ply, S-twist, ranging from less than .001 to .001 meter in diameter, with three twists in .005 to .006 meter; these have been twisted together to form the finished cords, which are compound: 4-, 6-, 7-, and 8-ply, both S- and Z-twist (with no apparent correlation with the different plies), from .002 to .003 meter in diameter, and rather loosely twisted with one twist in .012 for six-ply and one in .015 to .02 meter for eight-ply. Specimens no. A 2 and 3 and no. C 2 were either attached to, or closely associated with, this stranded material.

No. F 3 - Netting strips (Figs. 9-12). These are of knotless netting made with fine, hard cordage (?Agave lechuguilla?) and were the fifth and last wrapping of the bundle. There are now eight strips, although it is possible that some of them were parts of larger fabrics, but our attempts to match ends, weaves, and colors failed to provide conclusive evidence of original joining of any set of the fragments. However, it is certain that there must have been at least two textiles, because no. F 3b and c are of checker design, slightly narrower, tighter and less expansible than no. F 3a and d-h which are of banded design and of coarser and looser weave. Even with allowances for fading and discoloration, the colors and color-rhythm of the two checker strips give no clue as to whether or not they are parts of a single fabric; however, the number of netting “lines” is identical in each of the two at their broken ends, and it is unquestionable that b is the start of a textile, while c is the finish. Thus it is highly probable that no. F 3b and c are actually two ends of a single strip, parted by decay but with not much missing between them.

As for the six banded strips, although here also analysis failed to yield
conclusive evidence of joinder, I am inclined to believe that they are indeed parts of a smaller number of original fabrics. As with the checker strips, there are only two selvages, one of which is the start and one the finish of a textile; both no. F 3e and h taper, the latter to its selvage end and both of them in such a way as to suggest that they are adjacent, or not very distant, segments of an original strip. On the other hand, all the banded pieces together have a total length of 8.01 meters, which seems much too long for a single textile of this type. The indications are, then, that there had been more than one banded strip. In fact, the lengths of no. F 3a and d (2.68 and 3.27 meters respectively) would appear to argue against their having been parts of one original strip (although if no. F 3b and c compose one strip their combined lengths would be 5.42 meters, only about .50 meter shorter!). However, it seems that we probably have at least two strips, one containing no. F 3a and the other no. F 3d. It cannot now be told whether any of the other strips were joined with no. F 3a or with d; or possibly, although improbably, with yet a third strip. This is particularly unfortunate in the case of no. F 3e and h because of the finish-selvage of the latter. No. F 3f and g are relatively short, rather non-descript pieces with no special feature that associates them with any of the others. No. F 3a and b, one a banded and the other a checker strip, were tied together each at its starting selvage (Figs. 1, 9, 10).

A word is in order regarding the color identifications on the illustrations and in the text. Few if any of them can be considered exact, particularly the "red," "brown," and "red-brown" designations, all of which may have been one color or two colors at most. At times there may have been confusion between "brown" and "black," and what has been called "lavender" may be merely faded red. "Yellow" has been used to indicate what is inferred to be the natural color of some of the cordage (Agave lechuguilla). In all color designations, however, whether or not the original colors have been correctly identified, the contrast between colors has been generally recognizable and can be taken as indicative of an original color difference whatever those colors may have been. From this it follows that the color rhythms and patterning are undoubtedly real and as shown.

A further caveat must be made in regard to measurements. Netting fabrics both stretch and contract laterally with great facility, and it is quite impossible to know at precisely what tension, hence extension, to take measurements. It is also true that the borders of bands and color blocks are often very irregular, so that a mean dimension is all that can be given, unless long series of essentially meaningless measurements are provided. But it should be stated that other details which are presented without query in the illustrations and text can be taken as certain and verified to the limits of ability, judgment, and knowledge.

A word should be said about the meanings of the terms "line," "level," and "mesh." The term "line" refers to a single, vertically oriented, twisted segment of the cord in knotless netting; the number of "lines" is thus a
measure of horizontal distance or "width" (Fig. 9). The term "level" refers to the horizontal plane on which the terminal loops of the twisted segments of cord in knotless netting are aligned, and it is also used to designate the vertical distance between those planes; the number and dimension of "levels" is thus a measure of vertical distance or "length" (Fig. 9). The term "mesh" refers to the interstitial space between lines and levels; it has both vertical and horizontal dimensions, hence both "length" and "width" (Fig. 9).

No. F 3a (Fig. 9). This fabric starts with 31 lines of cord looped over 11 strands of selvage cord in the form of a roll approximately .145 meter in pulled-out diameter (i.e., double). By the second level the strip is 43 lines wide, additions being made as shown in Fig. 9. By the center of the second band (red) there are 55 lines, and in the last level of the third band (black) there are 65 lines, which is the maximum attained in the strip, although variation in the form of a fewer number of lines is not uncommon. The number of levels also varies within and between bands, often making the length of a band vary from one side of the strip to the other; only one band has a constant number of levels (6) from side to side. The length of the mesh varies between .02 and .04 meter; the width of the mesh is stretchable but "normally" seems to be about one-half of its length. It is noted that the length of the mesh does not depend on the number of twists given to the cord, but rather to the tightness of the twists themselves.

No. F 3b (Fig. 10). This textile of checker design is a tighter and more regularly fashioned piece of work than no. F 3a and the other banded strips. The length of its mesh is only .01 to .015 meter, and the total length of a six-level block is .065 to .068 meter, while an eight-level block ranges from .078 to .087 meter. The selvage is of a single, two-ply cord which is spliced into itself to form an unbroken, knotless circle about .33 meter in diameter; the selvage cords of no. F 3a are tied to this selvage by an overhand knot. Over this selvage circle, there are 60 loops which constitute the lines of the fabric. In the third block from the selvage, four new lines were added to make 64 in all, 32 on each side of the color-contrast line in the center of the strip. However, since the netting technique dictates that the adjacent lines of alternate color-blocks be twisted together at every other level, the line-count for alternate blocks is only 63. These dimensions continue without variation for nearly the full (present) length of the strip. But at the seventh block from the (present) end (the block with the level-count of eight), a significant variation does occur: five levels down from the start of this block, red cord from the left side begins to encroach upon the right or black side and, by the place where black changes to red at the beginning of the sixth block, there are 26 lines of black on the right and 38 lines of red on the left. This deviation is gradually rectified and, by the (present) end of the strip, the right line-count is back to 30 and the left to 34. This is precisely the count of the broken, non-selvage end of no. F 3c,
which strongly suggests that the two segments, despite apparent difficulties with color concordance, are from a single strip.

No. F 3f and g. These are relatively short, rather featureless fragments with no characteristic which will relate them specifically to any of the others. No. F 3f is approximately .44 meter long; its line-count is 63 and 64, and the numbers of levels in its two full bands are 8-1/2 and 9, 6 and 7; at one end there is a partial red band followed by black, then yellow, and a partial red-brown to terminate; it resembles no. F 3a in technique and cordage. No. F 3g is approximately .40 meter long but was in such a deteriorated condition that nothing could be learned with any certainty about other specifications; its color pattern is yellow-black-red-black-yellow; the notes say that in technique and cordage it is “same as no. a.”

No. F 4 - Designed netting textile (Fig. 13). This nearly complete textile is probably the prime example of the “Coahuila characteristic” of technological virtuosity, decorative drive, and indifference to artistic harmony (Taylor, 1967, pp. 158-59). The netting is extremely tight and the cords have been twisted only once making the mesh small and even: there are 10 to 12 lines per .03 meter and 167 within the total width of only .42 meter. Each of the four strips does vary slightly within itself as to line-count, but this is because alternate lines are twisted around adjacent lines of the adjoining strip to join and consolidate the whole. There are from four to five levels per .02 meter. Because of deterioration, it has not been possible to work out the order of manufacture; it seems probable that it was made in strips starting at the lower left corner of the representation in Fig. 13 and that work ended at the lower right corner with the loop-knot.

No. F 5 - Woven strips (Figs. 14-18). These constituted the second wrapping of the bundle. They are undoubtedly the most unique and technologically complex examples of weaving in this collection. There are now four pieces, two of which obviously represent different fabrics (no. F 5a and b) and the other two of which give some, although not conclusive, evidence of having once been tied together to form a single, wrapping unit. The unusual technological feature is that each of the colored bands is made of a single weaving element, i.e., “warp” and “weft” consist of a single cord and are one continuous, uninterrupted element and operation. For this reason, the term “row” has been used to refer to the “warps” and “wefts” of the fabric, either separately or together, since there is no technological distinction between these two normally discontinuous weaving elements. In the present example, not only are the bands monolithic, or better “monocorded,” but in the case of the bands immediately below the braided strands, both braid and band are woven of a single cord, only one renewal of which (in the three-braided part of no. F 5a) was discovered during analysis. Of course, a color change is accomplished by introduction of a new weaving element and cords within bands are often renewed with others of the same color. But essentially, from a technological point of view, each band is woven of a single cord. The same technique
was independently discovered by Irmgard Weitlaner Johnson among the textiles from Candelaria Cave, Coahuila (Johnson personal communication and ms.); it is most unfortunate that her important manuscript, incorporating the results of a minutely detailed and knowledgeable study, has not yet been published.

No. F 5a (Figs. 14-16). This piece was found immediately over and attached (? how) to stranded material (no. F 2). Over-all dimensions were impossible to ascertain because of the knot occurring at its "lower" end and because of the compaction and fragility of the fibers. However, the weaving process is reasonably clear. In starting, the cords which were later to be braided were looped over a series of seven two-ply cords (four red-brown or black, three red) which were tied in a loop-knot to hold. Slight technological variations will be noted between the right and the left pieces, but these appear to be of importance only to demonstrate once again the virtuosity of the artisans. One fact does seem to be of more significance, however, although a really detailed analysis was not possible: in the right, three-braided strip the number of cords are double those in the colored bands below; somehow, but by unknown means, the number of cords was reduced when the topmost band was started.

No. F 5b. This is a fragment of another woven strip having three braided strands at one end. It was in such delicate and deranged condition that no attempt was made to study it in detail. It has a twined selvage of black or red-brown cords; the first band is of yellow color, followed by a black or red-brown and then a red band. As far as could be told, cordage and weaving technique are the same as in no. F 5a.

No. F 5c (Fig. 17). Although decayed and broken, the loop of this specimen undoubtedly went around the corpse and was secured in position by two half-hitches. The broken end of the longer portion of the strip, beyond the hitches, is squeezed as if it had been knotted at one time. Since this same condition prevails at one end of no. F 5d, it is possible that the two were formerly tied together or were a single textile knotted in the middle. The cordage and weaving technique are the same as in no. F 5a. However, there seems to be more variation in both the start and the ending of weaving cords. The selvage of black or red-brown cord is generically similar to that of no. F 5a, but the twining has been done with only one pair of cords, instead of two. The striped band at the selvage-end is a unique feature; it is a "warp" face weave, yet the weaving technique is the same as that of the other bands; the color patterning is produced by introducing "warps" of different colors in some manner which was not learned.

No. F 5d (Fig. 18). In general, this strip is like no. F 5c, although here there is no striped band adjacent to the selvage. It is quite possible that the two pieces at one time composed a single textile: as in no. F 5c, its broken end is squeezed as if once knotted, and in both fragments the color of the broken, terminal band is red. One other feature associates them: the manner of ending weaving cords in both pieces is distinctive and found in no other speci-
men studied. The selvage end is tied with a square-knot to some stranded material (no. F 2), which at this place is itself square-knotted to a mass of soft fiber.

No. F 6 - Pair of sandals (Fig. 7). These were found in place on the (skeletal) feet of the corpse. They consist of a mass of coarse, hard, decorticated fibers sewed together. The sewing fibers (*Agave lechuguilla*) had also been decorticated and had been used in natural bunches as they came from the leaf, complete with terminal spines in place holding the fibers together and serving as needles. It is interesting to note that the toe-ties of the right and left sandals are mirror images of one another, an arrangement which is not usual in most sandals from Coahuila. The length and width as given in Fig. 7 are somewhat less than those dimensions would have been aboriginally because the sandals were molded around the foot evidently by the pressure exerted when the robe was wrapped around the body; it also suggests that at the time of bundling the sandals were rather pliable. Sewed sandals, but of a less formal pattern and construction, have been found in several places in Coahuila (Taylor, 1966, p. 73 and Fig. 16) and Durango (J. Alden Mason, personal communication; collections of the University Museum, Philadelphia).

No. F 7 - Woven robe (Fig. 19, 20). This specimen was the third wrapping of the bundle. It is a warp-face, one-over-one weave textile, tightly and regularly woven, of two pieces sewed together down their long sides with a simple binding stitch. The weft is of an olive color, except in one place at the “top” of the fabric where a black cord has been spliced to the olive to complete several rows. The coradage of the fabric is of soft fiber (*Gossypium*), and that used to sew the two parts together is hard (*Agave lechuguilla*). All eight selvages are present and in good state of preservation. The four short ones are of two pairs of two-ply twining cords of soft fiber; the pairs are started and ended with overhand-knots or loop-knots—loss of the very ends prevents discrimination here. As in the woven strip no. F 5a, the end of the weft element is included in the knot at the end of the selvage. Renewals are not spliced or inserted but, as in no. F 5c, either wound around warps or other wefts or tied with an overhand-knot to form a toggle held by the tension of the fabric. The irregularity depicted in Fig. 20A (encountered at the 27th weft up from the bottom and the 12th warp in from the right edge-selvage) raises the question of whether or not a shed could have been used. The question is reinforced when it is noted that the same irregularity occurred at a point 305 meter from the “top” and 15 warps in from the right edge-selvage of the same piece. The only other irregularities noticed were also in the right piece (Fig. 20B and C): they are weft “turn-backs” and endings, and they create partial Kelim slots in the fabric.

No. S 1 - Projectile (arrow) point (Fig. 7). This has been designated an arrow point because of its small size and light weight. It is made of brown and red chert. Its shape and other specifications are not distinctive enough to provide comparative information of any present significance, although as a whole
it is entirely comparable to points of the Jora and Mayran Complexes (Taylor, 1966, pp. 81-84, Figs. 27, 28; Aveleyra, et al., 1956, Lam. 9b and f). It has not been possible to tell whether its inclusion inside the bundle was purposeful or not; it could have been in the body at the time of death and burial.

CONCLUSION

The above, largely descriptive account has not been presented as a definitive study, but more as an interim report. There are many aspects of the material which could not be investigated at that time, so long ago, when the bundle was opened. Broader and more intensive comparative studies are surely called for. The material and its descriptive details need to be placed in both their local and more general cultural contexts. But it is hoped that enough has been presented here to indicate something of the wealth of cultural information lying ripe for analysis, even within the remains of the more simple cultures. It is quite evident today, although at the time the bundle was opened it was not nearly so much so, that the geographic region comprising the State of Coahuila was a refuge area and cultural back-water for many millennia (Taylor, in press). Yet the cultural remains archaeologically resurrected from that region, representing as they do a relatively large percentage of what cultural inventory the ancient peoples did possess, provide opportunities to the archaeologically oriented cultural anthropologist which are considerable and which are not offered by many areas of higher culture. The range of material objects preserved in the dry repositories of the western deserts of North America should present the anthropological archaeologist with a challenge and with visions of culture-historical and anthropological bonanza.

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Fig. 1
MULTIPLE BEAD AND CORD PENDANT, # A1

(Found with Stranded material, F2)
No A2

Body material looped over cord.

Knot (kind?)

Cord run through stranded material and knotted, not tied, to hold in place.

Cord: 2-ply, S-twist, .001 diam., 2 @ .005, black.

Bead layout viewed from below.

Beads are of bone, each attached by four cords.

MULTIPLE BEAD AND CORD PENDANT, #A2
(Found with Standed material, F2)

Fig. 3
**No A3** Stranded material

Brown cord body–material looped over cord. Knots (Kind?).

Stranded material

End of wrapping cord brought up and knotted with bead–tying cord.

Bead layout viewed from below Hidden (so detail, length?)

Beads #1, 3, 5, 6, 7 are pieces of shell carved to resemble OLIVELLA BIPLOCATA SOWERBY.

**MULTIPLE BEAD AND CORD PENDANT, #A3**

(Found with Stranded material, F2)

Fig. 4
GOURD BOTTLE WITH ENGRAVED DESIGN, #A4
(Found between folds of woven robe, F7)
SHELL PENDANTS, #C 1, 2, 3.

(#C 1 Found beneath ankles inside woven robe, F 7; #C 1 & 2 in region of chest. All probably derived from BUSYCON PERVERSUS LINN. from Gulf Coasts.)
**No. C4**

SHELL BEAD, #C4 (Found ankle or toe region)

Diam. of hole: .005

**No. F6**

Pair of sandals, #F6 (Found in position on feet)

Toe ties single cord run through sandal but not appearing on sole.

Tied to other tie cords by square knots (all).

Cord: 2-ply, Z-twist, .004-.006 diam., 1 @ .016-.018

No warp or weft; mass of fiber sewed 1st horizontally (A), then vertically (B); latter elements do not appear on sole.

Toe tie in position thus; other?; heel tie over calcaneus

**No. S1**

STONE PROJECTILE (ARROW) POINT, #S1 (Found in pelvic region on woven robe, F7)

Fig. 7
No. F1  Tassel fibers inserted between cordage plies to start

Total length: 1.665

drawing not to scale

Finger loop

Overhand knot to secure

Pocket: 3 strand flat braid; worn and very flat on both sides of reverse segment of loop.

Cord (2-ply, S-twist) looped through pocket and twisted on itself to make compound cord (2X2, Z-twist, .002 diam., 1 @ .006)

Wrapping fibers ended with overhand knot to secure

overhand knot

Ankle Loop (see Fig. 1)

Whipping: Tucked under 1 turn both to start and to finish; cord: 2-ply, Z-twist, <.001 diam., 1@ .001; 20 turns.

Compound cord (2X2)

6 half-hitches or button-hole stitches, 3 above and 3 below, of one ply of compound cord which had been left free when making cord.

Color of all cordage uncertain

SLING, #F1
(Found wrapped around woven robe, F7, binding ankles of body.

Fig. 8
Selvage of #F3b.

Overhand knot to fasten last of 11 selvage loops.

2 types of twist in adjacent "lines".

Edge selvage showing straight and twisted "levels".

Cord: 2-ply, Z-twist, <.001-.001 diam., 2 @ .003

Width = 65 "lines".

Approx. mean length of each band.

BANDED NETTING STRIP, (#F3a)
(Outermost wrapping of bundle)

Fig. 9
No. F3b

Selvage cord looped on itself, twisted back, spliced; Tied to #F3a
arrows show direction

Start of yellow cord (wound back and spliced)

Start of black cord: wound back and spliced

No variations observed

60 loops on selvage.

Edge selvage

Approx. 4.90

Width: 63 or 64 "lines"

- black
- Y = yellow
- R = red
- Br = brown

CHECKER NETTING STRIP, #F3b
(Outermost wrapping of bundle)

Fig. 10
**No. F3c**  
Selvage cord: 2-ply, Z-twist. Loops originally over selvage.

- Cord: as in #F3b.
- Approx. 0.52
- Width in # of "lines"
- Gradation in color.
- Direction of work
- Width: 64 "lines"; 34 in left side, 30 in right side.
- Y = Yellow
- BR = Brown (Red?)
- L = Lavender (Black?)

**No. F3d**  
# of "levels"

- Cordage and technique same as #F3a.
- Approx. 3.27

CHECKER(#F3c) AND BANDED (#F3d) NETTING STRIPS  
(Outermost wrapping of bundle)

Fig. 11
No. F3e "Lavender" (black)

1st four bands (L,Y,B,R) are all like this.

At B&Y band (at wider end), elements twisted another time, becoming like #F3A and D.

But instances of single twist continue to occur.

Cord like others of #F3.

BANDED NETTING STRIPS, #F3e AND h
(Outermost wrapping of bundle)

No. F3h

End of selvage like #F3c.

49 loops over selvage can be counted; at least 2 more originally.

Selvage is of 3 cords (2-ply Z-twist) tied by square knot to form small circle (.015 diam).
Cord: 2 ply, Z-twist, \(<.001 .001\) diam., \(9\theta .01\) (body and selvages)

No variations observed

Cords are renewed on obverse by tying with square knots.

\(\approx\) Hole

Colors (in diminishing intensities of black)=
black > red/brown > brown or red > yellow
white = uncertain.

Width; @10–12 lines per .03=

End of textile

DESIGNED NETTING TEXTILE, # F 4
(Next to outermost wrapping of bundle)
Cord: 2-ply, S-twist, .001 diam., 1@ .002, soft fiber (cotton?).

Loop knot to end or start selvage.

WOVEN STRIP, #F5a
(2nd wrapping from body)
No. F5a

#’s indicate # of 2-ply cords in each braid strand.

Twining cord is red, single.

# of twining twists for each strand of each braid:

Left—12=4 twists
8=2 twists
10=2 twists

Right—12=3 twists
10=3 twists
12=2 twists

44 “rows” long
64 (30+34) wide

Braid, “warp”, and “weft” cords are the same, i.e., continuous.

40 “rows” long
64 “rows” wide

Ended by splice and renewed by insertion.

Lowest renewal in 13th row from “top” of red band.

Etc.

WOVEN STRIP, #F5a (detail #1).

Fig. 15
No. F5a

#’s indicate # of 2- ply
cords in each braid
strand.

Again two ends of
twining element
(double here) are
tied in square knot
with end of uppermost
"weft" element
(as in detail #1).

This strip is 48
"rows" long, 38 wide.

Not enclosed
(error).

This space eliminated
by sloping "wefts".

Bottom of red strip

9th row from top of black strip.
This strip is 36 "rows" long,
38 wide.

WOVEN STRIP, #F5a (detail #2)

Fig. 16

52
No. F5c

Detail of cord endings in black band

(1 with overhand holding knot)

9th "weft" from bottom of band.

Large loop around body

#'s in bands are #'s of horizontal rows and metric "width" measurements.

Last band

# of "warps" per stripe and stripe color in last band

Cordage and weaving are same as in #F5a.

Detail of selvage and end of one "warp".

WOVEN STRIP, #F5c
(2nd wrapping from body)

Fig. 17
No. F5d

Cordage and weaving are same as in #F5a

Approx. 1.99

12th row from top of band.

Cords ending in overhand knots, not tucked or spliced or wrapped — just ended.

Selvage is single pair as in #F5c

Soft cordage tied to fiber by square knot

WOVEN STRIP, #F5d
(2nd wrapping from body)

Fig. 18
Letters and figures give color and number of warps and width of "strip".

- **R** = Red
- **R-Br** = Red-Brown
- **T** = Olive-tan/tan
- **C** = Cream/yellow

**Total number of warps**: 1208 (498 left, 710 right)
**Total number of wefts**: 668.
**Total length approx.**: 1.89m.
**Total width approx.**: 1.272m.

Cordage is soft (cotton?).
No. F7

End selvage tied to end selvage of left piece.

Sewed to left piece

End selvage

Irregularity of weft.

A. West turn-back

B. West endings at a and b.

C. Detail of tie(?).

WOVEN ROBE, (right piece), #F7
(Third, i.e. next to last, wrapping)

Fig. 20

56
AN INTERPRETATION OF PREHISTORIC DEATH CUSTOMS IN TERMS OF MODERN SOUTHWESTERN PARALLELS

by

Florence Hawley Ellis

In the last very few years there has been a marked return of interest to interpretation of the past, archaeology, in terms of the present, ethnology. Much of this has involved use of that intriguing toy of our programmed age, the computer; but manipulation of data, even with a time-saving device, is not interpretation, and conclusions must rest on the understanding of the anthropologist. Among some fertile fields hitherto largely untouched for lack of primary ethnographic understanding is that of customs and beliefs pertaining to disposal of the dead. In the Southwest, prehistoric graves and cremation deposits are considered choice finds because they so often yield rich rewards in accompanying objects. But except for a listing of items, a note as to customary physical arrangements and measurements, and the placing of such data in relative time and space for studies in relationships of prehistoric roots, stems, and branches, little has come from these finds. In other words, a minimum has been deduced in relation to the thinking of the culture carriers. The problem depends, to some extent, on shortage of clear cut and available data on historic usage and the beliefs of descendants of relatives of the prehistoric groups. A brief examination of some examples from the living Pueblos of the Rio Grande shows surprising parallels to little understood traits involved in disposal of the prehistoric dead.

Both inhumation and cremation were practiced by the pre-pottery Cochise people, with inhumation probably the more widespread. The oldest Cochise skeletal remains yet found, dating from either the Sulphur Spring or the Chiricahua stage at Sonora F:10:17, had washed out from the base of an arroyo bank, but they are thought to represent a burial. For the following San Pedro stage, we have eight formal inhumations from the Cienega Creek Basin in southeastern Arizona (Eddy, 1958, p. 52) where graves were dug into a midden deposit, and there are the pre-ceramic inhumations from Ventana Cave near Ajo (Haury, 1950, p. 460). Cremations from the pre-ceramic period were uncovered at the Cienega site at Point of Pines in eastern Arizona (Haury, 1957, p. 11), in the Guadalupe Mountains of southeastern New Mexico (Howard, 1935, p. 67), and near the mouth of the Pecos River in Texas (Cosgrove, 1947, pp. 162-163). As Wasley and Johnson (1965, p. 86) have pointed out, the Hohokam of the succeeding ceramic period chose cremation (possibly drawing on their Mexican background) though some inhumation does appear during the Sacaton Phase of the Sedentary Period and in the Classic. The Mogollon, in contrast, preferred
inhumation (Wheat, 1955), though a very few cremations occur among the San Francisco phase inhumations of Mogollon 3 and again in the Classic Mimbres Phase of Mogollon 5 (Cosgrove and Cosgrove, 1932; Wheat, 1955, pp. 68-69).

In Mogollon 1, pottery vessels, either whole or fragmentary, were placed with some burials. The amount of pottery placed with the dead increased slightly in Mogollon 2 or 3 (though some had none) and in the San Francisco Phase of the Pine Lawn Valley this pottery was broken and scattered in the grave. During Mogollon 4 and 5, the “killing” of such pottery was accomplished by punching a hole in the bottom. Jewelry often was placed with the dead in Mogollon 3, 4, and 5. By Mogollon 4, subfloor burial, especially of infants, was common. Orientation of bodies was not consistent in any Mogollon period, but placement of heads to the east or northeast seems to have been favored. From the beginning, the Anazazi to the north were practicing inhumation and placing objects, especially basketry in early times and pottery later, in the grave. Evidence of intentional breakage has not been reported. Orientation to the east was favored but not universally followed. As bodies seem to have been closely wrapped in a mat or robe, it may have been difficult for funeral attendants to be sure of the location of the head within the bundle.

With few exceptions, pre-Classic Hohokam “cremations” are only secondary deposits which consist almost entirely of sherds of vessels which have been put through the crematory fire, although all of the sherds of any one vessel never appear (Gladwin, et al, 1937). In the Pioneer and Colonial Periods, “pit cremations” were the most common, but only a very small amount of ash and calcined bits of bones were included with the sherds. The same custom continued through the Sedentary Period, although a trench sometimes was used instead of a pit. We do not know a great deal about the localized Santan Phase but in the Sacaton Phase at least the people of Snaketown collected more of the larger bone fragments to bury with sherds in a pit dug into the caliche (Haury, 1967). What actually happened to the remainder of the bones, ash, and sherds from the cremation is suggested by one Snaketown “trash mound” found to be composed largely of burned materials, including bone and sherds. Typical Colonial and Sedentary Period Hohokam “cremations” may be summarized as consisting of a minimal deposition, only a token of calcined bones and ashes swept up from the village cremation basin, accompanied by token sherds, portions of vessels intentionally broken and put through the fire. One immediately sees the possibility that the vessels and other artifacts, such as schistose palettes, were broken (killed), as well as put through the cremation fire, so that in the afterworld the spirit man would find himself adequately equipped with spirit artifacts.

In the major area of the Gila and Salt, urn cremations dominated in the Classic Period. A considerable amount of calcined bones and ash now were collected and placed in a jar which then was covered with a bowl for burial. Here was the man himself, differing from an inhumation only in having been burned. The only grave goods were the jar and the bowl. Near Gila Bend, on the western periphery of Hohokam country, some primary cremations have been found, and
fragments of bone indicate that the body, probably fully clothed, had been placed, head to the east, within a trench or on a pole bier suspended over the trench by three pairs of forked supports driven into the ground. When the fire died, the larger fragments of bone and the sherds from burned vessels were collected in one end of the trench and covered with a large sherd or a bowl. A small whole jar which could have contained water or food for the spirit was placed at the side of the pile. This local use of primary cremation, which replaced the typical pit “token” and rare urn types, is suggested by Wasley and Johnson to have resulted from influence of the Lower Colorado River Yuman peoples who were moving into the district at this time. Schroeder (1967) believes the Gila Bend sites where primary cremations occurred actually were Hakatayan (Yuman).

The prehistoric inhabitants of Papagueria, like the Anasazi, practiced inhumation and placed grave goods with the body (Haury, 1950).

The historic Pima and Papago cremated their warriors who died in battle, and it would be interesting to know whether these were believed to enter an afterworld different from that of the other dead, as in Mexico. The rank and file of the Pima-Papago dead were placed in a seated position in a crevice, with stones piled over the body, or, in later times, in a rectangular chamber outlined with low dry-laid stone walls and topped by a roof of poles and branches. The Pima-Papago belief that spirits of the dead went to a moist land in the east, from whence (as in Mexico) the rains came and where food was plentiful, is very similar to that of the Pueblos, although only one kind of rain spirit, the Kopishtaiya of the Keres, were placed in the east, and the better known type, the katcinas, had their home to the west.

As the journey of the Pima-Papago dead to their afterworld required four days, some provisions were placed in the grave. But, fearing that the spirit would miss his former home, personal possessions, and relatives, and even might return to take objects and persons of the family back with him, the living took care to burn his house as soon as the body had been removed. His tools and weapons were laid in the grave, and although the kinfolk cut their hair in respectful mourning, they tried to forget him and thus to separate themselves from him as soon as possible. Except for the food, items placed with these dead should not be spoken of as “offerings”; they were not gifts but only his own equipment and undoubtedly to a large extent of his own manufacture. This appears in contrast with Yuman death concepts and customs, in which the body was burned together with the possessions of the dead and also with considerable actual offerings, the belongings of friends and relatives, which were cast upon the burning pyre to be consumed. Even some of the song cycles belonging to relatives were declared to be “given” to the deceased and so sung for the last time at his death rites. The degree of resulting impoverishment of family, as in the Ute parallel, probably conferred status. Life after death was very vaguely conceptualized.

Navajo fear of the dead is well known, especially to archaeologists who
find their native excavators backing away or disappearing for some days when a skull or skeleton appears in the trench where they are working. Even the duty of family members to take the body out for burial, in a crevice or in a grave, is avoided if possible by requesting a local trader to handle the fearsome job. The hogan of the departed must be burned or abandoned, with a hole knocked in its north side to indicate that the dead has gone in that direction, or the doorway barred with crossed sticks to warn all that a spirit may be lurking there. Possessions of the dead, no matter how valuable they might be to the living, must be interred with him, lest his ghost return to claim them and at the same time cause the death of a relative. If he has owned a horse, it is shot, often at the edge of a narrow arroyo so that the bank may be pushed down to cover the body. The only modification of this arrangement has resulted from pressure by white teachers and the horror of increasing grave robbing by a few greedy non-believers, or by outsiders. Today most possessions are given to family members as one realizes the approach of death, and a purification ceremony is held over the remainder so that they may be safely retained. What is buried with the corpse thus has come to be minimal, token pieces.

Throughout the pueblos one finds a similar belief in the future life, as well as grave customs which appear startlingly like those of the Navajo, but the late-coming Navajo have borrowed the majority of culture traits we know from the Pueblo people with whom there was much association as well as frequent battling. The western Pueblos, like the Hopi (Parsons, 1938, pp. 68-75; Hawley, 1937), fear the dead. But they also are much concerned about them as individuals, and a primary theme which stands out in all Pueblo death rites is identification of the deceased by membership in social units so that he can take his proper place in the afterworld. Still another is full and sometimes exaggerated expression of family grief and the desire that the dead be adequately equipped for his journey (Fig. 21, 22). Some detail on specific examples from various pueblos brings out local symbolization of major beliefs.

In Isleta Pueblo, the primary organization to which one belongs, outside of the extended bilateral family, is the Corn Group, each such group named for one of the directions. This is not a clan but a ceremonial unit, in some cases composed of named divisions, comparable to the Taos small kiva organizations and related to the several kiva-katcina groups such as are found in Zuni and in Santa Ana, though the latter now are without kivas. (Corn Groups are not parallels of the big kiva organizations such as the two in Zia, San Felipe, Santo Domingo, Cochiti, and even Santa Ana itself; the Corn Group prototype presumably used small kivas such as we know for the prehistoric Anasazi). Isleta, and we may suppose Taos, had katcinas in the Spanish period, before the zeal of the conquerors effaced this open evidence of non-Catholic religion. Membership in the Corn Group follows neither patrilineal nor matrilineal line; children of a family usually are dedicated alternately to the Corn Group of the one and of the other parent, but one even may choose to leave his original Corn Group and join another. Affiliation is sealed by initiation.
Fig. 21. Cut and broken grave goods from shrine of the dead, Jemez Pueblo (as seen circa 1900).

Fig. 22. Native drawing of deceased woman and grave goods, of which only fragments will be placed on shrine for dead. Recent copy of an old painting.
The primary duty of the Corn Group lies in rain making, the mark of a katcina organization, and as the dead generally are believed by the Pueblos to become rain spirits (katcinas), the Corn Group is most important in dispatching the spirit of the dead to the afterworld. The chief of one's group has given the individual his native infant "baptism" by dropping sacred water onto his head with a duck feather, as a name is conferred. At the death of that person, the chief of the Corn Group is summoned by a relative. He comes immediately to draw a cornmeal line from the body to the doorway, thus giving the dead his "road" while naming him in a song in which all six directions are mentioned. Thus the door to the afterworld is symbolically opened. The chief then ties a few soft prayer feathers into a bunch of the sort representing his Corn Group. This is attached to the forelock of the corpse. The prayer which goes with these feathers will carry the spirit to "White Earth," the place of sunrise, where White Earth Man will direct the spirit on to the proper region for members of his Corn Group. When he arrives there, as the Corn Group chief states in the prayer with which he closes his small ceremony, perhaps there will be rain and lightning. Thus those on earth will know that the spirit is well received.

Although his relatives are lonely because they no longer hear his voice or see his shadow, they should try not to think of him or grieve lengthily because he may have been needed more "in this Indian place, or in the Baptist place, or in the Catholic place" than in the world we know. But should the individual have refused to take office in his Corn Group, if so requested, or otherwise have transgressed the rules of cooperation, he will be refused the Corn Group ceremony and his spirit forever will toss on the high winds which periodically sweep the Rio Grande Valley.

At the close of the Corn Group rites, the chief permits the deceased's "aunt" (father's sister, or father's brother's daughter, or a woman selected from his Corn Group) to wash the face of the corpse, dress his hair with the old style brush of tied grass stems, and put on clean clothes. The body lies at full length. The head man of any other society in which the deceased was a member now comes to sing and to paint his face with the color and emblems which will further identify the spirit in the afterworld.

The "aunt" then sews a black "manta" (handwoven blanket) over the corpse, though the feet, which are tied together, and the face are left uncovered. The hands are clasped and a cross placed in them, outside the blanket. Some corn and fruits are tucked under the upper arm to provide "lunch" for the spirit on his way to the next world. The bowl used in the washing is broken in the doorway where all who come in will step upon the sherds. The body is placed in the center of the floor, with the head on a pillow, though formerly on a block of adobe. Friends and relatives come to touch the forehead and feet of the dead and leave a candle or two as offerings. These are burned around the body during the night while there is a wake—possibly but probably not a post-Spanish touch, as the custom is universal among the Pueblos including the Hopi of Arizona. Supper is served at midnight and before anyone eats he
must pinch off bits of food and carry it outside or burn it to feed the dead. This is done with the left hand, to contrast with that used for feeding the living.

Next morning the body is placed on a stretcher or ladder to be carried on the shoulders of relatives to the church, where it is laid before the altar. The head is to the south because that is the direction from which the Isletas, or a portion of the tribe, claim to have come to the location of their present village. (Mixture of the Southern Tiwas and of the more southern dwelling Piros is recognized, and derivation of Piro from the Jornada Branch of the Mogollon and of the Tiwa from basic Mogollon is substantiated by the majority of data).

All of the friends and relatives of the dead offer to aid in digging the grave, and when the work is completed, two may remain there to guard it from witches. The body is carried from the church to the east side of the cemetery, just outside the pueblo, where those attending the funeral again touch the head and feet in a final salute. There is weeping and the Catholic priest intones a prayer, after which four men, holding the corners of the blanket, pass the body down to two others who have jumped into the grave. (This concludes the Spanish-influenced rites, which began with the wake). The face of the dead, covered when the body is removed from the house, now is uncovered and the feet are untied. Thus Mother Earth may "eat" the body more quickly, a concept shared by other pueblos, but apparently without the idea of sacrifice. The two men are given a hand in climbing out of the grave, the priest sprinkles holy water over the body, and everyone present begins to toss earth into the excavation. Again, the left hand is used.

When the grave is half filled, two or three women may volunteer to bring water, which is poured onto the corpse's head or splashed over it as the bowl is broken. Thus the person who has left this world is consigned to that of the water spirits. One man jumps into the grave to pull the blanket back over the face of the corpse and to begin tamping the earth fill into a solid mass by use of a heavy wooden block. This is a signal for the women to leave, and when the grave is entirely filled and thoroughly tamped, the most important relative (head of the extended bilateral family) reiterates that the one who has died may have been needed elsewhere and all relatives should give him the aid of their prayers.

The men now return to the home of the dead, and a message that the burial has been completed is sent to the Corn Group chief, who sends his "breath" (blessing) back to them with instructions that they must sleep in that house for the four nights following because the spirit remains there during that period and might endanger the family. Early on the morning of the fifth day the men go to the river, face east, and pray to the sunrise, name the deceased, toss cornmeal onto the water, and wash their faces. This is a purification and a recognition of the new status of the dead as a water spirit, but as they return to the house in single file, they must not look back because the spirit is believed to be following. The men go to their own homes where food is being prepared. That evening, the Corn Group chief and his assistants come to the house, lay down their floor altar, and draw a line of cornmeal from the doorway to the altar so that the spirit may enter. On this line is placed a bowl containing bits of the food, all
pinched off with the left hand. After a short ceremony, the leaders carry this bowl (which some say should have four chips knocked from its rim to represent the cardinal directions), a packet of prayer feathers prepared by the Corn Group chief, and a bundle containing the possessions of the dead, or pieces of them, to be deposited in a pit 3 or 4 feet deep, dug for this purpose. The pit may be a half a mile or more in any direction from the pueblo, but the spot should be secret. (The Laguna colony in Isleta makes their deposit on the morning of the sixth day after a death, and prefers to go west from Isleta, the direction symbolizing that from which their ancestors arrived after a major break in the home pueblo about 1800.)

The grave goods are covered, and the men race back to the pueblo and burst into the house, where one of them snatches an arrowhead to draw marks on the four walls to prevent the spirit of the dead from entering. Then, singing, the relatives march around the house in a line led by the Corn Group chief. At their rear his assistant uses two duck feathers to obliterate their tracks so that the dead may not trace and catch them. Thus exorcised from the house where he formerly dwelt and placated by his food and possessions having been set out for him, the spirit should not return. Some of the relatives may continue to sleep in his house for eight nights more, as a protection, and after this food is again put out for the dead, with a small ceremony. This completes all that can be done to prevent the return of the shade to his old haunts, and even then persons may be made ill by a wandering ghost.

What are the items which go into the pit with the bits of food? If a man has owned the tablita used in the Pinitu dance (the only tablita type remaining in Isleta), or a big abalone shell pendant such as is worn in many dances, this is included.

In the grave goods put together for one ceremonialist were three small bowls used to carry medicine water, two shells for dipping it out, a medicine bag containing ground cornmeal in which was a stone animal fetish, a small package of white powder, a bracelet of shells, and a cornhusk packet of prayer feathers. That for another was comprised of four painted leather armbands, a small bowl, ceremonial tobacco wrapped in a piece of buckskin, a packet of prayer feathers with a cornhusk ceremonial cigarette, and two short pieces of cane plugged with cotton. The deposit for a medicine man may include two baskets, each holding a pair of eagle wing feather exorcisors, a bear or eagle claw necklace from which dangles a crystal used in locating or diagnosing a disease, a bracelet of strung olivella shells among which a few stone arrowpoints are tied, and perhaps a headband. These all are personally owned bits of ceremonial equipment. Articles of daily use may be the wooden parts of a backstrap loom belt for weaving belts, a dough bowl, a small bowl and dipper for a child, hairbrushes of wild grass, and pieces of silver jewelry, though now the family keeps necklaces except for three or four beads which are strung onto a safety pin and deposited as representative of that piece.

Of the prayer feathers tied up in two folded corn leaves, one feather should
come from the Corn Group chief, one from father’s brother’s Corn Group, and one from father’s father’s Corn Group. The soft feathers are tied with hand-twisted cotton cord marked with the appropriate Corn Group symbol of black dots or stripes. Turkey and wild duck feathers are those used, the former the most common of all those put in prayer offerings, and the latter a specific reference to water spirits.

Feathers used by the Rio Grande Pueblos for ceremonial prayer plumes representing religious organizations are those of eagle, turkey, duck, flicker, cardinal, or orange, black and white bird (towhee?), and the magpie, the latter primarily as an offering to Wind, which sweeps the pueblos clean. In preparing prayer plumes to be used in the prayers of an individual only, any feathers desired, from blue jay to peacock, may be taken to the medicine societies to be “tied” and a prayer “attached.” The person concerned “attaches” his own prayer as well before putting the offering in a chosen spot. Except for the eagle, the feathers come from a few birds shot for that purpose. Eagles, formerly captured by reaching out to grab the legs when the bird settled on a piece of meat tied at the edge of an opening in the roof of a brush shelter, were kept captive and annually plucked to a state of nakedness in the fall when the feathers naturally loosened. A designated man held the bird, with a cloth over its head, while another removed the feathers. Should even a drop of blood appear, the medicine men were summoned at once. For the last several years Santo Domingo Pueblo has kept a macaw, purchased from a pet shop, and similarly has plucked its feathers for use in costumes and ceremonial paraphernalia, after which the bird must spend some weeks tethered behind a warm cook stove while his plumage replaces itself.

The customs concerned with disposal of the dead in the Tewa pueblos, above Santa Fe, are very similar to those of the Southern Tiwa (represented by Isleta), except for the pits containing grave goods. In San Juan Pueblo, when one dies the remaining members of the family gather in his home to hold a wake. He is dressed in his best: a loin cloth, shirt, belt, and leggings, and food is tucked under his left armpit. Holes are torn in his clothing, and his shoes are put on “in reverse” so that he cannot leave a correct set of tracks and thus be able to follow them back to his old home. He is sewed into a blanket after the markings distinctive of the religious society to which he belongs are placed upon his body. An adobe brick and a bundle of his remaining clothing are laid beneath his head. Orientation is to the east because the spirit must begin his journey in this direction. The spirit wanders for four days during which time small children must be guarded lest it return to harm or even carry them away. Appropriate songs are sung in Spanish throughout the night of the wake, a good indication that his portion of the rites is taken from the local Spanish velorio. People who feel they were wronged by the dead come in and forgive him so that he will not return to ask their forgiveness. Meals are served at about 10 p.m. and 2 a.m.

The next morning the body is placed on a ladder to be carried by the
pallbearers to the grave, and as a close relation throws the first handful of soil onto the body he gives a blessing in Tewa. This should be followed by a prayer in which the cacique of his moiety, one's primary Tewa affiliation outside the extended family, states that he is happy in a land of endless singing of cicadas. Within a month of the death, the caciques of both moieties should visit the family to offer condolences.

There are four procedures for discouraging the spirit from endangering the living. Clothes and other possessions, sometimes including his bed, are removed from the house and burned by relatives who fear his return for these articles. There is a thorough house cleaning, and medicine men may appear shortly after the burial to purify both house and relatives.

If the man has been a ceremonialist, his fellow religious society members come to take his personal fetishes, including his "corn mother," symbolic of Earth Mother, to be buried on a mountain to the west. Any society paraphernalia he has had at home is taken to the society house.

At the end of the four days which must elapse before the spirit leaves the pueblo, each related family brings a basketful of food to the house of the deceased. The male leader of the bilateral extended family pinches off a bit of each kind to put in a small vessel, made for the occasion. Then, with a native type of broom or brush, he sweeps the evil from all present. Placing in his mouth a piece of charcoal (symbol of Fire God and of Ash Boy, his younger counterpart, both protective supernaturals) for security against the lingering soul, he picks up the food vessel in his left hand and goes out to cast it onto the village trash mound. When he returns to the house, the charcoal is spat in the four directions to discourage the spirit from following. Each morning people will toss cornmeal out their doorways and drop tiny bits of food beneath the table for the use of all deceased relatives.

On All Souls' Day, a year later, food will be put out for the dead, prayers made, and the church bell slowly tolled by relatives for fifteen minutes, during which the family dead are supposed to turn over in their graves.

Isleta beliefs are duplicated in the concept of a person having died because he was needed elsewhere, and a shower occurring directly after a death indicates the immediate acceptance of the spirit in the afterworld.

To emphasize that wishing the deceased back is against Pueblo mores, a story is told of White Corn Maiden, beautiful and beloved by all, who long ago was married to one of San Juan's great warriors. After a year during which the two were inseparable, White Corn Maiden died. The grieving warrior could not believe she was gone and looked everywhere for her, though his relatives kept insisting that he try to forget her. On the fourth day he saw a light in the hills and there found her, combing her hair in preparation for her journey to the land of the spirits. He insisted that she not leave, and, though she explained that this would be wrong because after a few days her body would decay and he no longer would desire her presence, he prevailed and took her home. The family and all of the other people of the pueblo now
became angry at him. In about two weeks her body began to decompose, her skin grew yellow, and the odor became ever more apparent. Even the husband avoided her, and when he could no longer bear to come home, she began to follow him through the village. Soon a visitor from the spirit world appeared in their house and explained that as the two had disobeyed the old teachings, they must be punished. The warrior and White Corn Maiden thus were placed in the heavens, he a bright star (Morning Star) and she a dim one, forever trying to catch him.

The Keresan system of death ceremonies and deposits shares the majority of basic traits with the Tanoan, but there are certain distinctive differences. Santa Ana has not entirely given up the prehistoric custom of burying a baby in the corner of a room with a clay floor where a pit is dug 4 or 5 feet deep. The earth is so carefully tamped into place afterward that there can be no odor. As at Hopi, the infant's spirit is believed to be born again in another child. In Zia and Santa Ana, as at Hopi, and in the Towa speaking pueblo of Jemez, and possibly throughout Pueblo country, before the body of an adult is dressed, the clothing, even if new, must be cut or have holes punched in it. It is explained that the dead person no longer is whole; his spirit has left the body. As clothing, like everything else, has a spirit, the clothing for the dead no longer must be whole. The spirit must be liberated. In the afterlife everything is changed; if the clothes, like the human being, were not mutilated, they would be ragged rather than whole in the land of the dead.

The corpse's face is painted by the chief of the religious society of which he was a member. Prayer feathers are attached to the hair, and the body is wrapped in a blanket, beneath which food is placed. The villagers come to commiserate with the family in noisy weeping.

On the fourth day the possessions of the dead are blessed. The family, at least today, may choose to keep such things as good clothing, but in the past most or all of what a person owned accompanied him in death. The meal for the dead is prepared on the fourth day by his kin, and sometimes the entire village takes part. From the foods brought to the family residence, bits of bread, meat and all else are pinched off to be put into a water jar, if the dead is a woman, or in a small bowl if the dead is male. This vessel must have a hole punched in it or a chip struck off its rim. A few beads removed from a necklace of which the family pleases to keep the remainder may be placed with the food. Such things as the moccasins, hair ties, baskets, and bows and arrows of the dead are broken or chopped with an axe. The food offering, in its container, and the personal belongings all are laid on a special mound just outside the village by the leader of whatever religious society is requested to assume this duty. The village sacristan, a church official of post-Spanish times, must burn the "store clothing" of the dead, as well as having the body carried to the church. When the rites of "putting out" the possessions of the dead have been completed, everyone is invited to eat. If anything is left over it will be divided to be taken home by the participants.
In Acoma and Laguna the face is painted to show ceremonial membership, as elsewhere. If a woman is to be buried in her native style woolen manta dress, it is put on backward, so that the fastening comes over the right rather than the left shoulder. The clan head addresses her in a prayer much like those used in the other pueblos:

Oh, my dear sister (or brother)
Now for you there is only rest
Now for you the Shiwannah (rain spirits) are waiting.
Now for you the Kupishtaiya (other rain spirits) sing
Hear how beautiful their song.

The rain birds,
The cloud people,
The old ones,
The Katcina,
Now for you are calling,
By their first names are they calling.

Now for you—(name of the dead)
Much more than the earth can give
Much more than we who are poor can give
Where the wind and the Shiwannah alone shall live.
Now for you—

Now for you, dear Sister (or brother)
There is no sadness
Now for you nothing is hard or bad
Now for you there is no feeling but happiness
Now for you only gladness

Now for you there is only rest.
Now for you there is no night.
Now for you there is always rain and beauty
And all good things.

Go now in this right way,
Now you are going, four days passing, four times ending.
Never look back,
Never touching,
Taking no one with you
That thus, in this right way, turning,
All is forgotten.
Now for you there is no ending.
Forever and ever there is no ending.
From this place leaving,
In this right way leaving,
For now there is no ending.

The dead is told that he is going to meet relatives who have gone before him and he must not try to take any of the living with him. Neither should family members attempt to go with him. The twin war gods are advised of the death and protection is asked of them. Food, brought in by relatives and neighbors, is set out in a line near the body, and prayer sticks are laid with it. Bits of the food are broken off and placed in a bowl, later to be cast over a cliff with belongings of the dead at a spot reserved by each of these pueblos for this ritual. If a conservative Laguna finds a prehistoric vessel washed out from a grave cut by an arroyo, he should replace it in its original position if possible: possessions of the dead are not to be stolen by the living.

The Keres, like the Tanoans, admit to fear of the dead. A father will explain to his son that if he is overtaken by night while out hunting he should try not to think about the spirits which may be hovering about old ruins in the area. They probably would not hurt him. But I well recall that as late as World War II men who went out from their pueblo after dark would carry a gun “because of witches,” which in this case were described as ghosts, and Pueblo friends whom I visited were much concerned over my driving back to town alone after dusk.

A conservative man should be prepared with an offering whenever he goes out in the countryside, in case he should come upon a ruin, for the poor people who must have been buried nearby need someone to give them a thought and a little gift. Thus treated with consideration, the dead even may aid one. But their graves never should be disturbed, for it angers them. If there is some necessity for going through an old grave, such as laying a pipe line to one’s home or farm, the exigency should be explained to the dead in a prayer, and an offering of bread or of feathers or even a few beads should be left. Any bones which are exhumed must be reburied nearby. If one knows that the grave he has disturbed is that of a Navajo or of a non-Indian, he must go to a medicine man, request him to have the bones removed, and provide him with bread or feathers to be blessed and given to the spirit as offerings. The ceremonialist can give one the right to remove bones accidentally displaced.

Fear of the dead is not total. Following the old Catholic belief, the dead are presumed to return at Hallowe’en to visit the living, though not until the second year after death, and a gift must be put out for them. They even may appear in their old form. One pueblo tells of a young man and a girl who were much in love, but she died before they could be married. Grieving for her, he would have no one else, and when the first Hallowe’en came he brought the foods she liked and said a prayer asking the other spirits to take these to her. At Hallowe’en of the year following while walking along a street in town he
glimpsed a girl who called to him. As he saw her more clearly he realized that this was the girl he loved. She said, "I know you have not forgotten me, so I have come back to see you." He was very happy, and they went to his house in the pueblo and spent the night there. Next morning she got up and went out, disappearing as a spirit, but returned shortly. She suggested that they lie down and talk for a while because all spirits must depart when the bell rings at a certain time during the mass, and if she were not standing her spirit could leave without her body falling. The shock to her lover thus would be less. When the bell rang she disappeared and, though she had promised to return the next year, the young man was so unhappy that he could not wait. Inside of four days he too had died.

On All Souls’ Night in Acoma and Laguna, offerings are made to the dead by biting into food and then burning it. Prayer sticks, made in sets of four (two colored black and two a deep yellow) during the previous night, are burned. All of the orifices of the body are marked with black ash, and the people, carrying stone arrowpoints for protection, retire to the second floor rooms. An even more exotic touch is the presumption that someone is beheaded and the head kicked through the empty pueblo streets. Finally, in bare feet or wearing native made moccasins, all go out to greet the Morning Star, representing the elder of the Twin War Gods.

The tales of dead returning are not entirely non-European in character. But the introduced concepts are tied in with old stories of people going to the land of the dead and returning, as at Hopi (Simmons, 1942). In Santa Ana, people tell of a man who died after an illness. While his family was preparing the body for burial, his spirit—accompanied by a guide—went back to Shipapa, entrance to the Underworld, where he saw "the big boss" standing at the entrance, guarded by two dogs. He was asked about himself and then told, "All right, this must have happened because you are to carry a message back to your people." He was shown where he could peer through a doorway to see the evil people being given a very bad time, and through another doorway where he observed the good people enjoying a very pleasant life.

This vision was the material for his message, but unless he could reach home in time to re-enter his body before burial he could not go on living. Hence, a buzzard was provided for quick transportation, and he did reach the village just as his people were sprinkling the sacred cornmeal to give him a road. He slipped into his body with alacrity and gave a long sigh. Then his astonished relatives saw him turn his head. "Do you want to get up?" they asked. When they had propped him against the wall, he told of his journey and the conversation with Our Mother (Corn or Earth Mother, now more or less identified with the Virgin Mary), a warning to be given to all of his people.

It is not difficult to summarize the generalities exemplified by our ethno­logic data because they are consistent. Belief in a happy afterlife as a spirit associated with water is universal for all native Southwesterners but the Yumans, and an acceptable concept is that of the spirit leaving the body, visiting the
afterworld, and returning to continue life. Christian concepts of reward or punish­ment, depending upon conduct during this life, may be tied to the old native picture of such an adventure. But, though families are closely integrated and full expression of their grief at loss of a member is expected, his return must not be wished and lengthy mourning is discouraged.

Thinking in terms of their own great loneliness for the one who is gone, living people believe that the departed may make an effort to return for his possessions and even for some of his family. The attempt to obviate this dan­ger involves deposition of grave goods. A small amount of food is necessary for use during the journey to the land of the dead, but more food may be pro­vided for future consumption of this spirit and of the others there. The food, its container, and the prayer feathers which serve as something of a ticket to the afterworld are the only actual offerings, except possibly among Western Keres who may sacrifice more pottery. All of the other items deposited are the specific possessions of the dead and may consist solely of objects needed for daily living, but for a ceremonialist they include all personally owned ritual paraphernalia. The concept of personal possession is very strong in the pueblos, and the belongings of the dead are so firmly believed to continue to be his that no one else has a right to them, and the owner may punish anyone who takes them. The dead, if we may put it thus, are believed to be still living, though in a world where things are not so much different as reversed. Be­cause the specific place of a person in this other world will depend upon his group or ceremonial affiliations in this life, the marking of his identity by body painting and deposition of paraphernalia is most important.

A token deposit of food or of parts of objects is permissible because the part grows into the whole, or the small to the large, in typical Pueblo thinking. Offerings to the supernaturals, as such, often are handled as miniatures or as pieces. But some Pueblos go further. The breaking, punching, or nicking of vessels put out for the dead, the breaking of baskets, belts, bows, etc. in Jemez and elsewhere all have to do with “killing” the objects, separating its body and spirit, even as has happened to the human being. Prehistoric paral­lels are the Mimbres “killing” of any grave vessel by punching a hole through it, and the early Hohokam deposits of burned and broken sherds (but not all of any vessel) and the broken palette (probably used in final marking of the face of the dead for ritual identification) placed in the cremation pit and trench deposits. The Pueblos of New Mexico, like the Hopi, slash the clothes of the dead or put them on backwards so that they will be usable in the next world.

Grave goods may be placed in a pit rather than with the remains of the dead, as in Isleta and among the early Hohokam, or broken and left out on the village dump, as by the Tewa, or cut and broken and placed on a special mound or thrown over a cliff, as by Eastern and Western Keres; or merely left with the body, as by prehistoric Anasazi, prehistoric inhabitants of Papagueria, and historic Pima and Papago. Although it is possible that use of special places
of deposit for grave goods may have something to do with the advent of the Catholic church in New Mexico at about the turn of the 17th century, Pueblo IV graves dating from as early as the 14th century characteristically are without grave goods. Thus the customs of deposit in special places may antedate the Spanish period in New Mexico, as it certainly does, by many centuries, in southern Arizona. The archaeologist’s discovery of pit deposits of grave goods would be but a matter of considerable chance.

The Pueblos of today feel that the dust and sherds of a village dump, locally and more euphoniously known as the “ash heap,” represent their ancestors as well as Ash Boy and should not be disturbed. Prehistoric burials in the trash mounds of certain areas and historic placing of grave goods on trash mounds provide adequate background for such a belief. Some of the broken vessels of which the archaeologist finds all but a sherd or two may have held grave goods.

There is more of immediate practical use in our knowledge of Pueblo beliefs concerning the dead. When we were digging in the first Spanish settlement of New Mexico, San Gabriel del Yungue, a suburb of San Juan Pueblo in which ruins of Pueblo occupation before and contemporaneous with that of the Spaniards were uncovered, we came across burials in some of the rooms and just outside them. Concurrently we lost native workmen. By the third season at the site only a few tribesmen would consent to be hired. After we were refused Tribal permission for a fourth season’s work, the reason finally leaked out. We had been disturbing the dead. The old people not only had been distressed theoretically about the matter: they had blamed this disturbance for the hard winter which followed (in Europe as well as in North America), for increasing problems of drinking and accidents among the young people, for drought, and for a plague of grasshoppers. Hewett, I later learned, had run into the same difficulty in working at the Santa Clara ancestral site of Puye, years earlier. The dead reach up and clutch at the excavator’s legs and beg to be left alone. They return to him in bad dreams and headaches. They may make him seriously ill. What should the archaeologist do?

The Tewa would not discuss the matter, but a Keresan friend gave advice. If one disturbs the dead and does not apologize to them, they get you! A Pueblo workman hired by an archaeologist is not uncovering the dead on his own initiative, so he is not to blame, but he still feels that he must placate them with offerings. But, primarily, it is the boss who is responsible for the safety of his workmen, so the archaeologist really must handle the situation. Someone at San Juan should have told me to “speak to the ruins as a whole” with such a public prayer as “Please give us permission to disturb the dead so there will be no hurting of anyone,” and I should have had an offering to deposit. (Could one but have known earlier!)

That death customs have been carried over from prehistoric into historic times in Arizona and New Mexico is demonstrable. We can then with con-
siderable security postulate past beliefs in terms of the present. We would be inclined to credit Hohokam, Mogollon, and Anasazi with the concept of an afterlife enough like that known to the living to require equipment such as is used in this life as well as identification in ceremonial organizations paralleling those of the home village. From the beginning, the Hohokam conceived of material objects being possessed of spirits which could be liberated by breakage. By A.D. 600 this idea was picked up by at least the Mimbres branch people of the Mogollon stem. It may have been through them that the belief was transferred to the Anasazi, among whom we find it manifested by Pueblo V peoples of the Rio Grande, and we cannot say that they did not have it in Pueblo IV. “Token” deposits were early among the Hohokam and exist today in the Rio Grande. One may deduce that where this custom was carried on by prehistoric peoples their belief was that the part or the miniature represented the whole or large item.

Fear of the return of the dead as a ghost who might wreak damage seems to have existed in all three cultures as a background to the trait of depositing a person’s belongings in his grave, in a pit, or on a “trash mound,” sometimes known as a “shrine to the dead” in modern villages. We may guess that the modern Pueblo custom of placing prayer feathers with these possessions is old. Mogollon caves contain prayer feathers and other pahos, but our only evidence that the Hohokam may have used similar offerings is the emphasis of both Pima and Papago on the Vikita or Prayer Stick Ceremony, which was given at specific intervals by groups of villages acting together in the historic period. The fact that this was the only ceremony invariably recorded on their calendar sticks points to its importance, though descriptions are meagre. Prayer feathers, if placed with the dead, would have disappeared in Hohokam cremations, and in Hohokam, Mogollon, and Anasazi pit and grave deposits in the open; a few have survived from Anasazi burials made in caves. The term “offering” for items other than prayer plumes or food placed with the remains of the dead, whether actually present or merely represented in a token deposit, should be discarded in favor of the more accurate designation of “grave goods.” These apparently should be understood as actual possessions of the corpse.

Finally, it is notable that beliefs relating to disposal of the Hohokam, Mogollon, and Anasazi dead, as nearly as we can reconstruct them from historic parallels, were much the same and contrast with those of the Yumans.

Those of us who have been keeping a nose to the wind for any scent of Mexico-Southwest relationships will note some neat parallels between Pueblo and Chiapas beliefs and practice (Menget, 1968). Like the Pueblos, the Chamulas, highland relatives of the Mayan, picture the underworld to which the soul must travel as a place where the ways of life are the inverse of those here. The dead must have a new set of clothes, a blanket, little bags of food, a small drinking gourd, and money to purchase refreshments on his journey. In accord with the concept of inversion, the tortilla for the dead must differ from that for the living.
It is burned and the black powder placed in a bag from which the soul takes pinches of it with his left hand. The relatives also use their left hands in lifting a bit of this "food" to their mouths as a sort of communion with the departed.

The soul of a Chamula cannot begin his journey to the afterworld until he has collected those parts of himself, such as nail parings, hair, and any limbs lost during his lifetime, so a wake is held to cover this period of his hurried searching. But this consideration for his welfare does not eliminate the fear of his possible return, and relatives are cautioned not to lament so lengthily that he might be lured back. His house is swept clean, pepper is burned to drive his spirit away, and the door is locked. Moreover, all the chickens he has owned must be killed and eaten, an act said to represent a sacrifice to the gods, but which is very reminiscent of the old Pima-Pueblo-Navajo custom of disposing of possessions of the dead, even to killing his horse. Here we even pick up a Yuman parallel, for those people not only killed the horse but consumed it in the funeral feast.

It is not only the historic and the prehistoric Southwesterners who are linked by their death customs. The background for those customs, as for so many in the Southwest, probably lay far south in Mexico.
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INTRODUCTION

Historic Spanish pottery herein referred to are clay vessels made or used by Spanish colonists who emigrated from south of the present United States—Mexico boundary, by Spaniards born in the New Mexico area, or by indigenous people who partly or fully adopted Spanish culture. Excluded from this study are Mexican majolica and United States, European and Chinese porcelain imported into New Mexico.

An attempt was made to seriate and describe New Mexico Spanish pottery over 20 years ago (Hurt and Dick, 1946). Unfortunately, the descriptions were inadequate. They were not included in the “Check List of Southwestern Pottery Types” (Colton, 1955).

A series of new pottery types appear after A.D. 1620 in Spanish colonial settlements and occasionally in Indian villages. Distribution ranges from Mesilla, New Mexico northward to Antonito, Colorado along the Rio Grande axis and its lateral tributaries. Several types persist for more than 250 years.

The clay vessels used by the Spanish colonials in New Mexico are hand molded; the pottery wheel was never used. The forms most frequently encountered are both deep and shallow-bodied dishes with wide, almost horizontal rims or flanges; small, straight-sided bowls; large, everted-rim bowls; large, wide-mouth jars; very large, everted-rim, constricted-neck, round-bodied jars; neckless, narrow orifice jars (seed jars); and both handle and non-handle cups. The last two are rare.

The surface finish of vessels might be scraped, wiped, slipped, and/or stone polished. Vessel surface colors can be monochrome in unpolished brown, in polished brown, red, gray or black. Others are bichrome (red-on-brown) and polychrome (red, black, and white and red-on-brown with smudged interior). With the possible exception of some small bowls and some flange plates, the basic construction was by coiling.
Table vessels such as the small bowl, flange plate, and cup, are more distinctly non-Indian in form, whereas cooking and storage jars are more closely related to Indian forms.

It is conjectured that during Historic Period II (1598-1680), pottery in estancias and Spanish villages was made by Indian servants and/or slaves belonging to the Spanish family. In a later time, possibly after De Vargas' reconquest in 1692, and certainly by 1720, many Spanish women were making household pottery, producing the flange plate and small bowl, both having a characteristic red band around the rim. The large, plain storage jar and micaceous paste vessels appear far too numerous to be entirely trade vessels of Indian derivation. The large polychrome vessels are more typically Indian; the dearth of these in trash mounds could be indicative of trade. The extent of Spanish pottery trade with Indians has not been determined.

Documents of the 17th century (Chavez, 1954, pp. 58-70) reveal references listing the size of the nuclear Spanish family and the servants each possessed. Five to ten servants per family was not unusual. It can be presumed they were Indian and the manufacturers of much Spanish household pottery prior to 1680.

In three sites where combined dates bridge the years from ca. 1760 to ca. 1885, a detailed pottery examination reveals that the tempering material in a majority of the cooking, serving, and storage vessels is local. No contemporary Indian Pueblos existed in the vicinity of the sites under examination.

Two of three sites providing information for this report are a village and an isolated estancia in the Carnue area of Tijeras Canyon where it issues out of the mountains east of Albuquerque, New Mexico. Both were abandoned in 1772 (Adams and Chavez, 1956, p. 254). The trash accumulation suggests at least 10 years of occupation so that their establishment was ca. 1760.

The third Spanish site is the village called Old Casita or Casita Vieja, "old little house" settlement (Harrington, 1916, p. 145); also Casitas (Burial notice-1820, Archives, Archdiocese of Santa Fe—L.D. 1830, No. 36, Personal Communication, E. Boyd, 1959). Casitas is 7.3 miles south of the town of El Rito, New Mexico, longitude 106° 10' 30" west, latitude 36° 14' 45" north. The walls of the church can be seen about 0.3 mile east of New Mexico State Highway 96 on the east bank of El Rito Creek. The village was occupied by 1820 as the burial notices indicate and abandoned prior to 1910 (Harrington, 1916, p. 145), perhaps in the 1890's.

The small red-on-brown bowls and flange plates found in Casitas are tempered with sand procured from El Rito Creek. An examination of a random sample of 100 sherds shows 89.7% are local sand and 10.3% are tuff, the latter probably traded from the south.

Casitas consisted of four house blocks arranged in the form of a hollow square with a plaza in the center. The church with its walled campo santo or cemetery is on the east side of the plaza. Two prominent trash mounds outside of the plaza, one at the southwest corner and the other on the north side, were control-excavated. The houses were outlined and a number excavated.
A HISTORICAL FRAMEWORK

To what degree the divisions of the historic Spanish periods might relate to culture change, as can be demonstrated by archaeology, is not known at present. Therefore, the periods below are necessarily based on events of exploration, settlement, rebellion, and conquest and provide a chronological framework of reference that might prove useful in archaeological investigations.

Historic Period I (1540-1598). This is a time of Spanish exploration in New Mexico. It opens with Coronado's exploration and ends at the time of Oñate's settlement near present San Juan Pueblo. It is a period of little material influence on the Indians, but important in setting the stimulus of contact in native psychology.

Historic Period II (1598-1680). This begins with the first permanent settlement by Oñate and ends with the Pueblo Rebellion in 1680. Except for a few captive Spaniards, all were driven out of the Pueblo area for 12 years.

Historic Period III (1680-1692). The Pueblo Rebellion marks a break in acculturation. It was a 12 year period of re-crystallization of Hispano-Indian traits without the presence of the politically "dominant" culture. Subsequent important trait manifestations should be traceable through archaeological investigations and should produce interesting examples of selective acculturation of native and introduced traits.

Historic Period IV (1692-1846). This interval is characterized by a relative isolation of the Spaniards in New Mexico from the political and cultural capitals to the south. There is emigration of Spanish groups northward, many representing second and third generations in the New World, who competed with New Mexico's remaining first families, descendants of the original settlers. Alliances between Indians and Spaniards were stronger than in any other period because of common enemies and serious harassment by marginal non-Puebloan herders and hunters. This situation provides the setting for a distinctive frontier amalgamation of both the Pueblo Indian and Spanish cultures. It is also true to date that this period has provided the greatest amount of archaeological information. The period ends with the aggression and conquest by the United States.

Historic Period V (1846-1880). This period opens with a mass contact between the New Mexicans and the English-speaking people east of New Mexico whose laws and mores provided a different outlook on Indian contacts. The result was a conservatism and open revival of Indian mores with the relaxation of Spanish dominance. The U.S. entry also brought about some conservatism in the Spanish culture, particularly in more isolated areas. This period witnesses the establishment of a number of military outposts by the United States government. It closes with the opening of the west by the railroad.

Historic Period VI (1880-Present). The introduction of mechanical metal artifacts or mechanically produced artifacts increases in variety: the railroad,
windmill, barb-wire, repeating rifle, procelain, glass bottles, iron nails, wagons, corrugated iron sheets, tailored clothing, and shoes, to mention a few, become necessities and affect the traditional home crafts of the Spaniards. This period is a popular one with the bottle collectors. The Montgomery Ward catalog provides a good artifact check list.

It is intended that the above micro-historic periods will serve as a framework for interpretation of material archaeologically recorded in the upper Rio Grande Valley only.

CERAMIC DESCRIPTIONS

Casitas Red-on-brown

SYNONYMS: (a) Manzano Thin Red-on-buff, Hurt and Dick, 1946, p. 282; (b) Plain Red “Brick” ware, Toulouse, 1949, pp. 19-20; (c) Modern Painted Ware, Kidder, 1931, p. 136; (d) Plain Red, Kidder and Shepard, 1936, pp. 289-90.

NAMED FOR: Casitas

DESCRIBED BY: Hurt and Dick, 1946, p. 282

NAMED BY: New name.

ILLUSTRATIONS: This report, Fig. 23 a-c; Fig. 24 a-d jars; e-j bowl profiles; k-p flange plate profiles; Fig. 25 a-h.

TYPE SPECIMENS: ER3-A 3-3-1, ER3-C4-4-2, ER3-C1-5-3, in the type collection of Adams State College of Colorado, Alamosa.

TYPE SITE: Casitas

STAGE: Historic Period II through Historic Period VI.

TIME: Perhaps prior to A.D. 1672 to ca. 1890.

DESCRIPTION: Construction: Coiling followed by scraping. Firing: Oxidizing atmosphere. Paste: (a) Color- (Munsell) pink (7.5YR6.5/4), light brown (7.5YR6/3), light reddish brown (5YR 6/6), reddish yellow (5YR 6/5). (b) Temper - 92.8% very fine sand 20 to 30% by volume; 7.2% tuffaceous paste. Tuff percentage is high in tuff deposit areas. (c) Carbon Streak - Usually present in center and is light gray to dark gray and extensive. (d) Paste Texture - Very fine to fine. (e) Hardness - 3.0 to 4.5 (Moh’s Scale). Surface Finish: Bowls, wide mouth jars and flange plates are stone smoothed on inside and out; stone streaking and indentations are quite evident. A high polish is rarely achieved. Surface Color: Pink (7.5YR 6.5/4), light brown (7.5YR 6/3), light reddish brown (5YR 6/6), reddish yellow (5YR 6/5) (Munsell). Fire Clouds: Irregular patches occasionally on inside of bowls; occurs on about 50 percent of specimens on the outside of bowls, jars, and flange plates; color light gray to almost black (7.5 YR 6 through 3). Occurs usually on lower part of vessel. Form: Straight-rim bowls; everted-rim bowls; wide-mouth, everted-rim jars; flange plates are all most common. Closed orifice, non-neck (seed jars) rare. Thickness of Vessel Walls: (a) Bowl walls range 4.0 to 8.5 mm., average 5.5 mm. (b) Flange plate walls range from 4.0 to
5.5 mm. (c) Jar walls range from 6.0 to 11.0 mm. Rims: (Colton System, 1953, Fig. 10) IA2, IIA3, IIA4, IIIA2, IIIA3. Decoration: (a) Paint - Colloidal iron oxide clay used as both a slip and a paint, usually highly stone polished. Color - (Munsell) red (10YR 4/6, 10R 5/6, 2.5YR 4/8), weak red (10R 5.5/4, 10R 4.5/4). (b) Designs - A diagnostic feature is the red band on the upper part on both the outside and inside of bowls, continuous over the lip; on the outside of jars including the lip; on the inside of the flange of flange plates, including the lip. The bands are never more than 1/3 the vertical distance down the side of a vessel. Bowl interior red band widths range from 3 to 22 mm., exterior bands range from 7 to 27 mm. in width; invariably the band is of greater width on the outside than inside. Flange plate decoration occurs only on the inside of the flange on deep plates, whereas shallow plates are decorated on the underside of the flange. Jar red bands range from 3 to 25 mm. on the interior and 19 to 35 mm. on the exterior. About half of the bowls and flange plates have smeared designs on the vessel interior, in addition to the red bands. Designs consist of solid scrolls, running line scrolls, and series of circles presenting a "bulls-eye" target effect. The designs are often weak and badly smeared. The designs were applied with a cloth, rarely with a brush. Subsequent polishing caused further smearing. Purposeful paint splattering also occurs.

Range: Known to occur from Mesilla, New Mexico, up the Rio Grande and its tributaries as far north as La Sauces, Colorado in San Luis Valley. It occurs in a line in foothill villages east of the mountains paralleling the Rio Grande from Trinidad, Colorado to Manzano, New Mexico.

Remarks: A variety of Casitas Red-on-brown, similar in all respects to the above, can be classified a polychrome. The red-on-brown of the exterior is normal but the interior is smudged to (Munsell) gray (2.5YR 4/0) and dark gray (7.5YR 5/0). The red designs on the gray assume a greater brilliance than those on the normally oxidized exterior and range from red (2.5YR 4/6) to weak red (10R 4/4, 5/4).

**Powhoge Polychrome**

**Synonym:** None

**Named For:** The Pueblo of San Ildefonso, New Mexico.

**Described By:** Harlow, 1967, pp. 8-9. The type is illustrated with black-on-white drawings and jar and bowl decorations are described.

**Named By:** Harlow, 1967, p. 8.

**Illustrations:** Harlow, 1967, p. 9. This report, Fig. 26; Fig. 28, 1-k.

**Type Specimens:** ER3-C1-5-1, ER3-C4-8-2, ER3-C4-5-3, ER3-A4-2-4 in the type collection of Adams State College of Colorado, Alamosa.

**Type Site:** Casitas.

**Stage:** Historic Period IV

**Time:** Estimated 1760-1850.  

**Description:** 

**Construction:** Coiling followed by scraping. **Firing:** Probably
reducing atmosphere. Paste: (a) Color - (Munsell) Light reddish brown (5YR 6/4), pinkish gray (5YR 7/2, pink (7.5 YR 7/4). (b) Temper - Tuffaceous paste 69.3%; pumice 29.0%; sand 1.7%; sherd 1.7%. (c) Carbon Streak - Usually present, can appear center, outside half, inside half, or throughout; quite variable. (d) Paste Texture - Smooth, even. (e) Hardness - Moh's scale 3. (f) Fracture - Irregular, right angles to the vessel surface; surface is rough and hackly even though the paste is fine. Surface Finish: (a) Jars - Interiors are smooth to slightly undulating and may be smoothed by stone; exteriors may be scraped or brushed with a cloth or leather. Jar exteriors are slipped in white on the upper third or half, upon which black painted designs are placed. A band of red slip is placed below the white slip. At the line of intersection, the red overlaps the white. (b) Bowls - Red slipped over the entire exterior; interiors are slipped white and decoration applied in black. (c) Flange plates - Slipped solid red on the depression interior, white with black designs on the interior flange surface. The exteriors are unslipped. Surface Color: Unslipped surface pinkish gray (5YR 6/2); red slip (10YR 4/6); white slip (10YR 8/2) and (2.5YR 8/2). Extreme crazing occurs on the white slip; the cracks appear through the black paint. Form: Bowl; everted-rim, wide-neck jar; everted-rim, narrow-neck jar; flange plate (rare). Thickness Vessel Walls: (a) Jars range 8 to 10 mm. (b) bowls range 5 to 7 mm. Flange plates range 6 to 7 mm. (2 specimens). Rims: (Colton system, 1953, Fig. 10) Jars IA3, IB3; bowls IA3. Decoration: (a) Paint is black, organic, permanent, usually very dense; light polish over decoration. (b) Designs - All are placed in black-outlined white panels. Red does not occur in designs, but is confined to rim tops and underbody band. Black designs consist of base interlocking, solid triangles; diamond cross-hatchured triangles; elliptical leaf designs. Interior of bowls have elongated black triangles over entire surface; on jars the red rim line extends over the lip to form a band on the interior; on bowls the red rim line extends over the edge to form a band on the outside.

COMPARISONS: Kiua Polychrome from Cochiti and Santo Domingo Pueblos is similar, but differs in having a rag polish slip with striations rather than stone strokes, a coarser clay, and a black painted rim tip (Harlow, 1967, p. 8).

RANGE: Known to occur from Abiquiu-El Rito district to Belen, New Mexico.

Kapo Black

SYNONYMS: Manzano Burnished Black Ware, Hurt and Dick, 1946, p. 282. NAMED FOR: Kapo, the native name for the Pueblo of Santa Clara (Mera, 1939, p. 15). DESCRIBED BY: Mera, 1939, p. 78 (partial); Hurt and Dick, 1946, p. 282. ILLUSTRATIONS: Mera, 1939, pls. XXIV, XXV, XXVI. This report, Fig. 27, e.g. TYPE SPECIMENS: ER3-C2-5-1, ER3-B4-4-2, ER3-B2-4-3, ER3-C1-6-4 in the
type collection, Adams State College of Colorado, Alamosa.

TYPE SITE: Casitas.

STAGE: Historic Period IV through VI.

TIME: Ca. 1700 (Mera, 1939, p. 75) to present.

DESCRIPTION: Construction: Coiled and scraped. Firing: Reducing atmosphere with rapid reduction near end of burn. Paste: (a) Color - (Munsell) Reddish brown (5YR 5/3), reddish gray (5YR 5/2), dark gray (5YR 4/1), very dark gray (5YR 3/1). (b) Temper - Tuffaceous clay with fine to very fine sand added; occasional pumice. Sand grains sub-round to round. Amount of sand varies from sparse to moderate. (c) Carbon Streak - In the reddish brown through reddish gray core area, carbon zones 1 to 2 mm. wide are present on either exterior or interior edge. (d) Paste Texture - Fine to very fine. (e) Hardness - 3 to 4.5 (Moh’s scale). (f) Fracture - Break is straight, right angle to vessel surface, surface is smooth and fine. Surface Finish: Jar exteriors red slipped, polished; horizontal, parallel stone polishing marks in all cases. Jar interiors smoothed with very fine striae present. Bowl and flange plate interiors wholly polished and exteriors occasionally. Red band-lined bowls, slipped portion takes on deeper black gloss than unslipped portions, which tend to be a dull dark gray. Surface Color: Very dark gray (2.5YR 3/0) to black (2.5YR 2/0); occasional dusky red (2.5YR 3/2). Form: Large, flaring or everted-rim bowls; medium to very large constricted neck jars; straight-sided bowls; flange plates. Decoration: Polished black, the result of a deposition of carbon by a process of smudging. The smudged interior of some vessels of Casitas Red-on-brown, ranging from a glossy black to a dull dark gray on the same vessel, probably represents accidental smudging since it covers decoration on the bowl interior. Concerning black polished vessels at Pecos Pueblo Kidder (1936, p. 291) states: “The finest pieces are almost jet black and display a polish equaling that of the red parts of high rimmed modern painted ollas. Such perfection was, however, seldom attained, the average specimen being grayish-black and only moderately lustrous.”

RANGE: Antonito, Colorado south to Isleta Pueblo in the Indian and Spanish villages along the Rio Grande and its tributaries; East of the Rio Grande from Pecos Pueblo through the Spanish settlements to Manzano, New Mexico.

**El Rito Micaceous Slip**

SYNONYM: None

NAMED FOR: Type locality around El Rito, Rio Arriba County, New Mexico.

DESCRIPTION BY: This report.

NAMED BY: New name.

ILLUSTRATIONS: This report Fig. 27, a-b, sherds, exterior; c-d interior.

TYPE SPECIMENS: ER3-B2-2-1, ER3-C2-7-2, ER3-C1-6-3, ER3-C1-9-4, ER3-C8-8-5, in the type collection of Adams State College of Colorado, Alamosa.

TYPE SITE: Casitas.

STAGE: Latter third of Historic Period IV through V.
TIME: Estimated 1800-1895.

DESCRIPTION: Construction: Coiling followed by scraping. Firing: Reducing atmosphere. Paste: (a) Color - Gray (2.5Y 5/0) to dark gray (7.5YR 5/2), both common; brown (7.5YR 5/2) to pink (7.5YR 7/4) present. (b) Temper - Stream sand range .25 to 1.00 mm., bimodal .25 to .50 mm.; moderately tempered, ca. 25%. (c) Carbon Streak - Well fired specimens interior and/or exterior edges exhibit carbon band. (d) Paste Texture - Fine granular and medium dense. (e) Hardness - 3.0 to 4.0 (Moh's scale). (f) Fracture - Break is at right angle to vessel surface and straight; surface of break is rough. Surface Finish: Exteriors wiped, slightly striated; surface overall smooth to slightly undulating; exterior surface slipped with white or golden sericite mica. Inside jars and bowls smoothed by polishing stone to a semi-luster. Bowl interiors occasionally slipped with mica. Mica slip shows abrasion and has tendency to flake. Surface Color: Surface has metallic sheen with light reflection on mica plates. Golden mica slip is a light reddish brown (5YR 6/4); greatest number range from gray to black (10 YR 6/1 through 10YR 2/1). Form: Small, everted-rim bowls, rare; everted-and straight-neck, wide-mouth jars, common. Thickness of Vessel Walls: Range 5.0 to 8.0 mm., mode 6.0. Rims: (Colton System, 1953, Fig. 10) IB5, IB3, IIIA3, IIIB3.

COMPARISON: A similar pottery, Vadito Micaceous Slip is found at Picuris Pueblo and dates earlier than the very thin wall, sericite mica paste pottery made there today. The Vadito Micaceous Slip pottery in Picuris is extremely thick, ranging from 13 to 20 mm. wall thickness.

RANGE: At present only two known areas contain this type of micaceous slip pottery: Picuris-Taos and El Rito.

Carnue Plain

SYNONYMS: (a) Late, heavily-striated pottery, Kidder and Shepard, 1936, p. 326; (b) Manzano Coarse Ware, Hurt and Dick, 1946, p. 281; (c) Plain Red “Brick” ware, Toulouse, J.H., Jr., 1949, pp. 19-20.

NAMED FOR: Estancia and villages along Tijeras Arroyo located along the southeast edge of Albuquerque, New Mexico. Carnú is derived from the Spanish name of a village abandoned in 1772, located in NW¼ SE¼ Sec. 27, T. 10 N., R. 4 E., NMPM.

NAMED BY: New Name.

ILLUSTRATIONS: This report Fig. 28, a-j; Fig. 29, a-b. Kidder and Shepard, 1936, Figs. 273-276. Toulouse, 1949, Figs. 6, 7.


TYPE SITE: Estancia located SE¼ NW¼ Sec. 4, T. 9 N., R. 4 E., NMPM. Southeast Albuquerque, New Mexico.

STAGE: Historic Period IV through V.

TIME: Estimated 1700-1895.

DESCRIPTION: Construction: Coiling followed by scraping. Firing: Both oxidizing
atmosphere (Spanish), reducing atmosphere (Indian) conjectured. Paste: (a) Color - light reddish brown (2.5YR 6/4) and (5YR 6/4). (b) Temper - Medium to coarse sub-angular to sub-rounded sand, 9 to 26% by volume; grains protrude through surface producing a grainy texture. (c) Carbon Streak - very prominent through center forming a quarter to a half of wall thickness; light gray (2.5YR 7/0). (d) Paste Texture - Rough, granular, tendency to crumble. (e) Hardness - 3.5 (Moh's scale). (f) Fracture - Right angles to vessel surface, surface irregular, rough and granular. Surface Finish: Vessels semi-polished on interior, parallel polishing marks prominent; exteriors scraped and/or wiped, the pull of the temper grains over the surface producing course to fine striae. Surface Color: Light reddish brown (5YR 6/4), black (5YR 2/1), light gray to gray (7.5YR 7/0, 5/0); carbon from cooking masks the outside color. The interiors of vessels are frequently gray to black, in this case smudging occurred in the original firing. Form: Small, narrow-neck jars; small and large wide-mouth jars; large, wide-mouth, slightly everted-rim bowls; most vessels globular bodied. Thickness of Vessel Walls: (a) Bowls, range 5.5 to 8.0 mm., bimodal 6 and 7 mm. (b) Large jars, range 8 to 10.5 mm., mode 10.0 mm. Rims: (Colton System, 1953, Fig. 10) IIB7, IB7, IIIB7.

RANGE: Throughout central New Mexico from a line east-west through Trinidad-Antonito, Colorado, southward to below Mesilla, New Mexico.

REMARKS: One of the most common types along with Casitas Red-on-brown in Spanish sites. Also one of the predominant types found in United States' forts along the Rio Grande below Socorro, New Mexico between 1850 and 1885.

Petaca Micaceous

SYNONYMS: None.
NAMED FOR: Area of concentrated mica deposits around Petaca, New Mexico, 21 miles northeast of El Rito.
DESCRIBED BY: New Type.
NAMED BY: New name.
ILLUSTRATIONS: This report, Fig. 29, c-d.
TYPE SPECIMENS: ER3-A3-2-1, ER3-A3-2-2, ER3-A2-8-3, ER3-B1-5-4, in the type collection of Adams State College of Colorado, Alamosa.
TYPE SITE: Casitas.
STAGE: Latter part of Historic Period IV through V.
TIME: Estimated 1800-1895.
DESCRIPTION: Construction: Coiling followed by scraping. Firing: Reducing atmosphere most common, but some sherds indicate oxidizing. Paste: (a) Color - dusky red (10R 3/2) to brown (7.5YR 5/2) and very dark gray (5Y 3/1) to black (7.5YR 2/0). (b) Temper or inclusion - Moderate amount of angular quartz and feldspar with a size range of .26 to 1.42 mm. There are these size ranges in random distribution in any given sherd. These cause bumps on the wiped surface but rarely protrude. The particles are included.
in the original residual clay. (c) **Carbon Streak** - None or not identifiable.
(d) **Paste Texture** - Laminated and friable. (e) **Hardness** - 2.5 to 3.5 (Moh's scale). (f) **Fracture** - Break is irregular at right angles to the vessel surface; fracture surface is rough and granular. **Surface Finish**: Wiped obliquely, particles cause oblique scoring both surfaces of vessel. **Surface Color**: Very dark gray (5Y 3/1) to black (7.5YR 2/0); occasionally dusky red (10R 3/2) to brown (7.5YR 5/2). **Form**: Large, wide-mouth, globular jars; small constricted-neck jars. **Thickness of Vessel Walls**: Range 4.0 to 5.5 mm. **Rims**: (Colton System, 1953, Fig. 10) IA4, IIB4.

**COMPARISONS**: Modern Picuris Pueblo micaceous pottery contains no large inclusions of feldspar or quartz, having been removed, and is slipped with sericite mica.

**RANGE**: Known to occur in the El Rito, Abiquiu, Ojo Caliente, New Mexico districts.

**REMARKS**: The Petaca mining district, 14 miles north of Ojo Caliente, is the clay source for this pottery. Harrington (1916, pp. 157-58) reports that in 1910 the Petaca mineral deposit was visited by the Tewa Indians to obtain the glistening earth to make pottery. The deposit visited is two miles north of the Petaca settlement.

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Fig. 23.  a-c, Casitas Red-on-brown; d-f, Powhoge Polychrome.
Fig. 24. Casitas Red-on-brown: a-d, jars; e-j, bowl profiles; k-p, flange plate profiles.
Fig. 25. a-c, Casitas Red-on-brown shapes; d-h, decorative patterns.
Fig. 26. Powhoge Polychrome: a-d, jar designs; c, interior flange plate; e, small jar exterior.
Fig. 27. El Rito Micaceous Slip; a-b, sherds, exterior; c-d, interior; e-g, Kapo Black.
Fig. 28. Carnuè Plain: a-f, upper jar forms; g-f, jar shapes; i-k, Powhoge Polychrome flange plate.
Fig. 29. a-b, Carnué Plain rim sherds; c-d, Petaca Micaceous sherds.
Interpretation of prehistory is basically dependent upon material culture items recovered in association with features of different time periods and/or areas. Identification of the use of specific objects recovered from ruins to a great extent draws on ethnological studies relating to similar objects. Another source for data of the latter type is archival material.

Journals of early observers sometimes provide leads relating to the identification and use of an artifact. This type of source is particularly valuable since indigenous customs and uses of artifacts in early historic times might have differed considerably from those observed by ethnologists in recent years. Also, in some instances, an ethnic group might have discarded an early historic period practice by the time an ethnologist studied the group. In short, with data from the documents, one can determine what changes in custom or use, if any, occurred between the various periods of observation and more recent ethnological studies. In turn, the archaeologist will be able to more accurately postulate use of or custom relating to similar objects or features in prehistoric times.

The accuracy of the interpretation, of course, will depend on the amount of detail provided in the documents and the knowledgeability of the recorder at the time. The results of a study of a specific trait or custom through the historic period will produce an ethnohistorical trait use and lineage study. If the same approach is used to reconstruct through time the changes in the culture pattern of an ethnic group, the result will be an ethnohistory. Historical documents are important reference collections, particularly the earliest records if one is attempting to project an ethnohistory back into prehistoric times.

This paper makes no attempt to produce an ethnohistorical trait use and lineage study on feathers. It is strictly a survey of the early documents to determine the variety and amount of information available for, and the feasibility of, such a study on this specific item. If details of the association of feathers with other material items or their relation to specific features and customs are lacking, whether in documents or prehistoric sites, interpretation is severely
handicapped and reference must be made to recent ethnological studies for clues to reconstruct the past. If early historical associations or use differ from recent data, change obviously occurred and all the more caution must be considered in projecting into the prehistoric past. If there is a significant sighting of a bird mentioned in the documents that differs from present distributions, such will prove of interest to the ornithologist as well.

Documents of the early historic period, such as those used herein, reflect first impressions. The chroniclers were unfamiliar with the culture of Southwestern Indians, and as a result comparisons were sometimes made to the customs of Mexican Indians or the recorder presented his own ideas on the basis of his European cultural background. Sketchy observations, colloquial terms, and questionable or differing interpretations by the Spaniards tend to further confuse the picture. However, this is the material with which we have to work, and perhaps future excavations in historic period sites will help to clarify questionable or incomplete data.

Because of the interest relating to turkeys in the early documents, a check was made of Nuño de Guzman’s explorations of 1530 in Nueva Galicia, which indicate that the term gallina, for turkey, was in use well before Spanish expeditions penetrated the Southwest (Pacheco y Cardenas, 1870, vol. xiv, pp. 418, 444, 449). Molina’s 1571 dictionary of the Spanish and Mexican languages indicates that “gallina de castilla o gallo” was called quanaca or “castillan totolein” by the Mexicans, both of which I take to mean chicken. The term “gallina” alone has ciuatototolin or totolein as its counterpart in the Mexican language, probably referring to the indigenous turkey. At that time, according to this source, “pavo” or “pava” was given as “castillan quetzalototolin” (the latter being the quetzal), a bird prized for its rich green plumes. Most documentary references to turkeys use the word “gallina” in one combination or another, though “pavo” does occur. However, among the sources referred to herein for which the original Spanish was available to me, a statement by Fray Luis Velarde (1716) and two others in the Ofate documents (1601) used this term [see Ag5 and Dc3]. Fortunately, the word “gallina” in documents on the Southwest in many instances obviously refers to turkeys on the basis of its association in the context of the subject matter discussed.

For purposes of references in the material that follows, each major heading is designated by a capital letter, each expedition or subject subdivision is designated by a lower case letter, and each mention of a feather or a bird by a number in parentheses (beginning with “1” for each expedition or subject heading). Bracketed letters and numbers in the text refer to these reference symbols. Statements in parentheses are mine, except for the Spanish words from the original text.

A - SPANISH PERIOD OF EXPLORATION, A.D. 1540-1609

a) Since Cabeza de Vaca did not enter New Mexico (Krieger, 1961), the first
recorded history of Arizona and New Mexico begins with Fray Marcos de Niza’s account of his journey into the area (Hammond and Rey, 1940. For a reconstruction of his route through Arizona, relating to locales identified below, see Schroeder, 1955, pp. 284-290).

While on the lower San Pedro River of southeastern Arizona, Fray Marcos was given (1) quail (cordonices) by the Indians (probably Sobaipuris). In the region between the Tonto Basin and Zuni, he noted (2) partridges (perdices) slightly smaller than those of Spain. He also remarked that the gourd rattle Estevan carried into Hawikuh had (3) two feathers, one red and the other white. This was a rattle the Zunis recognized as one used by a people to the south (Yavapais or Sobaipuris?), evidently an enemy (Hammond and Rey, 1940, pp. 70, 75, 77).

b) In 1540, Hernando de Alarcón went a short distance up the lower Colorado River in an attempt to make contact with the Coronado expedition going north by land (Ibid., pp. 124ff. For a brief discussion of the distance he traveled upstream, see Schroeder, 1952, pp. 4-5).

While among these Yuman-speaking Indians, Alarcón noted a deerskin head covering with (1) a crest bearing some feathers [see Ac25], a sash with (2) a bundle of feathers hanging like a tail in back of a person, and women wearing (3) a large bunch of feathers, painted (?) and glued (?), tied in front and back (turkey feather skirt?), otherwise being naked. These people also gave undescribed (4) feathers to a woman of legend who lived by a lake. When these Indians were given a cross, they put (5) some feathers on it and took it to their master. Alarcón also remarked that he took (6) Spanish hens and cocks (Spanish chickens) upriver to trade (Ibid., pp. 129-130, 145, 150, 152, 154). This is the earliest definite reference to chickens in the Southwest [see Ac1].

c) Francisco Vázquez de Coronado’s expedition of 1540-1541 (Ibid.) provided a fair variety of data on birds and feathers. En route north from Mexico, while passing through Sonora, (1) chickens like those of Castile (gallinas como las de castilla - Hammond and Rey translated “chickens” throughout and Winship used “fowl”) were noted (possibly Spanish chickens acquired by the natives through trade prior to Spanish entry into the region, much in the same manner as iron reached a tribe of Indians above the Conchos River-Rio Grande junction before 1581 - Hammond and Rey, 1927, p. 20; but see p. 104). In Sonora; (2) royal (Winship says “tame”) eagles (aguilas caudoles) were used as an emblem of power (Hammond and Rey, 1940, p. 251; Winship, 1896, p. 516).

Coronado observed that not many birds were seen in the Zuni country because of the cold, but they had (3) a few (turkeys) larger than those of Mexico which he was told were used for feathers and not eaten, though he did not believe the latter. (Other statements that follow indicate that turkeys were given to the Spaniards to eat along with other food items.) [See Ac7, Ad5, Ad6]. He also described cloth among the Zunis painted with (4) birds and fish (Hammond and Rey, 1940, pp. 171-172, 175).

Melchior Diaz’ exploratory scout of early 1540 reported, on the basis of
second hand information, that the Zunis had (5) many tame chickens (gallinas en la tierra). The Traslado de las Nuevas account referred to them as (6) chickens (gallinas) larger (mayores—Winship uses “better”) than those of Mexico. Another narrative, the Relacion del Suceso, said these Zunis had (7) some Mexican chickens (gallinas) which were raised more for their feathers than for food (this suggests they did occasionally eat turkey) because they made quilts (turkey feather robes) of them, lacking cotton there. Castañeda reported both (8) feather and rabbit skin robes at these pueblos. The above Relacion also noted that these Zunis offered (9) plumes to water, usually at springs (Ibid., pp. 158, 181, 252, 286).

The Relacion Postrera de Cibola mentions cotton, yucca, and rabbit skin blankets at Zuni but not turkey feather robes, and adds that they possessed (10) some chickens (gallinas). The same fowl (gallinas) are referred to by this source among the Rio Grande pueblos, but in this case blankets made with the feathers of this bird are mentioned (Ibid., p. 309 - It appears that both statements refer to turkeys).

Hernando Alvarado, ordered to explore east from Zuni, recorded (11) chickens (gallinas) like those of Mexico at Acoma. The Relacion del Suceso also mentioned (12) chickens (gallinas) here. Castañeda stated that (13) turkey cocks with very large wattles (gallos de papada muy grandes) were given to the Spaniards at this pueblo. He also noted here a spring by which had been placed a wooden cross of small sticks adorned with (14) plumes and flowers (Ibid., pp. 182, 218, 223, 280, 288).

Among the southern Tiwas, Alvarado reported (15) chickens (gallinas) in great abundance and coats (robes) made with feathers of these birds (gallinas). Coronado stated that these people gave the Spaniards (16) hens (turkeys). The Northern Tiwas of Taos did not raise chickens (turkeys), nor did the Pecos. The Keresans of Zia, according to Coronado, and the Hopis, according to Castañeda, gave the Spaniards (17) “hens” and “native fowl” (aves de la tierra—turkeys) respectively (Ibid., pp. 182-184, 215, 289, 309, 331).

Remarks concerning Rio Grande Indians in general refer to (18) native hens and cocks (gallinas de las tierra y gallos de papada) and that all, including Taos and Pecos, had (19) some feather quilts made by fastening them with thread (cordage) to form a smoothly woven blanket. Alvarado noted that these people also (20) offered powders (pollen or flour), feathers, and even (21) blankets they wore to crosses erected by the Spaniards. (22) Plumes and roses were put on the arms of the cross, some being tied on with strings (Ibid., pp. 184, 255, 300).

According to Castañeda, (23) cranes (guillas—sic for grullas), geese (ansares), crows (cuerbos), and thrushes (tordos) were observed feeding in the planted fields along the Rio Grande. He also reported that (24) chickens (gallinas) of the variety (calidad) found in Mexico also occurred in the northeastern part of what is now the Texas Panhandle and that Indians of Mexico traded (25) rich-colored plumes (of macaws) for use in feather crests to the Indians living to the north (in Arizona?) of Nueva Galicia [see Abl, Ac26, Ad2, and Cb1] (Ibid., pp. 195, 239, 255. See
Schroeder, 1962, pp. 6-7, 9-10 for locale in Texas Panhandle). In support of the above statement, it should be noted that while Cabeza de Vaca was in Sonora, he learned that the Indians of The Valley of the Hearts or near vicinity gave (26) parrot (papagayo) feathers in exchange for turquoise to people who lived far to the north in very large houses (Bandelier, 1890, p. 42).

d) The Rodriguez-Chamuscado expedition of 1581-82, which came up the Rio Grande, provides information on other groups. Indians above the Conchos-Rio Grande junction gave (1) feathers to the Spaniards. About 13 days travel up the Rio Grande from the above junction, other Indians (perhaps a little below El Paso) gave them (2) two bonnets made of many macaw feathers [see Ac25, Ac26, Ae2]. (3) Turkeys (gallinas de tierra) were seen in the southern Piro pueblos where each Indian had his own (4) turkey corral holding 100 birds. These Piros and the Southern Tiwas made (5) aotes (corn-flour gruel) with meat of buffalos and turkeys (Hammond and Rey, 1927, pp. 20, 22, 24, 26-27).

Bustamante’s report and Gallegos’ testimony relating to the same expedition indicate that the Piros had (6) turkeys (gallinas or gallinas de la tierra - Bolton, 1916, p. 146, translated this “chickens” while Hammond and Rey, 1966, p. 129, used “turkeys”) for their own sustenance and that the Southern Tiwas also (7) raised large numbers. The pueblos in the Galisteo Basin had (8) large flocks of turkeys, many of which were given to the Spaniards along with corn and flour. Malagon (San Lazaro?) was one pueblo specifically mentioned by name as having and giving (9) turkeys. These people (Galisteo Basin in general) had (10) sticks adorned with plumes which a dancer who had been lashed gave to the spectator Indians so that they could place them in the fields and in pools of water to bring rain [see Be4] (Hammond and Rey, 1927, pp. 36, 39, 41, 43; Bolton, 1952, pp. 129, 135).

e) Luxan’s narrative of the Antonio de Espejo expedition of 1582-83 adds more data. The Patarabueys on the Conchos River had a large lock of hair on the crown of their head to which they fastened (1) white and black feathers of geese, cranes (grullas), and sparrow hawks. The Otomoacos on the Rio Grande above the junction with this river gave the Spaniards “ornaments like bonnets” with (2) colored feathers which they traded from the direction (west) of the sea (Nueva Galicia?) [see Ac25, Ad2] (Hammond and Rey, 1929, pp. 58, 67).

The Piros, who (3) raised turkeys in quantity, made (4) turkey feather quilts, especially for sleeping use, and used similar (5) quilts in place of cloaks. These Indians gave the Spaniards (6) turkey cocks and hens. Espejo mentioned shrines, in the Piro pueblos and in the middle of the roads, to which the people offered painted sticks and (7) feathers. At a pueblo visited to the east of the mountains (Abo or one nearby) Luxan reported that the Spaniards were given (8) more turkeys (Hammond and Rey, 1929, pp. 72-74, 77; Bolton, 1916, p. 174).

While among the Southern Tiwas, (9) many turkeys were noted and referred to as dew-lapts cocks and hens. Here some visiting Keres brought (10)
turkeys as presents for the Spaniards. When the expedition proceeded through San Felipe, Santa Ana, and Zia, more turkeys (gallinas) were received. Espejo mentioned (12) a parrot (sic—“urraca”—magpie, which Bolton mistranslated parrot) in a cage just like those of Castile. At Zia, it was noted that women wore (13) a turkey feather blanket over their dress, and at Acoma the dance-women wore “Mexican blankets” (cotton) with paintings, (14) feathers, and other trappings. This latter pueblo also presented the Spaniards with (15) turkeys (gallinas de la tierra) as did (16) the Tanos of Galisteo Basin (Hammond and Rey, 1929, pp. 79, 81-83, 85, 87, 117, 119; Bolton, 1916, p. 181).

When the expedition arrived among the Hopis, the women, girls, and children were said, according to Luxan, to be in the mountains with their (17) flocks. Espejo said they saw no turkeys (aves de la tierra) here. A newly erected cross in the main plaza of Walpi exhibited (18) many feathers and pinole (corn meal) which also were scattered on the ground beneath it (Hammond and Rey, 1929, pp. 95, 100; Bolton, 1916, p. 196).

The Verde Valley of central Arizona was reported as a warm land in which there were (19) parrots. The Querechos (Apaches in the locale of present Laguna) dressed one of their women with (20) a “feather crest” like that worn by the woman they captured from the Spaniards who had obtained her from the Hopis where she also had been a captive (Hammond and Rey, 1929, pp. 106, 113).

f) The journal of the Gaspar Castaño de Sosa expedition of 1590-91 also mentions receiving (1) turkeys (gallinas) at San Lazaro in the Galisteo Basin as well as at (2) the Tewa pueblos of Nambe and Tesuque. Reference also was made to (3) turkey (gallina) feather robes at Pecos and to a sighting of (4) a magpie (urraca) in December near Cerritos, downriver from Pecos (Schroeder and Matson, 1965, pp. 100, 112, 115, 145, 152).

g) Chronicles dealing with Juan de Oñate’s first colony in New Mexico and explorations outward mention (1) turkeys at Acoma. At Zuni they only received rabbits, but do record these Indians offering to crosses carried by the Spaniards that which they offered to their idols—flour (corn meal), sticks painted in various colors, and (2) feathers of native fowls (turkeys) (Hammond and Rey, 1953, pp. 394-95, 426, 467, 471, 614).

Near the edge of and in the Verde Valley, (3) “Castilian partridges” (quail?) were recorded, and the valley proper was said to have great numbers of birds. In general, the Pueblo land was said to be plentiful with (4) native turkeys, and the people had the practice of worshipping with feathers and offerings of almost everything, including birds (Ibid., pp. 411, 413-14, 483-84).

The Valverde inquiry, which reviewed the results of Oñate’s colonization in New Mexico to 1601, stated that the only domestic animals were (5) the native fowl of Mexico (gallinas de la tierra de Mexico), which in Spain are called turkeys (pavos) or in Mexico “native hens” (gallinas de la tierra). These were said to be raised for feathers to make blankets rather than for food or eggs. The Indians gave the Spaniards a few as tribute. Oñate also sent his
men out for (6) fowl and blankets. Also mentioned was the offering of (7) small birds of various colors to sculptured idols of stone or wood. If the idol was a god of the fowl, it had (8) some feathers tied to the head with a string. It was also reported that when the Spaniards went out to obtain tribute from the Indians, they would desert their pueblos and take their (9) fowl with them, but leave the other provisions (Ibid., pp. 626, 630, 634-35, 637, 641, 652, 664).

On a stream (Arkansas River?) near Quivira (in Kansas) were (10) Castilian quail and turkeys, according to this report. Another investigation in 1602 recorded a statement by Miguel, an Indian captive taken from the Quivira area to New Mexico in 1601, that (11) a turkey like the one shown to him also occurred in his home area on the plains. Brief reference also was made to the Pueblo people wearing cotton and (12) feather blankets and raising native fowl (Ibid., pp. 751, 839, 851, 874).

A review of Vicente de Zaldivar's services under Oñate in New Mexico also mentions (13) Castilian partridges and turkeys, specifically along the rivers of the plains, and also that the Keresans of Zia and Acoma gave (14) turkeys (gallinas) to the Spaniards (Ibid., pp. 889, 937-938).

The group of documents covered in the above survey are those of the Spanish period of exploration. These have been purposefully selected as a unit because the indigenous cultural practices and materials in use at the time probably had not been affected by the brief Spanish contacts of the exploratory period. For this reason they will serve well for comparative studies relating to more recent indigenous developments or to those of prehistoric times. Data from the initial Spanish colony of 1598-1609 also are included.

These early historical data cover a large area of the Southwest and neighboring territory and provide coverage relating to all the pueblos as well as some other ethnic groups. A detailed study of later historical records might well add sufficient information on several of these ethnic groups over a period of several centuries to reconstruct a trait use and lineage study on feathers from A.D. 1540 to the time of the most recent ethnological studies. The data that follow are a sampling of the documentary material from later periods which provide information relative to the subject matter treated above.

B - INITIAL SPANISH SETTLEMENT, A.D. 1610-1680

a) In the 1620's, Zárate Salmerón mentioned (1) feather blankets, for which the Indians raised many turkeys (gallinas de la tierra), and further that Pueblo Indian food included (2) "wild chickens" (sic —gallinas monteses—translated "wild turkeys" by Lummis, 1899, p. 44). He also mentioned (3) partridge and quail larger than other places (Milich, 1966, p. 57).

b) Father Alonso de Benavides, who served in New Mexico in the 1620's, observed that on wood gathering expeditions, the Pueblo people took (1) turkey feathers with them to place as offerings in ant hills as well as on heaps
of stone which nature had formed in a curious manner (wishing shrine?). Women attempting to reduce offered some (2) small feathers, meal, and other things to a stick or stone they set up as an idol. He also stated that a Tewa from Santa Clara, who was to approach an Apache (Navajo) as an emissary, had an arrow with (3) a colored feather instead of a point at its tip and that the Tewas also gave this Indian a pipe made of reed (cane cigarette). These Indians indicated with (4) a feather how far down they had smoked. The arrow was to be shot to the Apaches (Navajos) when the party reached their first rancheria, and the enemy would come in peace. He also reported that at Zuni, tall Indians, apparently captains, came into a room wearing (5) plumed headdresses and carried arms in a warlike fashion (Hodge, Hammond, and Rey, 1945, pp. 39, 43-44, 86, 219).

c) In the middle 1600's it was reported that the Zunis or Hopis of "Jongopavi" had (1) feathers and idols. In an underground kiva on the west side of the church at Isleta, kachina masks were seen. Beneath one was a wreath of flowering grass, (2) some feathers, and a short petticoat with a border of beads. In the province of Las Salinas, east of the Manzano Mountains, it was claimed that the padres used Indians to hunt (3) prairie chickens. Here, also, a dance was described in which one Indian fasts and later distributes (4) feathers to those he knows [see Ad10]. Another source adds to the above, stating that another Indian placed (5) feathers and flour on the ground upon which the man who fasted stations himself and that this act was repeated to the north, west, and south (Hackett, 1937, vol. 3, pp. 141, 144, 165, 208-209).

C - PERMANENT SPANISH SETTLEMENT, A.D. 1693-1846

There are numerous documents and Spanish publications relating to this period and reference is made only to a few to illustrate the continuance of customs relating to feathers and birds as well as to indicate the type of data available on birds in general.

a) Espinosa, in remarking on the habits of the Pueblo Indians immediately after the Pueblo Rebellion of 1680-92, stated that they were now accustomed to tilling the land and tending their sheep, swine, (1) chickens, and livestock, the basis for this statement being derived from Hackett (1942, vol. viii, p. cxlvi). It was the claim of the San Juan Indians, at this time, that one of the reasons they rebelled was because of Spanish efforts to abolish the ancient practice of placing offerings, including (2) feathers, ground maize, and almagre, on stone piles (Espinosa, 1942, p. 218).

b) Father Luis Velarde wrote in 1716 that at San Xavier and other rancherias, the Pimas raised (1) many macaws with "feathers of red and other colors, almost like those of a peacock", which they stripped from the birds in the spring for use in adornment [see Ac25]. He also noted that the Pimas offered (2) feathers to departed ones (Wyllys, 1931, pp. 129-131).

c) Fray Juan de Torquemada in 1723 published a work on the Indians that
included the Southwest. He noted that the natives along the Rio Grande raised (1) many turkeys (gallinas de la tierra) and made robes from their feathers. They also offered (2) plumes to coarse rocks that they had built up (wishing shrines). He referred to a "temple", a high room measuring 10 by 20 feet, all painted, wherein there was an idol of stone or clay seated on the right side of the temple with a basket with (3) three eggs of a turkey (gallina de la tierra) in it (Torquemada, 1723, pp. 678, 681).

d) The Rudo Ensayo, in addition to describing the environment and animal and plant life, mentioned a number of birds of Sonora (north to the Gila River) prior to 1763 (Smith, 1951, pp. 34-35) and gives the Indian names as well. Brackets below are mine.

<table>
<thead>
<tr>
<th>BIRD</th>
<th>INDIAN NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>eagle</td>
<td>pague</td>
</tr>
<tr>
<td>eagle</td>
<td>pichuchu</td>
</tr>
<tr>
<td>sparrow-hawk</td>
<td>taguara (Opata)</td>
</tr>
<tr>
<td>night-hawk</td>
<td>doguetaguar (Opata)</td>
</tr>
<tr>
<td>tecolete [sic]</td>
<td>muhu</td>
</tr>
<tr>
<td>another owl</td>
<td>teramu</td>
</tr>
<tr>
<td>owl [?, see above]</td>
<td>nacamud</td>
</tr>
<tr>
<td>quail (with tuft)</td>
<td>coitzi</td>
</tr>
<tr>
<td>quail (with large tuft)</td>
<td>cucu</td>
</tr>
<tr>
<td>quail (another type)</td>
<td>chacach (Opata)</td>
</tr>
<tr>
<td>wild quajalote (turkey)</td>
<td>chiqui (Opata)</td>
</tr>
<tr>
<td>wild pigeon</td>
<td>cui</td>
</tr>
<tr>
<td>turtle dove</td>
<td>ococoi</td>
</tr>
<tr>
<td>mocking bird</td>
<td>tzepa (Opata)</td>
</tr>
<tr>
<td>cardinal</td>
<td>churu (Opata)</td>
</tr>
<tr>
<td>rose-sucker [humming bird]</td>
<td>semu</td>
</tr>
<tr>
<td>crane</td>
<td></td>
</tr>
<tr>
<td>grey goose</td>
<td></td>
</tr>
<tr>
<td>white goose (with black feathers in wings)</td>
<td></td>
</tr>
<tr>
<td>heron</td>
<td></td>
</tr>
<tr>
<td>ducks</td>
<td></td>
</tr>
</tbody>
</table>

e) Pfefferkorn's treatise on Sonora, of the same period as the last (though completed in 1795), also presents a coverage of the animal and plant life and gives a similar listing of birds for interior Sonora (Treutlein, 1949, pp. 117-124). Some of his descriptions in several cases do not appear to be too accurate and should be considered with caution.
<table>
<thead>
<tr>
<th>BIRD</th>
<th>INDIAN OR OTHER NAME AND REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish chicken</td>
<td>tuchturi (chachalaca (Spanish))</td>
</tr>
<tr>
<td>bird similar to chicken</td>
<td>(tuchturi—Indians eat this bird but not the chicken. Legs are long like English chicken, tailless, and feathers are bluish all over.)</td>
</tr>
<tr>
<td>numerous wild ducks</td>
<td>no one hunts them.</td>
</tr>
<tr>
<td>turkey (Schraute in Cologne dialect)</td>
<td>guajalote—die in captivity unless hatched with brood hen.</td>
</tr>
<tr>
<td>geese</td>
<td>ash-colored on back, white underbody, coal black head with 2 or 3 white stripes under eyes. Larger than turkey cocks.</td>
</tr>
<tr>
<td>quail</td>
<td>unmolested by man. Partridge larger and more variegated than those of Europe. Tuft on head.</td>
</tr>
<tr>
<td>partridge</td>
<td>as numerous as in Europe. White raven occasionally seen.</td>
</tr>
<tr>
<td>crow</td>
<td>black on top, white underneath, long, thin beak, tail split at end, long delicate feet.</td>
</tr>
<tr>
<td>raven</td>
<td></td>
</tr>
<tr>
<td>flycatcher</td>
<td></td>
</tr>
<tr>
<td>sparrow-hawk</td>
<td>in southern Sonora and to the south. Bats are 1/3 again as large as those of Europe.</td>
</tr>
<tr>
<td>vulture</td>
<td>not common</td>
</tr>
<tr>
<td>owls</td>
<td>blue all over. Smaller than German titmice.</td>
</tr>
<tr>
<td>bats</td>
<td></td>
</tr>
<tr>
<td>cardinal</td>
<td></td>
</tr>
<tr>
<td>bluebird (azulejos-Haulichte)</td>
<td>sionsontle. Similar to nightingale in color, but larger.</td>
</tr>
<tr>
<td>[mockingbird?]</td>
<td></td>
</tr>
</tbody>
</table>
pirigua. Ash grey, varied with white and black feathers on wings and tail. Tail is long and broad with white “eyes” on the end. Tuft of white, grey, and black feathers. Pointed bill about 3 inches long.

chanates. One type is coal black and sparrow size. Other type black with a two-finger thick collar of golden yellow that also covers a small part of breast and back. A purple-red circle is between the beak and eyes. Larger than the all black type.

Farther south in warmer climate are found:

macaw [scarlet?]

guacamayo. Crimson, purple, yellow gold, blue.

[military?]
cotorra. Related to parrot but smaller, more gaudy, and short tail. Predominantly green with blue, red and yellow. Indians of Sonora raise these birds and sometimes pluck them for use in ornamentation.

parrots

perico

small parrot

perique. No larger than a partridge, prettier, and more gentle and talkative than perico.

I have not seen material of the Mexican period (1821-1846) that provides much, if any, data relative to Indian use of birds and feathers. Documents relating to the Santa Fe Trail (1820’s to 1846) should be consulted as well as the narratives of the early trappers and visitors in the Southwest, such as James O. Pattie, Thomas James, Kit Carson, Josiah Gregg, etc. At best, these latter will provide an occasional reference of interest concerning birds and Indian use of feathers. One source that spans the late Spanish period and the Mexican period refers to quail (cordonices), partridges (perdices), “wild hens (wild turkeys)” (gallinas de las tierra (pavos monteses), and grouse (gallinetas) in connection with hunting in New Mexico (Carrol and Haggard, 1942, p. 99).
D - THE PROBLEM OF THE CHICKEN

a) In New Mexico, a cursory check reveals an almost complete lack of mention of Spanish introduced chickens in the 1500's and 1600's. A review of the sources available to me indicate that no chickens are mentioned in the Coronado documents relating to New Mexico, though Alarcón took some chickens up the lower Colorado River to trade with the Yuman-speaking Indians of that area [see Ab6]. Journals of the Rodriguez-Chamuseado, Espejo, and Castaño de Sosa expeditions do not list chickens among their supplies. Neither do those of the Oñate colonizing party.

In the early 1600's, gifts from or to Indians do not mention chickens, nor are they listed among the mission supplies for New Mexico (Hodge, Hammond, and Rey, 1945) or among supplies for Sonora (Hackett, 1937, vol. 3, pp. 68, 71, 96-98, 108-109, 120). Neither are they mentioned in tithes New Mexicans gave to the church in 1639 (Ibid., p. 120). In the 1620's, cattle and other stock are recorded as doing well in New Mexico, but chickens are not mentioned (Hodge, Hammond, and Rey, 1945). The only reference to these birds is to (1) four dozen hens provided only for the use of those who became sick on the 1631 caravan journey from Mexico to New Mexico (Scholes, 1930, p. 102). In 1681, after the Spaniards had taken refuge in El Paso following the opening of the Pueblo Rebellion, it was reported that the pueblo of Alameda had (2) native chickens, but in Puaray the Indians had (3) Castilian chickens (Hackett, 1942, p. cxlvi). A more intense search of the documents of the 1600's might provide some information on the subject.

b) In northern Arizona, references to the period of the 1680-92 Pueblo Rebellion indicate that chickens were present in the Southwest. In 1692, De Vargas, while among the Hopis at Walpi, reported that he ate (1) "some eggs cooked in their special manner" (Espinosa, 1940, p. 271). The Mercurio Volante account of this event stated only that these were roasted or baked eggs (huevos asados), but in addition pointed out that the Indians at the opening of the rebellion vented their feelings on (2) the hens (gallinas—chickens in this case), sheep, fruit trees, and wheat (Leonard, 1932, pp. 56, 85), all representing Spanish-introduced items. It also was reported at Awatovi in 1692 that the Indians destroyed (3) "all the fowl [chickens] and animals domesticated by the Spaniards" (Espinosa, 1942, p. 99; 1940, p. 210, fn. 12).

In describing the possible use of the mission area at Awotovi, which pueblo was sacked and abandoned in 1700, the yard was said to be the place for (4) the chickens (Montgomery, et al., 1949, p. 210). Poultry coops in patios on the upper floors of Oraibi indicate that chickens were fairly common there in 1776 (Coues, 1900, p. 363).

These references to chickens happen to be restricted to the Hopis and might mislead one to believe that these fowl were obtained by trade from the Indians on the lower Colorado River where Alarcón first introduced chickens in 1540. However, the lack of mention of chickens by Oñate’s party in 1604-05,
while on the lower Colorado, the presence of (5) a few chicken bones in the upper levels of the excavations at Cuyamungue, a Tewa pueblo abandoned in 1696 (Wendorf, 1952, pp. 265-266), and the reference to chickens at Puaray in 1681 [Da3], suggest that chickens were present on the Rio Grande by 1680 and that those in the Hopi villages might well have originally come from the Rio Grande.

c) Southern Arizona probably was not the area from which the Hopis obtained chickens. Excavations at Quiburi yielded (1) some chicken bones in association with the San Pablo phase (1692-98) and Santa Ana phase (1704 plus), though the summary of this report suggests that chickens were brought in only in the latter phase and figure 33 indicates the former (Di Peso, 1953, pp. 235-236, 275, fig. 33). In any case, these occurrences appear to date after those in the Hopi country.

Father Eusebio Kino’s activities among the Sobaipuri Pimas did not begin until the 1690’s. The “ranches” he established among them contained cattle and other animals as well as chickens. In 1716, Father Luis Velarde reported that the Pimas raised (2) chickens of Castile and that in some places there were thousands of (3) birds (pavos o gansos, according to Castetter and Bell, 1942, p. 69) called chickens of the Indies (turkeys). Prior to the middle 1770’s, (4) Castilian hens (chickens) were recorded farther west among the Gila Pimas (Bolton, 1930, vol. 4, p. 44), among whom there were no Spanish settlements nor missions. This poultry probably was introduced from the south (where Coronado’s chroniclers recorded them in 1540 [Acl]) where one hen was equal to one real about A.D. 1750 (Ezell, 1961, pp. 29, 31) and where chickens prior to 1763 were said to be many (Smith, 1951, p. 34).

No further discussion is necessary beyond the 1770’s, since chickens were well established throughout Arizona and New Mexico by this date. The general lack of mention of chickens prior to A.D. 1680 might have been due to two factors—1) the Spaniards often used an inclusive term, ganado menor (small or lessor livestock) which could have included poultry, and 2) some of the early documents suggest that Pueblo Indians generally avoided fowl (including turkeys) as a food, and perhaps such aversion, if it existed, was not overcome until the late 1600’s. The Indians of Sonora did not eat feathered game or chickens or eggs, but raised chickens to sell pullets and eggs to the Spaniards (Treutlein, 1949, pp. 117, 198). However, this source also stated that they did eat a wild bird (tuchturi) resembling a chicken, but not the chicken (p. 117).

Though we do lack considerable data on the 1600’s in the Southwest, because of the destruction by the Indians of the Spanish documents at the time of the Pueblo Rebellion, the absence of any mention of chickens in the Southwest in contemporary documents available in the archives in Mexico is somewhat puzzling. Chickens were distributed in connection with colonization from the late 1500’s on. One method of colonizing provided for a proprietor who received a four league grant of land on condition that he establish a town of 30 families on this land. Among other things he was to supply each family
with horses, etc., including six hens and a rooster (Garfield, 1916, p. 66). Perhaps poultry was common in the Southwest and is not mentioned in the documents because the Indians did not take chickens on their raids.

Further excavations in late prehistoric and historic period sites might provide the final answer on the turkey and chicken as a source of meat among the Indians. My coverage of the documents of the 1600's is by no means complete and perhaps more definite information, including references to chickens on Spanish rancherias, will yet be brought to light by future search in archival material.

E - THE EARLY AMERICAN PERIOD

Many of the early American exploring expeditions had on their staff capable scientists who described the geology and the wildlife of the country through which they passed. See for example the zoological listing of the bird collections made by Möllhausen along the lower Colorado River and east across northern Arizona to the Hopi villages in 1857-58 when he accompanied Lt. Joseph C. Ives' party (1861, part V). These bird specimens are described in the General Report on Birds, vol. ix of the Pacific Railroad Report, which includes the results of other explorations and surveys. Others, such as Abert's New Mexico Report of the middle 1840's, contain references to the environment and the birds of certain areas and occasionally record Indian use of birds, i.e. turkeys and tame macaws at Laguna (1962, p. 82). Reports of early U.S. Army scouts and campaigns and Superintendent of Indian Affairs reports contain much of interest relating to Indian traits and customs.

Of pertinent interest to this paper are the observations of John Bourke about 1880 among the Southwestern Indians (Bloom, 1933-38). In the following data I omit his references to chickens, unless of specific associational interest, and have arranged the data on the pueblos into linguistic groupings for more ready reference and comparison. However, one must consult Bourke's journal text since he often makes general comparisons from one pueblo to another in regard to customs.

a) Zuni. Here Bourke saw (1) a pet raven, (2) wooden dolls with feather ornaments on the back of the head (kachina dolls), a number of (3) eagles kept for their feathers in wicker cages on the ground, (4) boxes containing feathers of the sparrow-hawk, blue jay, turkey, and eagle wrapped in paper, (5) old man tying feathers to sticks which were to be planted in the ground to insure good crops and bring rain, and (6) men wearing eagle and turkey feathers on their hats or head. He observed (7) eagles being plucked on May 18 and saw (8) owl pottery forms. He learned that the Zunis had (9) "parrot (?)”, (10) eagle, (11) crane (grulla), and (12) roadrunner (polilli) clans, kept (13) turkeys and (14) chickens but the last were not eaten for meat or eggs but raised for sale, (15) caught eagles when they were young, had clowns who
used (16) feathers in their dances, did not burn (17) owl feathers near their fields for fear of causing drought or bringing winds and hail, and (18) painted eagles on their pottery or (19) shaped pots in this form (Bloom, vol. xi, pp. 111, 114-115, 122, 188-189; vol. xii, pp. 195-196, 198, 200, 279, 366).

Apparently they did have parrots (most probably macaws since Bourke uses “huacamayo” most of the time) (Ibid., vol. xi, p. 266).

b) Acoma. No eagles were seen, but (1) the eagle clan as well as (2) “huacamayo” (macaw) and (3) turkey (gallina de la tierra) clans were represented. (4) Feathers from their (5) turkeys were planted in their fields to ensure good crops (Ibid., vol. xii, pp. 320, 362, 364, 366, 368).

c) Laguna. (1) Turkeys were observed here as well as (2) turkey forms in their pottery. They also (3) planted feathers in their fields and used them (4) to tickle their throats to induce vomiting. This pueblo had (5) eagle, (6) huacamayo, (7) turkey (largest clan), and (8) roadrunner clans (Ibid., vol. xii, pp. 360, 370-371, 375-376).

d) Zia. The only bird clan here was (1) the turtledove. (2) An eagle was kept in an abandoned house and (3) turkeys were observed, feathers of which were buried in the corn fields (Ibid., vol. xiii, pp. 220, 222-223, 231).

e) Santa Ana. (1) Many turkeys were seen as well as (2) four or five eagles in cages. The (3) turkey, (4) turtledove, and (5) eagle clans existed here (Ibid., vol. xiii, pp. 217-218).

f) San Felipe. (1) Two or four eagles were noted as well as (2) many turkeys, but only (3) the turkey and (4) turtledove clans were recorded. These people had (5) feather boxes and (6) huacamayos obtained from Sonora which were kept in cages. They too buried feathers in their corn fields (Ibid., vol. xiii, pp. 212-14, 231; vol. xii, p. 70).

g) Santo Domingo. Like San Felipe, these people had (1) Sonoran huacamayos in cages (Ibid., vol. xii, p. 70).

h) Cochiti. (1) Eagle and (2) turkey clans existed here, but only (3) turkeys were seen (Ibid., vol. xiii, pp. 235-236).

i) Jemez. (1) Three caged sacred eagles were seen on top of the houses and (2) a few turkeys in the village. (3) The eagle clan was represented and the kivas had paintings on the walls depicting (4) eagles, (5) ducks, and (6) turkeys, including (7) a hunting scene of Indians shooting turkeys in trees. These Indians buried feathers in their corn fields (Ibid., vol. xiii, pp. 227-228, 231).

j) Sandia. A bundle of (1) parrot feathers was noted in one house (Ibid., vol. xiii, p. 201).

k) Isleta. (1) The parrot (pájaro azul de afuera) and (2) eagle clan were recorded here and they also had (3) parrots (Ibid., vol. xi, p. 266; vol. xiii, p. 194).

l) Isleta del Sur. (1) A bundle of eagle feathers was seen in a house. These people had (2) eagle, (3) turtledove, and (4) goose (ganso) clans which they called gallina de la sierra as opposed to turkey or gallina de la tierra (Ibid., vol. xiii, pp. 205, 208).

m) Taos. (1) Three caged eagles were seen here (Ibid., vol. xii, p. 46).
n) Picuris. (1) A tame eagle in a cage as well as (2) an eagle clan were noted. These people wore (3) turkey, (4) eagle, and (5) owl feathers in their hair and (5) planted them in their fields to bring rain. Their (6) arrows were plumed with owl feathers (Ibid., vol. xi, pp. 276-277, 279-280).

o) San Juan. Their last (1) eagle died three years prior to Bourke's visit, and (2) the eagle clan was still active. However, (3) tail feathers of eagles and green boughs were seen on the floor of the kiva, left over from their last “dance.” (4) Parrot feathers, obtained from Zuni and Isleta, were abundant here and (5) eagles were plentiful in the mountains so they did not keep any in cages. These people (6) buried feathers in their fields. They also had adobe houses which were half underground for their hens (Ibid., vol. xi, pp. 259, 262-263, 265-267).

p) Santa Clara. These people (1) buried eagle feathers in their harvest fields and had an abundance of (2) down and plumage of eagles and parrots in all their houses. They had (3) clans representing both of these birds (Ibid., vol. xii, pp. 62, 255-58).

q) San Ildefonso. (1) Parrot feathers, blue on the outside and yellow inside, were seen. (2) The eagle clan as well as (3) eagles in cages also were noted. Two buffalo heads exhibited (4) eagle, (5) turkey, and (6) parrot feather trimmings (Ibid., vol. xii, p. 65).

r) Pojoaque. These people formerly had (1) parrot or macaw feathers (Ibid., vol. xii, p. 70).

s) Nambe. (1) Huacamayo feathers had been seen in all pueblos (Tewa) except Pojoaque, and here they were kept in little long boxes of cedar (juniper?) or cottonwood. He also saw (2) eagle, (3) turkey, and (4) sparrow-hawk feathers (Ibid., vol. xii, pp. 72, 74).

t) Navajos. Their war bonnets were decorated with (1) eagle or (2) wild turkey feathers. The buckskin masks worn in their dances had (3) two eagle feathers and a crest of horsehair. Though they ate (4) wild turkey, they cared little for (5) chicken (Ibid., vol. xii, pp. 223, 233).

In general, it would appear from this spot check survey that there is a considerable amount of data in the documentary and published records bearing on feathers and birds of interest to the ethnohistorian and to the ornithologist seeking information on birds of earlier periods. A more intensive investigation of the records should add substantially to this study. Obviously, the same type of investigation could be made on other objects and customs of Indians throughout the historic period. The same applies to archaeological trait distribution studies, which we sorely need.

Time-space studies of specific traits in the documents not only will serve to form a pool of comparative information, but will contribute a considerable body of data essential to any study of culture change. If combined with similar distributional studies of Southwestern archaeological material, anthropologists will have a 2,000 year time scale over a large area of the Southwest on which he can
trace development and diffusion of specific traits, traits assemblages, trait complexes, and ultimately patterns.

National Park Service
Santa Fe, New Mexico

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LIMB MEASUREMENTS
OF THE EXTINCT VULTURE, CORAGYPS OCCIDENTALIS

With a Description of a New Subspecies

by

Hildegarde Howard

The extinct black vulture, Coragyps occidentalis, has come to be recognized as a significant member of the Pleistocene and early Recent avifauna of North America. It is recorded from thirteen localities covering a wide area including Florida, New Mexico, Texas, Nevada, Oregon, California, and Nuevo Leon, Mexico, and dating from Middle Pleistocene (Reddick and Haile, Florida) to 8000 years Before Present (Oregon). See Brodkorb (1964, pp. 254-255) for bibliographic references.

Coragyps atratus, extant today in many areas of the South and West into Texas, has also been recorded from six North American Pleistocene deposits and three “prehistoric” Recent sites (Brodkorb, op. cit., p. 257). These records extend the westward record of C. atratus into New Mexico.

Fisher (1944), in discussing the skulls of black vultures, commented, “Coragyps occidentalis appears to be near the ancestral stock of C. atratus if not the actual parent.” To test the validity of this statement, which to me appears to be logical, it becomes important to examine the geologic and geographic distribution of each species. This, in turn, requires careful attention to the skeletal differences between the species. Fisher has pointed out the skull distinctions. But well preserved skulls are rarely included among the elements recovered in paleontological and archaeological sites. It is the limb elements upon which one must depend for study.

The description of Coragyps occidentalis, based on a tarso-metatarsus as holotype (Univ. Calif. Mus. Paleon. no. 12509) and twenty undesignated elements from the University of California’s excavations at Rancho La Brea, reads as follows (Miller, 1909, p. 306, footnote): Compared with C. atratus “body larger as judged by the skull, sternum, and pelvis; femur longer and heavier (107%); tarsus shorter (94%) but stouter (109%); foot wider (116%); humerus longer (107%).” Later, Miller (1911, p. 389) recorded measurements of “an average specimen” of tarsometatarsus from Rancho La Brea in comparison
with measurements of the type of *C. shastense* (later synonymized with *C. occidentalis*) from the Pleistocene of Shasta County, California. Measurements of a partial humerus from each locality were also recorded at this time. But measurements of the large assemblage of limb elements of *Coragyps occidentalis* now available from Rancho La Brea have never been recorded. This material is of utmost importance in determining the range in size and proportions to be expected in the extinct species.

At least 195 individual birds are represented by specimens of each element of the skeleton of *C. occidentalis* in the Los Angeles County Museum of Natural History collections from Rancho La Brea. I examined most of this material for purposes of comparison when recording bones from caves in New Mexico and Nevada. Qualitative distinctions from bones of the living *C. atratus* are not evident in the fossil limb bones; both species exhibit considerable variation. Differences lie in over-all size and proportions of the elements. Representative series of each of the main limb elements and the coracoid of *C. occidentalis* have been measured, including the maximum and minimum in length, and a random group between. As there appears to be no significant difference in size of the specimens from different pits, all were considered together in compiling the tables that follow. Pit 4 is most abundantly represented; others are Pits 3, 13, 16, 60, 61-67, and 77, all of which have a typical Pleistocene avifauna (see Howard, 1962). The number of measured specimens of each element varies from 50 to 70. Maximum, minimum, and mean lengths and breadths through the shaft and/or ends are given in tables 3-9, together with comparable figures from a series of six complete skeletons of the present-day *C. atratus*. Four of the latter skeletons are in the collections of the Los Angeles County Museum of Natural History (LACM) and two in the L.H. Miller collection at the University of California at Los Angeles. The smallest Recent specimen (LACM 1360) was collected in Oaxaca, Mexico, and possibly represents the subspecies *C. atratus brasiliensis* (see Wetmore, 1962, p. 2). The largest Recent specimens were collected in Florida and Texas, but in one or two elements these are equalled or exceeded in length by a skeleton from Guatemala.

The LACM collections now contain the specimens of *Coragyps occidentalis* from six of the other localities from which the species is recorded: Conkling Cavern and Hachita Cave (Howell's Ridge), New Mexico; Smith Creek Cave, Nevada; San Josecito Cave, Nuevo Leon, Mexico; and material from McKittrick and Carpinteria asphalt deposits, California, recorded by DeMay (1941a and 1941b); all are late Pleistocene in age. As measurements of these specimens were not included with the published records, they are added to the tables. I am also able, through the very kind cooperation of Mr. William Arvey of the University of California Museum of Vertebrate Zoology, to include the measurements of the type tarsometatarsus of *C. occidentalis*, which have not before been published. Mr. Arvey has taken these measurements for me.

In Tables 3-9, dimensions of elements from the modern skeletons of *C.
accessus are listed in the first column; the other columns refer to the fossil material of *C. occidentalis*. To indicate the source of the fossil material, the following abbreviations are used: RLB, Rancho La Brea; McK, McKittrick; Carp, Carpinteria; CC, Conkling Cavern; HC, Hachita Cave; SCC, Smith Creek Cave; and SJC, San Josecito Cave. The number of available specimens of each element from each of these localities is shown in parentheses under each site. Not all measurements could be made on each fossil specimen. Where a single measurement is inserted on the line indicating “Mean,” only one specimen could be measured for this dimension; where “Mean” is omitted, and only “Max.” and “Min.” given, only two specimens could be measured for this dimension.

**TABLES 3-9**

Measurements of Limb Bones of Pleistocene and Recent *Coragyps* (measurements in millimeters, ratios in per cent)

Table 3

<table>
<thead>
<tr>
<th>Coracoids</th>
<th>C. atratus</th>
<th>RLB (70)</th>
<th>McK (4)</th>
<th>SCC (1)</th>
<th>CC (3)</th>
<th>HC (2)</th>
<th>SJC (38)</th>
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<tbody>
<tr>
<td>Length, head to sternal facet Max.</td>
<td>60.7</td>
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<td>67.5</td>
<td>64.8</td>
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<tr>
<td>Mean</td>
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<td>64.5</td>
<td>66.2</td>
<td>63.7</td>
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<tr>
<td>Min.</td>
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<td>60.3</td>
<td>63.9</td>
<td>61.0</td>
<td>58.5</td>
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<tr>
<td>Breadth across triosseal canal Max.</td>
<td>11.4</td>
<td>13.6</td>
<td>13.3</td>
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<tr>
<td>Mean</td>
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<td>12.3</td>
<td>12.6</td>
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<td>12.5</td>
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<tr>
<td>Min.</td>
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<td>11.3</td>
<td>12.3</td>
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<td>11.6</td>
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<tr>
<td>Ratio, breadth to length Max.</td>
<td>19.1</td>
<td>20.5</td>
<td>19.8</td>
<td>19.2</td>
<td>21.6</td>
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<td></td>
</tr>
<tr>
<td>Mean</td>
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<td>19.0</td>
<td>19.1</td>
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<td></td>
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<tr>
<td>Min.</td>
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<td>17.6</td>
<td>18.5</td>
<td>19.0</td>
<td>18.1</td>
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117
Table 4

<table>
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<tr>
<th>Humeri</th>
<th>C. atratus</th>
<th>RLB (50)</th>
<th>McK (3)</th>
<th>CC (7)</th>
<th>SJC (15)</th>
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<td>Greatest length</td>
<td>Max. 142.2</td>
<td>155.9</td>
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<td></td>
<td>Mean 135.4</td>
<td>148.5</td>
<td>148.0</td>
<td>142.3</td>
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<td>Min. 124.8</td>
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<td>133.4</td>
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<td>Proximal breadth</td>
<td>Max. 27.9</td>
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<td>31.8</td>
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<td>across ext. &amp; int. tuberosities</td>
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<td>30.6</td>
<td>31.0</td>
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<td>Breadth distal end</td>
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<td>27.5</td>
<td>28.1</td>
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<td>Min. 22.5</td>
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<td>Least breadth of shaft</td>
<td>Max. 10.7</td>
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<tr>
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<td>Mean 10.1</td>
<td>11.5</td>
<td>11.4</td>
<td>11.5</td>
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</tr>
<tr>
<td></td>
<td>Min. 9.5</td>
<td>10.8</td>
<td>11.2</td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td>Ratio, proximal breadth to length</td>
<td>Max. 20.9</td>
<td>21.9</td>
<td></td>
<td>22.0</td>
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</tr>
<tr>
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<td>Mean 19.5</td>
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<tr>
<td></td>
<td>Min. 17.9</td>
<td>19.5</td>
<td></td>
<td>20.3</td>
<td></td>
</tr>
<tr>
<td>Ratio, distal breadth to length</td>
<td>Max. 18.3</td>
<td>19.4</td>
<td>18.3</td>
<td>19.7</td>
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</tr>
<tr>
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<td>Mean 17.8</td>
<td>18.2</td>
<td>18.5</td>
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<tr>
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<td>Min. 17.1</td>
<td>16.8</td>
<td>17.8</td>
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<tr>
<td>Ratio, shaft breadth to length</td>
<td>Max. 8.1</td>
<td>8.5</td>
<td>8.1</td>
<td>8.6</td>
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<tr>
<td></td>
<td>Mean 7.4</td>
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<tr>
<td></td>
<td>Min. 7.0</td>
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### Table 5

#### Ulnae

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<th>C. atratus</th>
<th>RLB (58)</th>
<th>McK</th>
<th>Carp</th>
<th>C C (6)</th>
<th>H C (2)</th>
<th>SJC (20)</th>
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<td>Greatest length</td>
<td>Max. 161.5</td>
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<td>178.9</td>
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<td>171.0</td>
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<td>Mean 155.9</td>
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<td>178.4</td>
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<td>transverse breadth through middle of shaft</td>
<td>Max. 8.2</td>
<td>9.4</td>
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<td>9.8</td>
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### Table 6

#### Carpometacarpi

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<th>C C (7)</th>
<th>H C (1)</th>
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<td>Length to distal end of metacarpal 2</td>
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### Table 7
**Femora**

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<th></th>
<th>C. atratus</th>
<th>RLB (65)</th>
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<th>C C (3)</th>
<th>H C</th>
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### Table 8
**Tibiotarsi**

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<th>C. atratus</th>
<th>RLB (65)</th>
<th>McK (4)</th>
<th>C C (3)</th>
<th>H C (1)</th>
<th>SJC (17)</th>
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<tr>
<td>Length from proximal articular surface</td>
<td>Max. 146.1</td>
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<td>12.9</td>
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<td>Max. 8.1</td>
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<td>8.3</td>
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<td>Ratio, breadth of shaft to length</td>
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120
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<th>C. airatus (6)</th>
<th>C. occidentalis (Type)</th>
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<th>McK (3)</th>
<th>Carp. (2)</th>
<th>SCC (1)</th>
<th>H C (2)</th>
<th>SJC (22)</th>
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<td>7.5</td>
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<td></td>
<td></td>
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<tr>
<td>Ratio, proximal breadth to length</td>
<td>Max. 19.1</td>
<td>21.8</td>
<td>20.8</td>
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<tr>
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<td>19.4</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio, distal breadth to length</td>
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<td>20.9</td>
<td>22.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean 19.7</td>
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<td>21.4</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Min. 18.6</td>
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<td>20.7</td>
<td>20.6</td>
<td>20.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio, breadth of shaft to length</td>
<td>Max. 8.8</td>
<td>10.5</td>
<td>10.1</td>
<td>9.6</td>
<td>11.0</td>
<td></td>
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<tr>
<td></td>
<td>Mean 8.4</td>
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<tr>
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<td>Min. 7.8</td>
<td>8.5</td>
<td>8.3</td>
<td>8.5</td>
<td>8.2</td>
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</tbody>
</table>
ANALYSIS OF TABLES

Rancho La Brea. The measurements of the material from Rancho La Brea reveal a number of important facts concerning size and proportions of *Coragyps occidentalis* that serve to broaden the understanding of the species as first described.

The coracoid, being a short, compact bone, is one of the most abundant, well-preserved elements in the fossil series, whereas complete body bones, such as sternum and pelvis, are few. Measurements of the coracoid, therefore, are useful in providing tangible indication of body size. The series of 70 fossil coracoids shows *C. occidentalis* to have been 9 percent greater than present-day *C. atratus* in mean length of this bone and 15 percent greater in mean breadth across the triosseal canal. Only the shortest fossil specimen falls below the maximum measurement of *C. atratus* in length; another two fall within the range of the Recent bones in breadth across the triosseal canal. But slightly over half of the fossil specimens fall within the range of the modern bones in relative breadth (ratio of breadth to length). It is noteworthy that twenty of these coracoids, which are below the average for the fossil series in relative breadth, are above the series average in length.

In general the measurements of this large series of limb bones from Rancho La Brea agree with the original diagnosis of *Coragyps occidentalis*. Exact percentage distinctions as compared to present-day *C. atratus* tend, however, to be increased. The inclusion in the tables of the small specimen of *C. atratus* from Mexico (LACM 1360) lowers the average size of the Recent series, and, in turn, increases the percentage by which the fossil exceeds the living form. The tarsometatarsus was noted in the type description of *C. occidentalis* as being 6 percent shorter in the fossil than in *C. atratus*. In the present series, the mean is almost the same in the two species (*C. occidentalis* 99.7% of *C. atratus*), and six of the fossil tarsometatarsi exceed the range of the living form in length (maximum 103%). Thirty fossil tibiotarsi fall within the size range of the living species, the other 35 being longer (maximum, 105%). Relative to the other limb bones, however, both the tarso-metatarsus and tibiotarsus are shorter in the extinct species. Table 10 demonstrates some of these relationships in the two species, comparing maximums, minimums, and means of length of each element. Particularly notable is the fact that in the living species the tibiotarsus is longer than the humerus, whereas in the fossil form the humerus is longer. The tarsometatarsus and tibiotarsus both average broader of shaft in the extinct species; 83 percent of the tarsometatarsi and 95 percent of the tibiotarsi even exceed the Recent maximum in this dimension.

All the fossil femora are longer and distally broader than those of *C. atratus*. The fossil series also averages broader of shaft, but two specimens fall within the size range of the existing species in this dimension.

Of the wing bones, all the fossil humeri exceed the modern bones in all dimensions. Comparing means, *C. occidentalis* is 9 percent longer and 13 to 15
percent broader. Although the ulnae and carpometacarpal also average larger in the fossil, ten of the 58 ulnae are within the size range of *C. atratus* in length and thirteen others overlap in breadth of shaft; four of the 65 fossil carpometacarpal are shorter than the maximum *C. atratus* specimen, and eight fall within the size range of *C. atratus* in breadth of metacarpal 2.

In brief, *C. occidentalis* is shown to be a larger, heavier bird than *C. atratus*, with shorter legs. Overlap in size range does occur, however, in certain dimensions in all elements except the humerus. Although rarely affecting more than one dimension in an individual specimen, the fact that overlap exists is sufficient to warn against attempting identification of fragmentary material that might be considered "borderline."

### Table 10

Comparison of Skeletal Proportions in *C. occidentalis* and *C. atratus*

<table>
<thead>
<tr>
<th></th>
<th><em>C. occidentalis</em></th>
<th><em>C. atratus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio of length of tibiotarsus to length of humerus</td>
<td>96 - 99 %</td>
<td>103 - 106 %</td>
</tr>
<tr>
<td>Ratio of tibiotarsus to length of ulna</td>
<td>85 - 88 %</td>
<td>90 - 92 %</td>
</tr>
<tr>
<td>Ratio of length of tarsometatarsus to length of humerus</td>
<td>55 - 57 %</td>
<td>60 - 61 %</td>
</tr>
<tr>
<td>Ratio of length of tarsometatarsus to length of femur</td>
<td>86 - 88 %</td>
<td>96 - 98 %</td>
</tr>
<tr>
<td>Ratio of length of tarsometatarsus to length of carpometacarpus</td>
<td>101 - 105 %</td>
<td>110 - 112 %</td>
</tr>
<tr>
<td>Ratio of length of tarsometatarsus to length of coracoid</td>
<td>128 - 129 %</td>
<td>136 - 141 %</td>
</tr>
</tbody>
</table>
San Josecito Cave, Mexico. The San Josecito Cave assemblage is sufficiently large to provide significant comparison with that from Rancho La Brea. Every element in the Mexican group averages shorter, and over 90 percent of the specimens fall below the mean of the Rancho La Brea series.

This trend to smaller size does not, however, suggest closer relationship to Coragyps atratus, for the specimens all show the relative stoutness that distinguished C. occidentalis. In fact each of the elements averages slightly stouter than in the Rancho La Brea series. Also in agreement with C. occidentalis are the relative lengths of the elements shown in Table 10. The comparable ratios for the Mexican series are: tibiotarsus to humerus, 97-98 percent; tibiotarsus to ulna, 85-88 percent; tarsometatarsus to humerus, 55-56 percent; tarsometatarsus to femur, 86-88 percent; tarsometatarsus to carpometacarpus 99-103 percent; tarsometatarsus to coracoid, 125-128 percent.

The Mexican assemblage obviously represents a geographic variant of typical C. occidentalis, not an intermediate form between the Pleistocene and Recent species. It is proper, therefore, that it be designated as a subspecies, and I propose the name Coragyps occidentalis mexicanus. The Rancho La Brea form will take the typical trinomen of C. occidentalis occidentalis.

Although the characters of the Mexican race are delineated by consideration of the size range of the total assemblage in comparison with that of the typical form, custom prescribes that a holotype be designated. As the tarsometatarsus is the holotype for the Rancho La Brea form, this element is chosen to represent the Mexican subspecies.

**Coragyps occidentalis mexicanus n. subsp.**

_Holotype:_ Left tarsometatarsus lacking external distal condyle; LACM no. 20455, collected by Calif. Instit. Technology.

_Age and Locality:_ Late Pleistocene, San Josecito Cave, province of Aramberri, state of Nuevo Leon, Mexico; LACM (originally Calif. Instit. Tech.) locality no. 192.

_Diagnosis of holotype:_ Compared to type of Coragyps occidentalis from Rancho La Brea (Univ. Calif. Mus. Paleon. no. 12509), 11 percent shorter, 10 percent greater in proximal breadth relative to length, and 14 percent relatively stouter of shaft. Compared to the series of tarsometatarsi from Rancho La Brea (Table 9), 6 percent shorter than minimum, but 4 percent greater than maximum in relative breadth of proximal end and stoutness of shaft.

_Measurements of holotype:_ Greatest length, 73.5 mm.; greatest breadth of proximal end, 16.8 mm.; least breadth of shaft, 8.1 mm.; breadth of proximal end relative to length, 22.8 percent; breadth of shaft relative to length, 11.0 percent.

_Referred material:_ With the type, the following additional specimens constitute the type series: 21 tarsometatarsi (LACM 3358, and LACM 20307-20326); 38 coracoids (LACM 3354, and LACM 20327-20363); 15 humeri
(LACM 3352, and LACM 20364-20377); 20 ulnae (LACM 3356, and LACM 20378-20396); 21 carpometacarpi (LACM 3355, and LACM 20397-20416); 23 femora (LACM 3353, and LACM 20417-20438); 17 tibiotarsi (LACM 3357, and LACM 20439-20454).

Maximum, minimum, and mean measurements and ratios of these elements (with type included) are listed in tables 3-9. The mean length of each element is 5 to 6 percent less than the comparable mean of *C. occidentalis occidentalis*, and the mean ratio of breadth of shaft to length is 2 to 4 percent greater. An analysis of length of each element compared to *C. occidentalis occidentalis* is presented in Table 11.

In addition to these fully formed bones, the Mexican assemblage contains an equal or greater number of imperfect and immature specimens of *Coragyps* that cannot be accurately measured. These presumably represent the same racial group.

It is worthy of note that the caracara of San Josecito Cave also shows a variation towards short stout bones as compared to the Rancho La Brea caracara, and has been described as a subspecies of the extinct *Caracara prelutosa* (Howard, 1940).

### Table 11

**Size of *Coragyps occidentalis mexicanus***

**Compared to *C. occidentalis occidentalis***

**Based on Lengths of Limb Elements**

<table>
<thead>
<tr>
<th>Total no. bones of <em>C. o. Mexicanus</em></th>
<th>Below mean of <em>C. o. occidentalis</em></th>
<th>Below minimum of <em>C. o. occidentalis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Coracoid</td>
<td>38</td>
<td>36</td>
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<tr>
<td>Humerus</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Ulna</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>Carpometacarpus</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Femur</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Tibiotarsus</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Tarsometatarsus</td>
<td>22</td>
<td>18</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>156</strong></td>
<td><strong>147</strong></td>
</tr>
</tbody>
</table>
Carpinteria and McKittrick, California. The four measurable specimens of *Coragyps* from Carpinteria agree with the Rancho La Brea series in size and proportions. The McKittrick assemblage of 23 specimens includes a tarsometatarsus longer than the maximum of the Rancho La Brea series, and a femur of greater distal breadth. Whether this trend to larger size would become statistically significant with a more representative sample of the population is a matter for further study. It is possible that more bones of *Coragyps* will be found in the material from McKittrick contained in the collections of the Kern County Museum.

Nevada and New Mexico Caves. Only two specimens of *Coragyps* were recovered from Smith Creek Cave, Nevada. The tarsometatarsus has a distal breadth only slightly greater than the maximum of *C. atratus*, but above the average for *C. occidentalis*. The assignment to the extinct species is confirmed by the heavy shaft of the tarsometatarsus and by the length of the coracoid.

The material from Conkling Cavern, New Mexico numbers 43 specimens, of which 29 have yielded one or more measurements. The assemblage is unquestionably assignable to *Coragyps occidentalis*, every measurement exceeding the size range of *C. atratus*. The complete specimens of ulna, carpometacarpus, and tibiotarsus also exceed in size the small Mexican race (*C. o. mexicanus*) and indicate that the Rancho La Brea subspecies extended into New Mexico.

The nine measurable limb bones from Hachita Cave, New Mexico fall within the range of *C. occidentalis* with, for the most part, average or greater dimensions. One specimen, however, a subadult coracoid, is nearer the minimum in size, and in length barely surpasses the maximum measurement of *C. atratus*. Had this specimen been the only representative of the genus in Hachita Cave, the assignment would have been questionable.

Records from New Mexico, close to the present habitat of *C. atratus*, are especially critical in determining the limitations of range, both geologically and geographically, of the two species. The Recent species, *C. atratus*, also, is recorded from New Mexico, at Rocky Arroyo, a site now noted as being Pleistocene in age (Brodkorb, 1964, p. 257), although originally believed to be Recent (Wetmore, 1932, p. 141). The record is based on a coracoid (Wetmore, op. cit.). This specimen was kindly lent to me in 1961 when I was studying the *Coragyps* material from Hachita Cave. The measurements taken at that time, compared with the series of measurements of *C. occidentalis* and *C. atratus* now at hand, are found to be close to the minimum of the extinct species and the maximum of the Recent, with a leaning towards the former (length approximately 60.9 mm., breadth across triosseal canal, 11.9 mm.). These dimensions, like those of the coracoid from Hachita Cave, mentioned above, leave room for doubt as to the identification. It is unfortunate that this is the only specimen from Rocky Arroyo. Brodkorb (1964, p. 257) lists another (unpublished) occurrence of *C. atratus* from the Pleistocene of Albuquerque, New Mexico. The measurements of the specimens from this locality will be of importance in determining
whether or not *C. atratus* actually did exist in New Mexico in the Pleistocene, presumably as a contemporary of *C. occidentalis*, not as a descendant.

**Florida.** None of the Florida specimens has been examined for this study. It is noteworthy that in this area only middle Pleistocene records are referred to *C. occidentalis*; those of the late Pleistocene are all referred to *C. atratus*. Except for the material from Seminole Field, the records from the late Pleistocene sites (Itchtucknee River, Sabertooth Cave, and Rock Spring) are based on only one or two bones, and no dimensions are given. Regarding the “numerous fragments” from Seminole Field, Wetmore (1931, p. 24) states, “these remains are similar in size and form to those of modern individuals.”

**SUMMARY AND CONCLUSIONS**

Measurements of over 400 limb bones and coracoids of *Coragyps occidentalis* from the Pleistocene of Rancho La Brea provide the first record of the actual size range of the extinct species at its type locality. The relatively shorter, stouter tarsometatarsi and tibiotarsi, longer wings, and over-all larger body size of the extinct form in comparison to the living *C. atratus* are emphasized by these measurements. At the same time, however, it is apparent that there are some dimensions in which size range of individual elements of the two species overlap. It is possible, therefore, that a single, incomplete specimen could not be safely identified.

The 156 measurable limb bones of *Coragyps* from San Josecito Cave, when compared with the specimens from Rancho La Brea, are found to average shorter in each element, while retaining the stoutness and proportionate relationship of elements characteristic of the Rancho La Brea material. A separate race is, therefore, established for the Mexican population, *C. occidentalis mexicanus*.

Of the previously identified specimens from Nevada and New Mexico, only the material from Conkling Cavern, New Mexico is sufficiently abundant to indicate racial identity; it clearly represents the larger form, *C. occidentalis occidentalis*.

The importance of the skeletal material obtained from or adjacent to areas where *C. atratus* is still extant is emphasized. These are the critical areas from which it may be possible to determine whether *C. occidentalis* and *C. atratus* were, at one time, contemporaries or whether the extinct form was ancestral to the Recent. As at present recorded, both species are listed from the late Pleistocene of New Mexico. In the West, *C. occidentalis* alone is represented in the late Pleistocene of California and into the very early Recent in Oregon. In the East, in Florida, *C. occidentalis* is recorded only from the middle Pleistocene, and *C. atratus* is recognized in the late Pleistocene and Recent.

It is hoped that the measurements offered here may assist in determining more precisely the status of the two species.

*Los Angeles County Museum of Natural History*
*Los Angeles, California*
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THE INSTABILITY OF THE DISTRIBUTION
OF LAND BIRDS IN THE SOUTHWEST

by

Allan R. Phillips

This paper attempts to analyze the rate of significant changes in the distribution of land birds in and near Arizona. It is very appropriate that such an analysis should appear in this volume.

One hot August afternoon in 1933 I first met Lyndon L. Hargrave. This man, while directing archaeological excavations at Wupatki, northeast of Flagstaff in the Little Colorado Valley in Arizona, was also (with no encouragement whatever) enthusiastically collecting the birds of that rather desolate area. I could not understand this, nor why on my next visit in March 1934, he at once put me to work skinning birds that he had kept frozen outside his north window in Flagstaff since the preceding November. Yet his enthusiasms, misguided as they seemed at the moment, somehow attracted me; so on graduating from college in February 1936, I at once came to Flagstaff to help him band birds and curate the collections he was forming for the Museum of Northern Arizona. The results of our banding of small birds disappointed me. The little light it shed on my main interest, migration, cost immense time and effort. (This, of course, does not deny the outstanding value of banding and marking techniques for other studies, other areas, and other kinds of birds.) Nonetheless, my real, technical education began that spring and summer. I struggled to understand why ornithologists of that time had identified Hargrave’s birds as they had, which forcibly led me to taxonomy; and I pondered his “strange” ideas.

Three of Hargrave’s guiding principles for biological field research and its interpretation stand out in my mind. These were (1) the need to base scientific work on an adequate series of specimens, carefully studied and always available for re-study; (2) the need of thorough analysis of all data, from every conceivable angle, before attempting synthesis; and (3) the fallacy of viewing the distributions of species in the recent past in terms of their present distributions. The second point was easy to understand. The first might also seem self-evident, though it took me years to grasp its importance; and some zoologists still seem oblivious of both points.
But to a brash and ignorant young ornithologist, Hargrave's views on past distributions then seemed almost preposterous. Aside from a few of the bones he had recovered at Wupatki, we then knew virtually nothing about possible changes in distribution of birds in Arizona within historic or Recent time. Only the California Condor (*Gymnogyps californianus*) was generally known to have withdrawn from the state, and even this was denied by leading authorities of that (and later) times. Only two birds (excluding introduced species) were known to have entered the state within historic time, the Black Vulture (*Coryagyps atratus*) and the Red-eyed or Bronzed Cowbird (*Tangavius aeneus*); and an 1890 record in central Arizona cast doubt on this change in the case of the vulture (Cooke, 1914). Except for occasional irregular flights, we knew nothing at all about any possible changes in numbers or distribution within the state, excluding of course the famous Masked Bob-white (*Colinus virginianus ridgewayi*) and certain sparrows, whose disappearance was generally recognized as a direct result of overgrazing, and a very few of the largest birds which had been shot out.

With the exception of one highly speculative paper (Grinnell, 1922), the stability of distributions ran like an undercurrent through the writings of the more prolific authors on California and Arizona birds (Miller, 1937, p. 249), even up to their most recent summaries (Grinnell and A.H. Miller, 1944; A.H. Miller, 1951). Likewise, many writers on "evolution," zoogeography, taxonomy, and subspecies take such stability for granted. Yet by now it is clear that Hargrave was right, to an amazing degree. If the following analysis of major changes in bird distribution stresses Arizona, this is due simply to faulty early data elsewhere. Either neighboring regions were not visited by ornithologists 50 to 100 years ago, or the identical areas have not been recently reworked; or, in the case of California, no attempt has been made to dig up old manuscripts and compare them with current conditions. In Arizona, on the contrary, there are valuable early lists or manuscripts from many parts of the state: the Colorado River (Cooper, Brown, et al.); northwestern Arizona (Stephens); Prescott (Coues); the Verde Valley and many surrounding points (Mearns); north-central Arizona (Merriam, Wetmore); central Arizona (Gilman et al.); the San Pedro Valley (Palmer, etc.); eastern Arizona (Henshaw, Aiken); Tucson and the Santa Catalina Mountains (Brown, Scott, Stephens, L.H. Miller, et al.); the southeastern mountains (Stephens, Nelson, Henshaw, Cahoon, Swarth, Law, A.P. Smith, et al.); and the whole Mexican border (Mearns and Holzner). Besides, excellent fieldmen such as Nelson, A.B. Howell, E.G. Holt, E.A. Goldman, J.L. Peters, etc., visited virtually the whole of Arizona for the U.S. Bureau of Biological Survey (now Fish and Wildlife Service), chiefly in and shortly before 1913-1916. Other early collectors visited Arizona briefly, or kept few or no notes. Nevertheless, some may exist of which I have no knowledge; and surely the notes of Bendire (Tucson and south, 1858-1873) and of Law (Chiricahua Mountains region, 1910's and 1920's would add still more data to those presented below.)
The distributions here considered are those which might be expected to be reasonably stable, i.e. the breeding distributions of diurnal land birds only. The instability of aquatic habitats in the Southwest, especially with recent overgrazing, is too well known for comment; hence birds of aquatic habitats are generally omitted, along with introduced species. Changes of winter range (Green Heron, Ardea virens, and various Fringillidae) are likewise omitted, as are those of migration (Hairy Woodpecker, Dendrocopos villosus; Sage Thrasher, Oreoscoptes montanus). Data on nocturnal and crepuscular birds are too scanty to warrant inclusion.

Further omissions below are local changes that do not seem to be parts of broad patterns (the species being, so far as known, reasonably stable elsewhere). Data on such local changes may be found in “The Birds of Arizona” (Phillips, Marshall, and Monson, 1964). Among them are, at Camp Verde, the Flicker (Colaptes auratus), Bewick’s Wren (Thryomanes bewickii), Red-winged Blackbird (Agelaius phoeniceus), and Summer Tanager (Piranga rubra); at Prescott, the Common Crow (Corvus brachyrhynchos) and Western Meadowlark (Sturnella neglecta); in the Flagstaff area, Spotted Owl (Strix occidentalis), White-throated Swift (Aeronautes saxatalis), Cassin’s Kingbird (Tyrannus vociferans), Say’s Phoebe (Sayornis saya), Rough-winged Swallow (Riparia ruficollis), House Wren (Troglodytes aedon), Rock Wren (Salpinctes obsoletus), Red-faced Warbler (Cardellina rubrifrons), Yellow-breasted Chat (Icteria virens); cf. Carothers and Haldeman, 1967), and Hepatic Tanager (Piranga flava); at Fort Mojave, the Elf Owl (Micrathene whitneyi) and Bewick’s Wren; on Sonoita Creek, starting in 1961, the Western Kingbird (Tyrannus verticalis) and Varied Bunting (Passerina versicolor); in the Santa Catalina and Graham Mountains, the Spotted Screech-Owl (Otus trichopsis), Saw-whet Owl (Aegolius acadicus), Rivoli’s Hummingbird (Eugenes fulgens), Sulpher-bellied Flycatcher (Myiodynastes luteiventris), Olivaceous Flycatcher (Myiarchus tuberculifer), Olive Warbler (Peucedramus taeniatus), and Gray Vireo (Vireo vicinior); in the Chiricahua Mountains, the Eastern Bluebird (Sialia sialis); and at Tucson, the Spotted Owl, Barn Swallow (Hirundo rustica), and Bridled Titmouse (Parus wollweberi).

Another major and extremely important change now taking place is the extermination of many of our finest birds by the indiscriminate use of chemical pesticides. This criminal irresponsibility is without precedent in the past, and therefore is not included in calculating past rates of change.

Most of the data herein are drawn from the various sources acknowledged in “The Birds of Arizona” (pp. viii-xi), and the abbreviations for museums (mostly concordant with the “Index Internationalis Herbariorum”) are those used therein. Again, italicized dates are of records supported by specimen evidence, in the museum cited. And again, wing measurements are of the chord.
SOME BIRDS WHOSE RANGES HAVE CHANGED IMPORTANTLY

Black Vulture, *Coragyps atratus*. The 1890 report has been shown to be untrustworthy. The first sight records were made southwest of and near Tucson in 1920 and 1922. Farther south in Sonora, where this is a familiar and conspicuous town bird, it was not seen by Stephens on his trip to the Gulf of California in 1884; but on the same route, 50 were seen by me in passing, Feb. 2, 1932 (at Altar). Likewise it reached Magdalena sometime between 1887 and 1925 (van Rossem, 1945). In northeastern Sonora, Cahoon (ms.) found it “common” at Moctezuma in 1887, but does not mention it elsewhere. In May 1947, van Rossem and I saw it there, near Cumpas, near Nacozari, and also near Esqueda, on a brief reconnaissance. Shortly after, Ernest R. Tinkham and I saw two at San Bernardino Ranch, east of Douglas, Arizona, July 8, but it has not become established anywhere in that region, to my knowledge. Joe Marshall and I, on another of Cahoon’s routes, saw seven near Bacuachi, Sonora, June 2, 1953, and on June 21, we found 12 or more on the Río Bavispe, 15 kilometers north of San Miguel. I have not seen it farther north, in passing the Colonia Oaxaca or Colonia Morelos areas, but did find it north of Esqueda (within 3 kilometers of Fronteras) in late 1953, when the largest flock seen was 14 birds. There were at least 60 farther south, at Granados.

North of the Tucson Valley there was no reliable report until 1944, when a casual flock was seen at Wickenburg. It did not establish itself this far north, but was seen regularly in a limited area along the Gila River and nearby from 1947 on.

Particular interest attaches to this case because, in the Pleistocene, a similar but larger species, *C. occidentalis*, occurred in the Southwest. Details of its distribution and extinction are of course unknown, but obviously the identification of remains found in Indian ruins must be made with extreme care. The genus as a whole has obviously undergone much ebb and flow in the past several thousand years.

California Condor, *Gymnogyps californianus*. This species, now nearing extinction, was a rare bird in Arizona by the time exploration began. A very few were reported, in scattered localities, 1881-1885, and almost none thereafter. Bones have been found in cave sites of the Grand Canyon where, as in southwestern Texas (Wetmore and Friedmann, 1933), these were the predominant birds utilizing such shelters (as far as known). The Arizona bones are of uncertain age, but those of Texas are estimated as 1500 to 3000 years old and include (from a single cave) at least three individuals, among them “a young bird barely old enough to fly.”

Prior to 1944, the shrinkage in range of this species was well known and universally recognized (cf. for example American Ornithologists’ Union, 1931, pp. 62, 428; Howard and Miller, 1933, pp. 17-18), though some sight records were questioned. Then H. I. Fisher (1944) separated all the Pleistocene bones as a
distinct species, *G. amplus*, because the skull was larger, with stronger occipital processes and other slight differences. He found no overlap of "some 107" (p. 289) or 127 (p. 272) fossil crania with 7 Recent skulls in the basitemporal regions, and concluded (1944, p. 292): "One must either assume that *Gymnogyps californianus* has evolved as a species since the Pleistocene, or that it has moved into the area since the Pleistocene." Neither assumption is, to me, at all likely, though the lines between species in geologic time are of course necessarily arbitrary.

Fisher consistently refers to the bones he examined as "fossil" or "Pleistocene." This was perhaps necessary at that time, since exact data on their ages were lacking. Recently, however, an important study by Howard (1962 ca.) has shown that nearly all the bones of *Gymnogyps* are from the oldest pits of Rancho La Brea, there being a rapid decline at first and a steady one later; thus in the three most recent pits (part or all of which material accumulated after the arrival of man in California) there are 1, 0, and 0 individuals, respectively. It is likely that all the crania seen by Fisher were from the three to six oldest pits, which contained 75.8 and 92.6 percent (respectively) of the Rancho La Brea *Gymnogyps*. (Only 16 individuals out of the 215 tabulated by Howard, 1962c, p. 21, are in the seven most recent pits of the 13 enumerated.) It thus appears that the gap in characters noted by Fisher is paralleled by a gap in time. This, I feel sure, is why Fisher maintains the Rancho La Brea bird as a distinct species, which both he (1944, p. 292) and Howard (1962a, p. 30; 1962c, p. 18) believe probably was ancestral to the living species. (This is not to deny that a second full species of *Gymnogyps* may have persisted elsewhere, in southwestern New Mexico, until late Pleistocene or even early Recent times, as suggested by Howard, 1962b.) A similar tendency at Rancho La Brea in the Golden Eagle, *Aquila chrysaetos* (Linnaeus), is considered merely subspecific by Howard (1947), and a glance at Howard (1962c, p. 21) will show why; 590 of the 960 Golden Eagles from Rancho La Brea are in the seven most recent pits (52 in the last three). Fisher was apparently misled by an accident of sampling.

Nonetheless, Fisher's dissociation of the species from its fossil record (followed by all subsequent writers on vultures) cleared the way for Koford (1953) to deny its whole history. Koford's claims were (1) the species always had had a very limited range; records outside of California were mostly unsupported by specimens and thus not valid. Even within California he dismissed one record that disagreed with his own estimates of population size. (2) The old records for the Columbia River (Oregon and Washington), which he could not deny, he explained away as being the result of a northward post-breeding migration in winter to take advantage of a seasonal food supply.

Koford's theorizing, unfortunately, ignores all the facts and probabilities: (1) It is seldom possible to get within range of very large birds. Even if one does and recovers the bird from where it may fall, the odor of vultures is guaranteed to deter all but the most ardent souls from attempting to skin one of these tough creatures. (At certain times and places, too, one might receive more money for the quills than for the skin.) Using Koford's own criterion, one could easily
“prove” that he himself, in his special studies, never saw a condor or, for that matter, probably never saw any vulture! (2) With the exception of a few marsh-inhabiting or fish-eating species, all land birds nest at the extremes of their ranges farthest from the equator. Not a single case of movement to a colder climate in winter (or moving north in the northern hemisphere) has ever been found as a regular migration. Familiarity with general principles of migration would have warned Koford against belief in such an unsupported and extremely unlikely hypothesis. (3) There is not the slightest reason to believe that the finds of condor bones in caves represent more than a mere fraction of the birds that roamed the Southwest until recent years. Every ornithologist knows that birds, by the millions and even billions, inhabit almost the entire earth, but that a mere handful of localities has ever yielded fossil birds in any quantity. Rancho La Brea, probably the richest of these, has yielded a total of less than 100,000 bird bones or fragments (representing, of course, many less individuals; Howard, 1962c, p. 24, lists a total of only 5,845), over unknown thousands of years. It would thus be the sheerest accident if, among these very few birds preserved from the past, any represented an unusual occurrence in any way, such as the farthest east that a species ranged or the latest date of its occurrence at the place of fossilization (or, as Léon Croizat has remarked insistently, the earliest).

I am of course aware that Fisher (1944, p. 294) said the Eocene or early Oligocene Plesiocathartes europaeus “probably represents a straggler on the European continent,” and that Howard (1962c, p. 18) advanced, as a possible explanation of finding only three Ectopistes in the Rancho La Brea deposits (each in a different pit), “that the few individuals represented were migratory strays” (see also Miller, 1937). As to the former, it may suffice to remark that this is the only possible Eocene cathartid listed by Fisher, all of his American forms being Oligocene (two bones only) or above. The case for considering Ectopistes casual would be stronger if the abundant and similar (in size, and to some degree in habits) Columba fasciata were not represented by exactly the same number and scattering of individuals. Further, other notably gregarious birds (shorebirds, terns, blackbirds) are also poorly or not at all represented at Rancho La Brea. Other birds much heavier, and of less powerful flight, than Ectopistes are absent: loons, pelicans, Aechmophorus, Egretta thula, Gallinula (and almost the ubiquitous Fulica, with only one individual!), possibly Limosa fedod (dubious identification of 2 or 3 birds only), and Himantopus. Consider, too, the evidence afforded by Gymnogyps itself. The present remaining stronghold of this bird is not far away, and there can be little doubt that it was present more or less continuously in the region all through the late Pleistocene. Yet almost none were preserved in any of the relatively recent pits, despite the fact that these were natural traps for raptors, as Howard notes. Thus under even exceptionally favorable conditions (big birds and a natural trap), there is little chance of the fossilization of uncommon species. I think it quite certain that condors were common in western Texas and probably southern New Mexico, at least, within the past few thousand years, though their systematic status re-
mains doubtful and the possibility of more than one species cannot be ruled out.

In summary, I cannot accept Koford's theories and conclusions, and regard his paper, and to some degree Fisher's, as a disservice to the general understanding of Gymnogyps and its history.

**Gray Hawk or Mexican Goshawk, Buteo nitidus.** This hawk was reported (eggs taken) by Stephens in 1876 as far northeast as near Fort Bayard, New Mexico, and later by Law (1929) as occasionally seen in the Chiricahua Mountains. I know of no recent records in or near these mountains. In fact, after about 1946 these hawks were virtually limited in Arizona to the Patagonia-Nogales region near the Mexican border for about 11 or 12 years, after which they again spread out in the Tucson area.

**Common or Mexican Black Hawk, Buteogallus anthracinus.** This, like the last, is a summer resident here, wintering in Mexico. It was found by the early explorers in southeastern and central Arizona, but not by Stephens in 1902 on the Big Sandy River in the northwest, nor by anyone farther north or west. In 1948-1952 I found it a regular summer resident on the Big Sandy. Only a straggler farther west, it has however reached the Virgin River Valley to the north, where it appeared in 1961 and has nested (in both Utah and Arizona; Carter and Wauer, 1965; Wauer and Russell, 1967). A report from northern New Mexico (Bohl, 1957), illustrated by a photograph obviously of another species, is of course to be disregarded, and is not credited to this species by Ligon (1961), though he inexplicably includes a drawing based on the same photograph as a "Black Hawk" (pp. 71-72).

It may be significant that none of the early explorers identified this striking hawk along the Gila River. It ranges up this river well into New Mexico, but I know of no definite record prior to 1918.

**Marsh Hawk, Circus cyaneus.** Found nesting near Tucson in 1872 and in the northeast, presumably in the St. Johns-Springerville region in the 1880's. Ligon (1961) records two nests as recently as 1935 in the San Simon marshes, on the Arizona-New Mexico border. Possibly he failed to find them here in later years, for he states they "usually nest" (cf. pp. 75, 322), unfortunately without details. In recent years, with the destruction of our natural marshy areas, there has been only one locality where a possibly nesting bird was seen (the Joseph City reservoir, Little Colorado Valley).

**Audubon's Caracara, Polyborus or Caracara cheriway.** Not included here, as this tame and conspicuous bird was probably largely shot out, aided by poison put out by government killers.
**Aplomado Falcon, *Falco femoralis***. This handsome bird was apparently rather common, at least locally, in southeastern Arizona until 1887 (US). It then disappeared abruptly, for unknown reasons. I can hardly believe that, at that early date, “thoughtless hunters” were common enough to wipe it out, as suggested later in New Mexico by Ligon (1961, p. 82). A few survive farther east, in New Mexico, but in Arizona it is now a very rare straggler, and years go by with none at all reported. Nor have we found it in our work in Sonora. There is no good evidence that it performed any regular migrations.

**(Masked) Bob-white, *Colinus virginianus ridgwayi***. This was Arizona’s “almost mythical” bird; fairly common in a very limited area of lush grassland (with mesquite along the washes), it promptly disappeared when cattle wiped out its cover. It has recently been questioned (Anderson, 1965, vol. 82, p. 117) whether drought and hunters may not have helped; the answer is that the birds had survived droughts for thousands of years, and that hunters (few and far between except at the spot where it survived the longest!) were then interested in bigger game such as deer, antelope, turkey, etc. They seldom had the proper guns and shot for quail, nor did they affect the numbers of the other three species living in the same region to a serious extent at that time, even though two of these species are a good deal easier to hunt than a Bob-white. Mr. Anderson would be well advised to read the important articles by Herbert Brown, who was on the spot all the time, as recommended in “Birds of Arizona.” The cattlemen have plenty of well-paid professional apologists raising smoke-screens in the name of “science,” and need no further help.

There are only one or two reports of Bob-white in Arizona after Brown’s summaries that deserve serious consideration. David M. Gorsuch, Arizona’s first expert on quail (who had collected this species in Sonora), told me of shooting a female, which unfortunately he could not find, just west of Las Jarillas, west of Arivaca, about the end of June 1929. Stanley P. Young, while trapping wolves, heard them in the Turkey Creek region, southeast end of Canelo Hills in 1916 to 1918.

I do not agree with Ligon (1961, p. 95) that it could ever have “occurred in the Animas Valley,” New Mexico, nor that this high valley is “comparable to...its original Arizona range,” which did not extend “eastward to about Douglas.”

**Meams’ (Fool or Harlequin) Quail, *Cyrtonyx montezumae***. Somewhat like the last in appearance and habits, this quail has fared better due to its mountain home of greater rainfall and more brush in which to hide (as well as more rocks). Thus it was less vulnerable than the Bob-white was in the flat, open valleys. Also, of course, it could quickly disappear across a ridge. While very scarce in many areas for years, it does not seem to have been completely wiped out except in the Flagstaff and Prescott regions, where it was never common. A combination of much grazing and some hunting probably caused the decline,
which seems to have ceased in recent years. This is a good sporting bird, difficult
to hunt, which sportsmen should value. It occurs, in our country, only from Ar­
izona to southwestern Texas. As Ligon (1961, p. 99) aptly says, “the only hope
for restoring them [in numbers] to much of the formerly occupied range lies
in reformed land use so that native vegetative ground cover may again thrive.”

Turkey, Meleagris gallopavo. Not included here, as it was clearly shot out—the
only Arizona bird so decimated by miners and hunters.

White-winged Dove, Zenaida asiatica. The uncertainty of the early distribution
of this noisy, conspicuous dove is explained in “Birds of Arizona.” (To which
may be added that I am unaware that its bones have been found in any Indian
ruin or cave deposit in the United States, save in surface layers; see also Cooper,
1877, p. 95.) By 1885, however, it had occupied most of its present Arizona
range, i.e. the Colorado to San Pedro (and north to Agua Fria) river valleys.
Its further spread may have been slowed by hunting (see Brown, 1900; Visher,
1910) and destruction of favored nesting cover in some areas. Certainly it has
been less spectacular than that of the Inca Dove, though the actual number of
birds involved (in and near Arizona) is probably substantially larger.

White-winged Doves certainly invaded New Mexico within the present cen­
tury, but the details are cloudy. The only valid 19th century record was in the
extreme southwestern corner of the state (1892). Ranchers told Vernon Bailey
of their appearance in 1905 and 1906 farther north, on the San Francisco and
upper Gila rivers, and a pair nested in 1912 near Las Cruces (but did not return
in 1913). Yet lower down on the Gila, at Redrock, ranchers noticed them first
in 1921! They are now established near Las Cruces (fide Raitt), and are “occa­
sional” even in southeastern New Mexico (Ligon, 1961).

Perhaps we should not pass over in silence the recent claim that “in Arizona
the distributions of White-winged Doves and saguaros appear to coincide”
(MacMillen and Trost, 1966, p. 453). These unfortunate authors obviously failed
to read the text and map in “Birds of Arizona,” wherein doves are recorded far
from the saguaros; for example, abundant for many years at Camp Verde, and
nesting in oak groves, and even in the uplands of northwestern Arizona. Further­
more, of course, the birds are no longer limited to Arizona, but are spreading
slowly into the southern parts of Nevada (Gullion et al., 1959) and Utah (Behle
et al., 1963), many miles from the nearest saguaro. One wonders why scientific
journals publish “physiological” papers containing such wild speculations as
that “presumably in the field both” White-winged and Inca Doves can live on
“moist fruit (prickly pear and tomatoes) as the sole water source” (MacMillen
and Trost, loc. cit.). Neither species, of course, lives on any such diet, nor is
“succulent grass” important to S. inca. Why are not actual observations, ex­
namination of crop contents, etc., considered necessary before advancing theories
so completely at variance with all the known facts about the food of doves (cf.
for example Bent, 1932)? At least, competent Arizona ornithologists might
have been consulted, one would think. *Zenaida* is far from being "very de-
pendent on saguaro cactus."

**Inca Dove, *Scardafella inca.*** The steady advance of this dove within the
United States has been quite obvious; but it is not generally realized that it was
wholly absent from the country originally. It was first found at Laredo,
Texas, on the Mexican border, in 1866—an early date, to be sure; but by then
a good many birds had already been received by eastern museums from
southern Texas. Thus this dove, already present in some numbers, was the
only bird found there by Butcher that was new to the known fauna of the
United States. Such a familiar, tame, and conspicuous bird would hardly have
escaped the notice of earlier explorers had it been present. Nor is it likely
that the Laredo population was simply a very local one, for (1) no other bird
has or had a local colony there, and (2) the local vegetation is, and was, much
like that of the rest of the lower Rio Grande Valley, above and below Laredo.

Nor can I consider this dove’s spread across Arizona a mere response to
changed ecology (i.e. construction of towns and settlements). It was found at
several points (such as Florence and Benson) not long after their settlement,
and was common in the Pima Villages by 1908 (if not by 1880, when no ob-
servations were made). These villages were then probably not greatly different
from what they had been like for centuries. Details of its advance across Ari-
zona may be found in “Birds of Arizona.” Stragglers reached southern Nevada
in 1952 (Gullion, 1953) and extreme southwestern Utah in 1963 (Behle, 1966),
and farther east have reached Oklahoma, Kansas, and Louisiana; but as yet this
dove is established only in Arizona, southern New Mexico, and Texas.

In New Mexico, the first stragglers were found in 1924 and 1926, and it
was established at Virden (just east of the Arizona line) by 1947. They arrived
at State College (Las Cruces area) in 1943 and were in some numbers in 1944
(Valentine, 1945). At Duncan (near Virden, but in Arizona) during a brief
visit on Aug. 18, 1937, H.H. Poor, A.W. Sanborn, and C.W. Stillman saw one.

It is interesting to note that another city-inhabiting dove, *Streptopelia
decaacto,* has in recent years spread explosively northwest across Europe,
and is now well established even in the British Isles. No ecological changes are
involved.

Farther south in Mexico, Inca Doves in small numbers are found along
rivers at some distance from houses. But in Arizona this is unusual. Still, in the
thick brush (*Senecio,* etc.) of the Sonoita Creek bottomlands 3 kilometers
southwest of Patagonia, Gale Monson and I saw a flock of four or more on
December 3, 1939. Returning with Hargrave on March 10, 1940, we encoun-
tered a flock of three or more and collected one (preserved as a skeleton).
These data were published (Monson and Phillips, 1941). At the time there
was a CCC camp about 200 meters southeast of the creek, but this had neither
watered lawns nor chickens, and we did not notice any doves about it. After
the war I found doves scarcer here, but saw one 5 kilometers southwest of
Patagonia at least once (July 31, 1949), though I was primarily looking for birds that, to me, were more interesting. Thus, contrary to the finding of MacMillen and Trost (1966, p. 454), whose “search...along the Sonoita River...was fruitless,” Inca Doves do (or did) occur there, as a local variation from their usual habitat.

Violet-crowned Hummingbird, *Amazilia violiceps*. The original status of this striking hummingbird in Guadalupe Canyon is dubious. Mearns visited the canyon only briefly, so we cannot be sure it was absent in the early 1890's. On my only summer visit, a brief one also (July 1947), I was quite sure I saw one. An even briefer visit with Hargrave and Herbert Brandt, on May 21, 1948 may have been too early, seasonally, for this late-arriving species (cf. Zimmerman and Levy, 1960).

More definite has been the spread of this bird into the Huachuca and Chiricahua Mountains, both well known ranges for which there existed only a single record for each prior to the very late 1950's. Then single birds began to appear rather regularly in the Chiricahua Mountains, and these have now increased to the point where a nest is to be expected if sought systematically. More recently it has spread to the Huachucas, where Guy McCaskie saw the bird in 1960, 1961, and up to about five birds in 1967; he was told that a supposedly unsuccessful nest had been found, though not seen by him, in 1967. It was also seen there in 1966 by Harrison, on three occasions.

Belted Kingfisher, *Megaceryle alcyon*. As noted in the introduction, I have not seen Major Bendire’s notes, for which some Arizonan should institute a search. Meanwhile I can only quote his all-too-brief remark again, that “in southern Arizona...I have found Kingfishers breeding in localities where fish must have formed but a small percentage of their daily fare.” Also, Swinburne wrote that it breeds in “Apache Co.” (presumably the St. Johns area or southward) in a letter to Bendire on April 1, 1890. These are the only definite reports of breeding, and are distressingly general; the authors could not anticipate the coming desiccation of Arizona, naturally. By the 1930's it certainly did not breed in southern Arizona, and probably not in Apache Country (at most it was very local there, and probably absent). The upper Verde Valley from Clarkdale north should be searched for kingfishers in summer, according to Milton Wetherill.

Gila Woodpecker, *Centurus uropygialis*. A definite expansion of range is into the Verde Valley, starting in 1888 (US; lost?) and becoming established by 1916. It has reached lower Oak Creek there, and also occurs occasionally to the west at Prescott, though it is not known to be established there as a permanent resident. It has likewise expanded west from the Colorado River into Imperial Valley, California, arriving in 1931. This was thought by van Rossem (1933) to be “unquestionably due to the planting of cottonwoods and other
trees in the locality." Another probable extension of range is along the Gila River into New Mexico, where it was apparently not found by the early explorers before 1908 (Bailey, 1928). As may be seen, this is not a case of very marked change, and may be better regarded as local spreading out. This also has occurred ecologically, if it was really absent from the town of Tucson in 1926-1927 (Swenk and Swenk, 1928, pp. 28-29).

Rose-throated or Xantus' Becard, *Pachyramphus aglaiae*. Here again the picture remains blurred, as this bird is still very local. It surely bred by 1947 (ARP), and probably earlier, along Sonoita Creek. Elsewhere only an odd nest has been found (Guadalupe Canyon and near Tucson), with no steady occurrence and no assurance of having bred successfully.

Thick-billed Kingbird, *Tyrannus crassirostris*. Thanks to its strident voice, this bird is more definitely known as a recent invader. Surely neither Mearns, Brandt, nor I would have missed it in Guadalupe Canyon had it been present in the 1890's or 1940's. Levy discovered it there in 1958 (US), and it apparently increased in 1959 (Zimmerman, 1960). Similarly it certainly colonized Sonoita Creek, a favored spot of bird-watchers by that time, in the early 1960's. Here Harrison (ms.) saw four pairs, June 30, 1961; and he found a pair at the popular Madera Canyon, Santa Rita Mountains, starting in 1964.

Tropical Kingbird, *Tyrannus melancholicus*. When I first discovered this not-very-distinctive species breeding near Tucson in 1938 (ARP), I thought (Phillips, 1940) that it had merely been overlooked in Arizona previously. In the early days it was found north only to Guaymas, Sonora, but in 1947-1952 (ARP) van Rossem, Marshall, Yaeger, and I found it generally distributed along the rivers of Sonora from Imuris south. Its history is by no means clear, but the several new breeding colonies that blossomed forth from 1956 (JSW) on cannot but cast serious doubt on my original theory.

Black Phoebe, *Sayornis nigricans*. The usual lack of detailed early records for most of Arizona is aggravated by the species' mysterious seasonal movements. It was certainly absent originally from at least the Needles-Fort Mojave area of the Colorado River in late spring, and presumably summer, but this is of little moment. It is still very local as a breeding bird in that valley. More definite seems to be its increase in southwestern Utah, with stragglers starting to appear farther north (Behle et al., 1963, Behle, 1966). Within Arizona, it certainly colonized Prescott sometime between 1865 and 1916.

More is known of its more recent expansion in New Mexico. I disregard Surber's supposed report of it as "sometimes common" in northern New Mexico "in a canyon and cave country" between Feb. 10 and April 10, 1904 (Bailey, 1928). This is a palpable *lapsus* or error of transcription. Not only is it far from the then known area of occurrence of this phoebe, but the species

140
lives by water, not in dry caves. It first reached the Las Cruces area, much farther down the Rio Grande, in 1913, and was apparently unreported in southeastern New Mexico before 1915 (op. cit.). From near Carlsbad and Las Cruces it spread north up the Pecos and Rio Grande valleys, in less than 50 years, to Albuquerque and Roswell (Ligon, 1961). On the Pacific coast no definite expansion can be proved (see Cooper, 1877, p. 93).

**Buff-breasted Flycatcher**, *Empidonax fulvifrons*. As noted in “The Birds of Arizona,” the disappearance of this tiny bird from most of its known range here was probably largely due to the choking of the grassy slopes and meadows it favored by invading brush and saplings. (The Western Bluebird, *Sialia mexicana*, was evidently decimated by the same change, but not wiped out.) Yet this may not be the whole story. There are still grassy meadows in the upper Chiricahua (Rustler and Barfoot Parks) and Santa Catalina Mountains (mouth of Carter Canyon). Are these too high for *fulvifrons*? Prescott still seems suitable, too, but it was always rare there.

**Vermilion Flycatcher**, *Pyrocephalus rubinus*. This highly conspicuous bird seems to have been very rare above Yuma in the Colorado River valley in the early 1860's (Cooper) and above Ehrenberg until about 1900 (cf. Stephens, 1903). It became quite widespread before the severe winter of 1948-1949 (Monson); now it is local but not excessively rare, and breeds north even into Nevada and Utah. In eastern Arizona, it reached Fort Apache as a regular (?) summer resident between 1937 and 1952, and arrived at Snowflake (across the Mogollon Plateau!) in 1964, where the pair “stayed during the breeding season and evidently had young,” but did not return in 1965 (A.J. Levine’s, in litt.).

In New Mexico, it was apparently very rare in the Gila and Rio Grande Valleys before 1900. Now it is common from Silver City west (and south), ranges (though not very commonly) up the Rio Grande to Socorro, and even occurs on the Pecos, north “sparingly to Roswell,” with two exceptional reports farther north (Ligon, 1961). In recent years, too, it has appeared as a rare winter visitant in the southcentral and southeastern United States, and in southwestern California.

**Black-billed Magpie**, *Pica pica*. Originally more or less common in the lower Little Colorado Valley and northward, this large and conspicuous bird has been found, more or less regularly, only in the extreme corner of Arizona since the time of the smallpox epidemic in the Hopi Villages, late in the 19th century. Likewise, it was apparently a fairly regular winter visitor to Death Valley, California, up to the mid-1930’s (Gilman, 1935), but was not seen November 1957 through December 1961 (Wauer, 1962. Relative to Death Valley, I have been unable to consult Gilman’s final (1947) report cited by Wauer).
Curve-billed Thrasher, *Toxostoma curvirostre*. Traveling down the Big Sandy River and then east, Stephens found his first in February 1880 at Seymour (on the Hassayampa River near or a little below Wickenburg; AMNH). This is significant because he was especially interested in thrashers. In 1902 (US) he found it on the Big Sandy, and it is now established there. Temporary incursions, in small numbers, into the Verde (Mearns) and lower Colorado Valleys (McCaskie and Prather, 1965) have not resulted in establishment there. Stragglers have turned up occasionally farther afield, even to Florida.

American Robin, *Turdus migratorius*. Requiring mud for its nest and feeding mainly on soft, shaded areas, this familiar bird spread during the present century from its mountain-forest home down onto the lawns of California towns. It has not yet done this in Arizona, but the situation should be closely watched. On the Rio Grande in New Mexico, it was found breeding near San Antonio in 1942 (Monson, 1946; GM), but its status in earlier years is unknown. Farther downstream near Las Cruces, where it definitely did not breed before, Dr. Raitt informs me that he has seen them in summer recently, including young birds still partly in juvenal plumage.

Bell’s Vireo, *Vireo bellii*. Now extremely scarce and local in at least the Phoenix and Benson areas, this tiny bird was certainly decimated in the latter by cowbird parasitism, as shown by Hargrave’s observations. Since the Brown-headed Cowbird (*Molothrus ater*) is now abundant in the Phoenix area, it is very likely that the same fate overtook the vireos there. Elsewhere in Arizona there is no reason to think the distribution has changed importantly. Likewise in Death Valley, California, it was “not uncommon” in 1891 but evidently absent or very rare as a breeding bird by 1917, when cowbirds had apparently greatly increased (see Fisher, 1893; Grinnell, 1923), the same fate having probably overtaken the common Yellow-throat *Geothlypis trichas* (see also Wauer, 1962, p. 226).

In New Mexico it was never found in the Rio Grande Valley prior to 1942, when Monson (1946; GM) discovered it near San Antonio. But it is still so local and rare in that valley that it is not certain that its range has actually increased; conceivably a local colony had always been there. Absence of early records in southwestern Utah is not necessarily significant.

Lucy’s Warbler, *Helmintopha luctiae*. Though faulty early data from critical areas cloud the picture, as usual, this wee gray mite has probably spread considerably to the east (and perhaps northeast) within the present century. As in the preceding case, Monson (1946; GM) discovered a population at San Antonio, the first record anywhere on the Atlantic drainage; but until more new colonies appear, we will not be absolutely sure that this was not simply due to Monson’s being a better and, perhaps, more fortunate ornithologist.
than any who had preceded him in that valley. Present absence from Phoenix
is harder to explain, since this warbler nests in crannies where cowbirds must
find it difficult to enter. (The open nests of vireos, Yellow Warblers (Dendroica
petechia), and Summer Tanagers (Firanga rubra) offer no problems to these
parasites.)

Otherwise, within Arizona this warbler has doubtless spread out locally with
the invasion of the overgrazed grasslands by mesquite, its favored nesting-tree.
But major movements, if they occurred, took place early, for by 1892 (US,
AMNH) it had reached both southwestern and southeastern Utah, and by 1907
extreme northeastern New Mexico. Yet it was still (or newly?) rare about Needles,
California, in 1902-1905, for neither Stephens nor Hollister found it. Later it
was fairly common, but in 1955-56 disappeared abruptly from the lower Colorado
River, north at least to Ehrenberg! None was seen through 1962 (Monson).

On the upper Gila River, it was first found near Fort Thomas, Arizona, in
1876 (Aiken, 1937). It may be significant that Henshaw’s party, spending much
more time there than Aiken, did not find it in 1873-1874; but the same thing is
true of the Hooded Oriole, and also the Cardinal (“not very rare,” p. 29).
Higher, in the New Mexico part of the valley, it was first found in 1928 (Mell-
ing and Stewart, 1940; see also Haller, 1951).

Hooded Oriole, Icterus cucullatus. Unknown in the Prescott area in 1865, it
reached there sometime between the 1880’s and 1920’s. By 1950 it had occu-
pied most of northwestern Arizona south of the east-to-west section of the Colo-
rado River, including Union Pass near Fort Mojave (where it had not been found in
more extensive work previously). Pioneers reached southwestern Utah in the
1930’s (Hardy and Higgins, 1940; Hardy, 1941) and Fort Apache in eastern Ari-
zona in 1952, and were increasing in southern Nevada in the 1950’s (Johnson
and Richardson, 1952; Gullion et al., 1959); but I have no recent information
from these places. As usual, the few points explored in the 19th century at the
proper season for migratory birds, mostly clustered in southeastern Arizona, do
not suffice to tell us the full extent of this oriole’s spread; but this has pretty
surely been less striking in Arizona than in California, where it had not reached
Los Angeles by 1870 (Cooper, 1870). Within 75 years it spread from a little
south of there north to the San Francisco Bay region!

In New Mexico it was found on the Gila River, 1876 (Stephens, SD), and
reached Silver City by 1905. In recent years another race has occurred irregu-
larly in western Texas, but I am not aware that it has yet established itself
there; nor will we ever know just what its original distribution in Mexico may
have been.

Wagler’s Oriole, Icterus wagleri. This striking black-and-orange oriole has
one of the most fascinating, yet fragmentary and inconclusive, histories of any
small bird. It rests almost entirely on a somewhat cryptic reference by Herbert
Brown in his notebook of his trip to the Patagonia Mountains in 1910. Discuss-
ing orioles, he wrote: "Had hoped also to have found *I. bensoni*. Had seen numbers of them in the vicinity of Harshaw years before Benson found them in Sonora, but unfortunately could not secure the birds themselves..."

Now the fact is that there is no *Icterus bensoni*. Rather, there is a quail *bensoni* described from Sonora. This was taken by Benson on a trip with Cahoon, and shortly afterwards Cahoon (not Benson) did take several new birds in Sonora, including *Icterus wagleri castaneopectus*. Benson never took any other new bird in Sonora nor had any other oriole been described from Sonora then (before 1910). Since Brown was clearly discussing orioles, he can only have referred to this species. Presumably Benson had told Brown about the new birds discovered in Sonora, and Brown confused the names.

We have the word of Herbert Brown, then (an excellent observer and collector), that these orioles disappeared from this otherwise unexplored spot between sometime "years before" 1887 (the year of Benson's and Cahoon's work in Sonora) and 1910. Are there contributory data for Sonora? Such data would have to come from Cahoon, since Benson and Robinette (and W.W. Brown, Jr., in 1905) kept no notes (as far as known), and those were the only ornithologists to penetrate northeastern Sonora prior to Berry Campbell's visit in 1935.

Yes, there are data, but they are not yet altogether conclusive. If we assume, as is quite possible, that this oriole is migratory, my failure to find it on various winter trips (and its absence from Robinette's collection) means nothing, distributionally. Still, it was not found on Marshall's summer trip into the Sierra Aconchi (near where Brown took it), nor on our joint summer explorations farther east, which included the Sierra de Oposura (Marshall, 1957). Cahoon found it below these mountains, but it was scarce. Perhaps our recent work has been too concentrated at higher altitudes than these orioles inhabit, and in the wrong valleys. The less promising higher Lower Sonoran slopes should be carefully checked, for Cahoon thought he saw one there. At Moctezumahe saw two pairs only, shooting these but losing both females. None has been seen there since, but little work has been done in summer.

**Boat- or Great-tailed Grackle, *Cassidix mexicanus***. The spectacular spread into the southwestern states of two quite different races has already been sufficiently mapped (Phillips, 1950; Phillips et al., 1964). While this loud, conspicuous bird is apt to attract attention, stragglers may have reached the state before the main invasion. This is suggested by Selander and Dickerman's (1963) decision that the strange blackbird from the lower San Pedro River, *March 1928* (US), is a hybrid of *C. m. nelsoni* and the Red-winged Blackbird (*Agelatus phoeniceus*). It is too early to tell whether grackles found in southeastern California in 1964 (McCaskie et al., 1966) represent similar forerunners or the start of the main invasion of that state. It has now reached almost all of New Mexico, north even to Clayton (1958) and Aztec, and nests north to Albuquerque (Ligon, 1961).
Besides our two races, other races of this species, and other grackles, have spread northward into other regions in the 20th century, as have also other cowbirds. This may, in some cases, be partly due to increased populations resulting from vastly greater acreages of favored habitats. These various blackbirds favor the open landscape that man provides, associate in some cases with his livestock, and eat the kinds of foods that he produces in abundance. Yet I hardly think that major changes in northern Mexico sparked the northward spread of our grackles. They do not inhabit dry cattle ranges, and the great “boom” in agriculture in Sonora has developed principally since the Sonoran race appeared at Tucson in 1938 (ARP).

Brown-headed Cowbird, *Molothrus ater*. Besides ethics and propriety, this urchin violates all the rules of ornithology, not to mention taxonomy or systematics in general; for here, more than in certain cases to follow, one subspecies has spread into and established itself within the general range of another! Nor is this the more frequent “ring-form” situation (cf. Phillips, 1959), for the two races differ only in size. Such a situation naturally requires extreme care and much collecting for its elucidation; and often we see cowbirds so close to livestock that shooting is undesirable. Moreover, nets cannot be used at all where cattle can reach them. Because technical problems of subspecies and serious misinterpretations are involved (unlike previous cases here considered), we must treat this situation in detail.

Confusion began at the very start when the Smithsonian Institution received a specimen supposedly taken in the “Sacramento Valley” of California by Dr. A.L. Heermann. It lacked all other data, and Dr. Heermann’s birds were not always carefully labeled. This bird was presumably the basis for Cooper’s later (1870) speculation that the species “perhaps” occurred in the San Joaquin Valley. I have not seen this specimen, which cannot now be found (Richard C. Banks, in litt.). All those who did examine it, as far as I know, referred it to *M. a. ater* (presumably equivalent to the later *artemisiae*). Nevertheless, it is this dubious specimen which has been used to deny the northward spread of the much smaller *obscurus* just where it has been most obvious! At best (if authentic), it was purely accidental there at that time, and summing up the situation in California, Cooper wrote: “Why they do not approach the Pacific Coast in somewhat strange...” At that time there were already records for the east (desert) side of the mountains, at least in San Diego Country. The next year (1871) Dr. W.J. Hoffmann saw (but did not collect) cowbirds at Portzarick and Camp Independence, presumably in Owens Valley, which is also east of the mountains.

The spread of cowbirds onto the Pacific slope evidently began in the first years of the 20th century. In the heavily studied Los Angeles-Ventura County region, the first eggs were found (1 each year) in 1904 and 1905, though later it was reported that they had been found farther east in the San Bernardino Valley “about 30 years” before 1919. If this date is approximately correct, it
indicates a slow spread west across the San Gorgonio Pass. The first specimens were taken on the Pacific slope at the end of 1911 and 1912 (see Willett, 1912, 1933; Grinnell, 1915). Farther north in the Fresno district, wandering birds were first seen in September 1902 and July 1911, but no eggs were found before 1913 or later (Tyler, 1913).

The northwestern race of this species was described virtually simultaneously by Bishop (1910) and Grinnell (1909b). The latter named *artemisiae* as a Great Basin race “practically coincident with the range of the sage-brush (*Artemisia tridentata*),” though he had seen no specimens from elsewhere than Humboldt County, Nevada, nor any *M. a. ater* from west of Chicago, Illinois (save one from Minneapolis, Minnesota). Ignoring this vast gap, he considered that he had demolished “the recurring suggestion that cowbirds are of recent arrival in the west;...that the cowbird...is rapidly extending its range across the wide area westward from the Rockies is negated by the available data.” In the demolition of this straw man (whether set up personally or not is unimportant), Heermann’s specimen played an important part, being the only cowbird mentioned from west of eastern Nevada and Fort Yuma, in the extreme southeastern corner of California. It was called upon again for an even more imposing role, when Alden H. Miller echoed Grinnell as follows: “Has increased phenomenally...southwestern California...San Francisco Bay region...Sacramento Valley...; however, old records [sic] indicate that some cowbirds have been present throughout historical times in each of the major areas now so well populated.” Though ostensibly credited to Grinnell and Miller (1944), it is clear that Miller is responsible for the above passage, both from the introduction and also from the Grinnell and Wythe paper quoted below. Not the least noteworthy feature of this peculiar statement is that Heermann’s bird had now been quietly transferred to do duty under the smaller race *obscurus*, with which Miller had synonymized *M. a. californicus* Dickey and van Rossem, (1922), another abortive attempt to deny the facts of the case. (I have examined the type specimen, and cannot see that it differs from the small southern Arizona bird, so on this particular point I believe Miller was right. For a realistic appraisal of the general situation, see Behle, 1937.)

It is conceivable that Miller accepted “about 30 years” at face value, and that to him 1889 was the start of “historical times,” but how can one account for his statement about the San Francisco Bay region? Here Grinnell had later admitted (Grinnell and Wythe, 1927) that cowbirds were “apparently only of very recent arrival in the Bay region. First reported in 1922, when eggs were found...” No subsequent evidence has come to light that would in any way justify Miller’s remarks, which is untrue as regards all three major areas. (An accidental record, even if authentic and if of the race under discussion, does not prove that “some [birds] have been present throughout historical times”! The vast amount of work done in California in early years, even though not all published, may be judged by glancing through Grinnell, 1909a and 1924.)

Now, what of the interior? Henshaw (1875) found them in [northern and central] “Utah and Colorado...in about the same relative abundance as in the
Eastern States...At Fort Garland, southern Colorado, no birds were seen, but a single egg found...In some portions of Arizona, and perhaps the extreme southwest generally, replaced by...obscurus, which, however, does not seem to occur in very great numbers. A single specimen was shot by Dr. Rothrock on the Gila River in October." He mentions no other cowbird south of Pueblo, Colorado, and Provo Canyon, Utah; and in 1876 Aiken (1937) saw cowbirds only on Black River, Arizona. By 1880 they were common on the San Pedro River (Stephens, ms.), but still did not breed (and were "rare in spring") in Apache Hills, southwestern New Mexico in 1886 (Anthony, 1892). In 1889 Merriam saw none in northern Arizona, but in 1891 he saw "several" in southwestern Utah and "a few" in Pahranagat Valley, Nevada (Fisher, 1893, p. 73); otherwise the Death Valley expedition found only one, a male artemisiae in Death Valley, June 1891 (US). None at all were seen then in Owens Valley, whence later Grinnell and Miller (1944) recorded both races plus intergrades. In Death Valley in 1917 and 1920, Grinnell (1923, MVZ) found artemisiae chiefly or entirely in company with obscurus, which apparently outnumbered it considerably in late April. While he made no observations at the same season as Fisher, it is likely these early obscurus remained at least through June, since this was about the northern limit of the range of these small birds at that time. Grinnell saw "up to six" obscurus at one time, but does not mention more than single birds of artemisiae, which apparently was little if at all more common than in Fisher's day (see also Bell's Vireo, antea, for important biological evidence on cowbirds' nesting there in the early 20th century).

It seems, then, that Grinnell was right that "extremely few cowbirds have been preserved previously from" the Great Basin region (1909b, p. 276), and that this was due not only to the almost complete absence of collectors, but also to an actually scarcity of cowbirds. It may not be out of place to refer to a passage by Mearns (1896, p. 400) stating that "Leucosticte australis" was said by his "venerable friend" Ongwishe, not to inhabit the Hopi country. The significance of this statement lies in the fact that the bird Mearns so identified, and showed to the Hopi, was actually a juvenal cowbird. Obviously neither man was familiar with this plumage, but as they were far from alone in this ignorance, it does not necessarily prove that cowbirds were then rare in either central or northeastern Arizona.

What of New Mexico? Bailey (1928) called most of the birds there ater, the eastern race, but most of the few specimens (US) are in juvenal plumage in which this race would be difficult (if possible) to tell from artemisiae. Aside from an almost certain migrant from Animas Valley in the extreme southwest (Aug. 9, 1908), these juvenals are late August and September birds from Hebron, Koehler Junction, and Dorsey. Older birds, later called "buphilus," are males from Española, June 18, 1904, with wing badly worn (106 mm.), and from Fruitland, Oct. 30, 1908, in molt (primary no. 7 106 and 107 mm., respectively). Thus I see no good reason not to call all New Mexico birds artemisiae up to 1913, with the exceptions of the extreme southwest (Playas Lake, Grant Co.) and a speci-
men from Santa Rosa, June 4, 1903 (all US). Shortly after, a series of 5 males was taken at Alto (Austin Paul Smith, AMNH), and these are apparently intermediate, clustering about the maximum of obscurus (wings 102, 103, 105, 105, 106). One from Taos Peak at 8,500 feet altitude in the north, July 29, 1918, was artemisiae as expected, and birds from south of central New Mexico at Fort Hancock, Texas, 1893, were obscurus. Surprisingly, however, two in juvenile plumage from farther south (Chenati Mountains, Aug. 7, 1887), and even 3 males from Paisano, south of Fort Davis (all AMNH), are apparently artemisiae! These last were taken so early (July 9, 1887) that it is unlikely that a flock would already be migrating south, but their large bills suggest that they may be better referred to M. a. ater. No specimens of obscurus were taken at that time. Yet only obscurus was found breeding in Brewster County (which now includes Paisano) in 1928-1935 (Van Tyne and Sutton, 1937, p. 94)! To be sure, artemisiae still occurred, but now only as a transient; a flock of 25 “appeared at Glenn Spring on July 25.” This place was Van Tyne’s base from June 14 to July 4 and from July 24 to August 7 in 1928, the only year in which observations extended into July. Later they secured an April specimen also.

Before leaving the subject of its early status in New Mexico, it should be noted that the Dec. 6, 1854 record from the Gila River actually pertains to southwestern Arizona (then still part of New Mexico). Thus the only records of any cowbird for southern New Mexico, prior to 1890, seem to be Henry’s, Marsh’s, and Anthony’s.

In northeastern Arizona, the earliest specimen is an artemisiae from Springerville (June 9, 1915, US). This is the only race taken there since 1934, MVZ; 1936, ARP. Kayenta has likewise yielded only artemisiae (1933, MVZ; 1936, MNA), as also have Holbrook (April 25, 1948, ARP) and Rock Creek, Colorado River, Utah (1937, UT). So far as I know, cowbirds are not common at any point where artemisiae breeds in this region, as has been indicated by all writers since Henshaw.

In summary, then, in the whole interior, from Owens and Death Valleys, California, through southern Nevada and northeastern Arizona to central and northern New Mexico, and in most of eastern New Mexico and western Texas, only artemisiae was taken through 1915, and it was nowhere common west of the upper Rio Grande except at Shiprock, New Mexico (Gilman, 1908). It was thus quite unexpected when all 4 birds taken by Hargrave north and east of Flagstaff in 1932-1933 (Deadman’s Wash, Turkey Tanks, Doney Mountain, and Wupatki; MNA) proved to be typical obscurus. In the next few years obscurus was traced north to Tuba City (MNA; UT) and east to Showlow and in New Mexico 25 miles northeast of Springerville (both ARP). Then Milton Wetherill found it farther north near Manuelito (4 kilometers east of the Arizona border), where 4 were taken (1 male, 1 female, preserved) from a flock of 20 on May 14, 1948 (MNA); they were not then breeding. Later Behle (1960) reported obscurus in southeastern Utah. Thus a strange checkerboard
was formed. Accidental omission of Turkey Tanks, Showlow, and first New
Mexico border localities from the map in "The Birds of Arizona" makes it less
evident how largely obscurus now surrounds the artemisiae colonies (if such
persist) at Springerville and Holbrook. Even so, it is clear how few localities
are represented by specimens in and near northern Arizona. There is not even
a good basis for an educated guess as to whether or not the two races inter-
breed, and if so, to what extent. For that matter, no one has taken artemisiae
in this region during the period when it should be settled for the summer,
since 1936 (MNA, ARP). The only specimens I have seen that were not clearly
one race or the other (except in winter) are the Alto series, but other inter-
grades are reported by Behle (1943) and Grinnell and Miller (1944).

Table 12

Range (and average) of measurements of all available adult and 1-year-old cowbirds
from northern Arizona and adjacent New Mexico (MNA, ARP):

<table>
<thead>
<tr>
<th>Sex, race, dates</th>
<th>Wing</th>
<th>Tail</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 m obscurus, May 14 - July 15</td>
<td>99.9-103 (100.8)</td>
<td>67.5-70 (68.5)</td>
</tr>
<tr>
<td>3 m artemisiae, April 25 - July 24</td>
<td>107.6 [+] -112.6 (110.1)</td>
<td>74 [+] -76.2 (75.3)</td>
</tr>
<tr>
<td>4 f obscurus, May 14 - July 29</td>
<td>89 [+?] -93.6 (91.3)</td>
<td>60.8-65.3 (62.2)</td>
</tr>
</tbody>
</table>

Juvenal

<table>
<thead>
<tr>
<th>Sex, race, dates</th>
<th>Wing</th>
<th>Tail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 m obscurus, Nayarit, July 8</td>
<td>94.5</td>
<td>60.3</td>
</tr>
<tr>
<td>1 m artemisiae, eastern Arizona Aug. 12</td>
<td>109.7</td>
<td>70.5</td>
</tr>
</tbody>
</table>

m=male f=female

In our present extreme ignorance, one cannot conclusively prove that obscurus spread north into lands occupied sparingly by another race. My
grounds for thinking so are: (1) we know that nearly all the recent expansions
of blackbirds, and most of those of land-birds generally in North America,
have been northwards; (2) there are suggestive bits of evidence of a great in-
crease, known to pertain to obscurus in every case, i.e. Death Valley, Paisano,
San Francisco Mountains to Tuba City, Manuelito, Grand Canyon Village; (3)
there are no contrary bits of evidence, and no evidence of an increase of
artemisiae; (4) obscurus has also increased greatly at one point (Tucson) in
southern Arizona, at least in winter; and (5) we have overwhelming evidence,
contra Miller, of the expansion of obscurus west and north for most of the
length of California, whereas at only one point (Owens Valley) does artemisiae
seem possibly to have moved in recently. It may be further remarked that a
cowbird was recently reported (Sanger, 1967) as having turned up far at sea
off the coast of Oregon. This is a full-grown juv enal male (as he kindly informs
me) with wings 92.7 and 91.9, tail 66 mm., though it was identified as artemisi a e
by Ned K. Johnson, it seems far too small. (Measurements of the only
definite males, in my small series of juvenals, are given at the foot of Table 12
for comparison.) And among stragglers to the Farallon Islands, off San Francisco,
California, a shift similar to that in Death Valley took place between 1911 and
1965, according to Tenaza (1967, p. 583). This should be verified, because of
confusing references to Grinnell (who did not give measurements of females or
young birds), and because Tenaza lists a male of the large race as weighing less
than a female (!) of the small, both being in “immature” [=juvenal] plumage
with “little fat.” This hardly seems possible.

It has been considered for many years that the greatest barrier to the spread
of any one race is the existence of the next race of the same species. How then
could obs cur us spread over northern Arizona?

This problem is not as difficult as might at first appear. We know that, in
many if not most species of birds, occasional wanderers appear at points more
or less remote from the normal distribution of the species. Though of course
usually not obvious, the same must surely be true of populations: stragglers of
one reach the area of another. It may then happen that some reproductive bar-
rier prevents the increase of their offspring, or in the absence of such a barrier,
their genes may be overwhelmed in the gene pool of the local birds. But if these
hold the territory so sparsely that few or none are nesting in that particular
spot, the newcomers’ genes will remain obvious. For the racial traits to persist
undiluted, two or more of the same race must find a spot, suitable ecologically,
which is unoccupied or nearly so by the race of that general region. I am con-
vinced that this situation in the cowbirds has arisen because, time after time,
small flocks of obscurus have wandered north without making contact with
artemisiae, or without cross-breeding with the few they did encounter. Con-
ceivably, too, artemisiae (a brood-parasite of much larger size) showed little
territoriality against its small cousin. There has been considerable interest lately
in interspecific territoriality, but no one pays any heed to possible intersub-
specific territoriality. Yet there is no assurance that reproductive isolation
never occurs before or after the achievement of full species status, rather than
simultaneously (see Phillips, 1959, and other papers in same symposium).

Red-eyed (or Bronzed) Cowbird, Tangavius aeneus. First seen in Arizona
in 1909, this cowbird spread out to occupy most of central and centralsouthern
150
Arizona within the next 20 years. Since then its spread may have been slowed by failure to find enough Hooded Oriole nests to parasitize. Absence of records in the upper Gila valley, however, may simply reflect lack of recent field work there in the brief season (May through July) when these birds are conspicuous. Farther south, it reached the Animas Mountains, New Mexico, in 1957 (Ligon, 1961).

**Cardinal, Cardinalis cardinalis.** This gorgeous bird, apparently rare and local in the early 1870's and conceivably absent from Arizona a few years before, had spread by 1885 north to the Agua Fria River. It began to establish itself at Camp Verde in 1887 and was taken at or near Payson in early 1888 (all data from Mearns: AMNH). At Camp Verde it was apparently established by 1892 (A.K. Fisher, FW files). Spreading more slowly later, it reached the Colorado River by 1946 (LA, ARP); and it appeared in a higher Life Zone, previously unoccupied, at Tonto Natural Bridge in central Arizona sometime between the late 1930's and 1955 (Phillips).

All early reports from New Mexico are faulty, either as to the identification or the locality, or at best must represent escaped cage-birds. When the adjacent Arizona part of the Gila Valley was first explored, by Vernon Bailey on June 3-4, 1907, cardinals were “seen at Duncan and Guthrie” (FW files). The first valid New Mexico record seems to have been made the next year at Redrock, where “one only was seen and shot” (Goldman, FW files). This is quite a contrast to its abundance there 14 years later, in 1922 (Kellogg, 1922).

**(Rose-breasted) Common Grosbeak, Pheucticus l. ludovicianus.** While this strikingly colored race (commonly called a “species”) is not known to breed in the Southwest, individuals may well do so. Its status is so similar to the next that the two cases are worth comparing. It should be noted that most records here are for May and June, exactly the months that these birds do breed. Further, no one ever has time to follow these stragglers around and see what they are doing; and even if he did, unless an expert, he would have trouble telling the females apart (besides which, of course, these forms cross-breed).

The crucial factor which has prevented this form from establishing itself is not its own wanderings or numbers, but the abundance and wide distribution of the Black-headed race. This ubiquitous race is apt to be present anywhere nearly all summer, nests on all the high mountains, and doubtless drives its Rose-breasted cousin to distraction.

Nonetheless, single Rose-breasts have appeared with increasing frequency in recent years, particularly since 1950 (cf. Behle, 1966; Rickard, 1960). Even with this increasing frequency, however, they have not appeared in flocks, and Ridgway (1901, p. 620, footnote) was perfectly correct in questioning the early report of a whole colony in California, of which only some heads were saved. The striking racial differences are in the body and wings, not the heads. Single birds now appear in California too, at a rising rate (McCaskie et al., 1967; Tenaza, 1967).
(Indigo) Common Bunting, *Passerina c. cyanea*. This case parallels the last in many ways, but the western race ("Lazuli Bunting") is much less numerous and more restricted as a breeding bird and is less inclined to sing off the breeding grounds (though it does so, for example at Hereford in mid-July and on the San Francisco Peaks, July 24-26). The fact that it breeds, as far as known, only along certain favored creeks north of the Salt and Hassayampa Rivers (and even there in small numbers) left Arizona wide open to the invasion of the eastern form, which was first found in 1917 (MVZ), 1930 (SD), and 1933. It began to appear annually, or nearly so, at one spot or another in 1937 (ARP). The usual lack of field work leaves us uncertain at how many spots in central and northern Arizona and adjacent states it actually bred and how much cross-breeding took place; but there was no real basis to suspect breeding south of the Salt River until very recently. Records in southern Arizona and New Mexico were all crowded (in spring) into the period May 10 to 30 (ARP). Then in the summer of 1964 several (perhaps even ten) males were singing along the Nogales sewage disposal stream, and two were singing June 15, 1965 for the first record in the well-known Patagonia region (Harrison, in litt.). In the absence of nesting Lazuli Buntings near the border, there is no obvious reason why these colonies should not prosper and spread out.

The Indigo Bunting also increased markedly in California in 1963 (McCaskie et al., 1967).

*Rufous-winged Sparrow*, *Aimophila carpalis*. There has been little if any actual change in distribution, but it is worth calling attention to the dramatic changes in numbers, as outlined in "The Birds of Arizona": shrinkage to near-extinction locally with overgrazing, then recovery and even expansion.

*Botteri’s Sparrow*, *Aimophila botterii*. The same remarks apply, but without the happy ending, so far. Still, there have been favorable local developments, and by 1965 it had increased near the border, "especially around Nogales where housing developments exclude grazing" and it became "common" (Harrison, in litt.).

*Song Sparrow*, *Melospiza melodia*. Another roughly parallel case, though resulting from overgrazing less directly: the general drying up of the country, with uncontrolled flash floods, and loss of streams and marshes and of the adjacent vegetation. By 1947 it was apparently extinct in the Arizona part of the Santa Cruz River drainage. It may well have survived in the upper, Sonora part of the river, however, and has since staged a comeback of sorts near Tucson (Crossin, 1965) and on Nogales Wash (Harrison, in litt.).

**DISCUSSION**

By now it must be obvious that there is a crying need for data on the birds of most parts of the Southwest. Many localities have been worked for only
short periods, and in many more, a naturalist has hardly set foot to this day. Since our knowledge of even present or recent distribution is so incomplete, our knowledge of changes must be much more so, since it depends on sufficient and reliable data for the same area at two or more different times, years apart (and in most cases these must be seasonably comparable). Thus the changes listed above are doubtless but a fraction of those that have taken place in the past 50 to 100 years.

Because I mean to calculate rates of change on the basis of the land birds breeding in Arizona, I omit certain others which have been markedly unstable elsewhere in the Southwest. Notable among these are the kites, two of which have been seen in or very near Arizona in recent years, while a third long ago disappeared from the whole Southwest, before serious summer exploration of Arizona began. Thus none, so far as known, has bred in Arizona or even been taken here. Dr. Raitt informs me that one, the Mississippi Kite (Ictinia mississippiensis), has now been taken in New Mexico. Omitted, too, is the Scissor-tailed Flycatcher (Muscivora forficata), which has not been found breeding in Arizona, though its breeding range in New Mexico seems to be expanding (Ligon, 1961).

If we include Wagler's Oriole, about 203 full species of native, diurnal land birds have pretty surely bred in Arizona. Of these, to our present knowledge, 34 have shown more or less pronounced (more than local) changes in distribution (in the breeding season, when distributions are most stable) within this period. Half (or more) of these have undergone major range expansion or contraction, or nearly 10 percent of the total breeding species. This figure excludes changes due to direct action by man (birds shot out, or introduced to this continent). If it is an average figure, and if the species that change distributions differ each 100 years, then all species of birds should undergo major changes in distribution within 1200 years! This seems unlikely, as certain groups (vultures, doves, blackbirds) are especially unstable today, while others (quail, swallows, jays) are stable except as affected by habitat changes (overgrazing).

Yet, in the recent past, can we be sure that climatic fluctuations and possibly temporary over-abundance of some native animal have not produced habitat deterioration at times? Certainly the distribution of quails and grouse in the Pleistocene was very different from today, and in all too few cases do we know when the fossil bones were preserved; some may be only a few centuries old (see for example Howard, 1962b). Then, too, not all vegetational changes are due to cattle. Some are evidently climatic, and a few are due to vulcanism, changes in land levels, etc. So maybe 1200 years is not an exaggeration.

These changes, of course, are not complete. The species continues to occupy part of its old range when withdrawing, and when expanding continues to occupy most or all of its former range, as a rule. But whether these short-term principles hold over several centuries is of course unknown.

What of possible reversals of direction? There is no assurance that these changes are irreversible. A species might expand in one century and with-
draw in the next. But as against this possibility may be urged the extreme conservatism used in the above calculations. Had we all the facts, I believe that nearer 40 than 8.5 percent of our diurnal, native land birds would show important changes in their breeding distribution in and near Arizona within the past century.

To get a lower figure, we may try assuming that the species changing ranges do so at random; i.e. that the fact of having been stable or instable in preceding centuries has no effect on its stability in the next century. Then, if only 10 percent change their distributions to an important degree each century, 65 percent of the species will have made one or more major changes within 1000 years. This is hardly a negligible figure! Yet it assumes stability of vegetation, but in periods of vegetative change the rate would surely be much higher.

Does all this mean that birds are less suitable as zoogeographic evidence than other groups of animals? Not necessarily. Most of the changes listed have been in a northward direction. If they are simply parts of a general north-south instability, conclusions based on birds would not be wholly invalidated. Furthermore, they may well reflect simply our greater knowledge of birds than of other groups. We know that some mammals, such as the opossum (*Didelphis*) and certain rodents (as well as the coyote, *Canis latrans*), have spread out greatly in this century; can we be sure this is simply a response to man's decimation of the larger predators? Of other groups of animals we know even less. We cannot categorically affirm their geographic stability.

CONCLUSIONS

The principal lesson we must learn from these considerations is clear to me: paleo-ecologists must not place too much emphasis on the occurrence of any single species of warm-blooded animal in their interpretations any more than on easily-wafted pollen. They should try to judge past conditions from groups of species of animals and from plants growing in situ. We will have less, but sounder, speculations. Hargrave was quite right.

A second lesson is the urgent need of more complete exploration. It is fashionable today to sit back and claim that we know everything about birds and their distribution, that taxonomy is passé, and that we must all turn to studying ethology, biochemistry, or molecular biology, to wild speculations on evolution, adaptation, competition, and zoogeography, or to ingenious methods of torturing birds in captivity. A glance at any current ornithological journal will prove this. For example, “The Ibis” in its extensive review section divides ornithological publications into Books, Sound Recordings, General Biology of Species, Behavior, “Ecology and Populations,” “Migration and Homing,” “Morphology, Physiology, and Genetics,” and lastly “Taxonomic, Faunistic & Miscellaneous.” If a small part of the number of pages now devoted to idle and absurd speculations, misleading and inconclusive experiments, badly done taxonomy and “evolution,” etc., were devoted to factual data on distribution,
abundance, and ecology, our successors would be grateful.

Another point shown by the above data (*Molothrus, Pheucticus, Passerina*) is that subspecies, too, change their distributions. The many recent discussions of subspecies by Mayr and others give the impression that they are fixed geographically; if one ventures into the range of another, they must either react as full species (developed in isolation) or merge. But here (particularly in the cowbird) we have races that obviously are still subspecies (differing only in size) persisting without present geographic segregation, and in most areas without known crossing. Can this go on? We do not know. Meanwhile, it merits careful study at every opportunity. Here, and not in widely publicized cases like the English Sparrow (*Passer domesticus*) or the Galapagos Islands, on which such vast amounts of public and private funds are squandered with so little result of any value, we really see evolution occurring; yet aside from Hargrave, who pays any attention? Nothing shows so plainly the lack of vision of present-day 'evolutionists.'

Last, but not least, we need a greater respect for the facts—an end to the bland denials of obvious truths which have to be refuted at such length by later authors, but which meanwhile pass as high scholarship in scientific organizations. These cannot but discredit both the author and his sponsors, and eventually our scientific organizations will have lost our respect. These denials are not limited to matters mentioned above, but seem most prevalent in the answers of authors to criticism of their papers, and extend to taxonomic and distributional matters (Phillips, 1960). Genuine scientists do not deny and "gloss over" the facts.

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The influence and contributions of Lyndon L. Hargrave on Arizona ornithology are measured not only in the volume of publications he has made on the subject, but even more by the contributions of the many people he has guided and encouraged. I am pleased to be a part of this group and to record here an observation resulting from my relationship with Lyn.

On November 21, 1961, I observed four Hairy Woodpeckers (Dendrocopos villosus) feeding in the scattered cottonwood trees along the Puerco River about one mile southwest of Adamana, Navajo County, Arizona. One of the birds was collected and preserved in the Petrified Forest National Park collection (specimen no. 2400). This was a male with whitish testes measuring 1 mm x 1.5 mm. There was no fat on the bird and the tongue extensors reached into the nostril. Measurements were: length 236 mm; wing chord 128 mm; tail 83 mm; and extent 405 mm.

Almost one month later, on December 17, 1961, another specimen of this species was taken from another clump of cottonwood trees about 3/4 mile upstream from the above location, i.e., at the Puerco pumphouse in Petrified Forest National Park. This bird (specimen no. 2403) was a female with the developed ovary measuring 5 x 5 mm. There was very little fat. Measurements were: length 225 mm; wing chord 130 mm; tail 81 mm; extent 381 mm.

On September 14, 1961, Richard Russell, Assistant Chief Park Naturalist at the park, reported sighting both a Hairy Woodpecker and a Downy Woodpecker in the park. The exact location was not recorded. However, Mr. Russell made most of his observations in the vicinity of the Painted Desert Inn on the rim of the Painted Desert.

The unusual nature of the occurrence of these woodpeckers was not noted until Birds of Arizona (Phillips et al., 1964) was published. Only one specimen of the genus Dendrocopos was ever taken on the Little Colorado River in the Holbrook vicinity, and that was prior to 1900 (p. 75). The Adamana area is on the Puerco River about 20 miles upstream from the Little Colorado River junction near Holbrook. Only a very few scattered conifers (Juniperous sp) occur...
in or near the area.

Unusual winter wanderings of the species are reported by Phillips, et al, on certain severe winters. This could well account for the presence of the five birds, of which two were collected, but not the September record. More likely the scarcity of records indicates a lack of collectors and observers.

Yosemite National Park
California

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In a couple of papers written, respectively, about 25 years ago and about five years ago, I touched on certain aspects of this general subject. Both of these productions had somewhat limited circulation, and I should like to quote key passages:

"Several indications of gradual upward recession of the pine forests in the Southwest are observable: . . . occurrence of numerous prehistoric ruins in locations now desolate, with . . . occurrence of considerable timber, including yellow pine and Douglas fir, in prehistoric ruins in areas of pinyon-juniper type or virtually treeless. . .

"The yellow pine forest seems today to be retreating. There is usually abundant reproduction in open spaces within the forest, but little or no reproduction along its lower border, where outlying yellow pine individuals are, so far as I have observed, usually old trees; and the young trees at the overlap between yellow pine and pinyon are generally pinyon. . .

"The present distribution and differentiation of the tassel-eared squirrels, the Abert group, animals restricted sharply to the yellow pine belt and unable, in contrast to larger pine forest mammals, to cross large intervening areas, suggests relatively recent upward retreat of the forest, breaking up a yellow pine zone formerly continuous from northern Chihuahua and southwestern New Mexico to Colorado and northern Arizona; the Kaibab squirrel north of the Grand Canyon and the Durango (Mexico) squirrel, however, have been long separated off to become sufficiently differentiated from proto-aberti, so to speak, that they are accorded the status of separate species (McKee, 1941).

"Forests never stand still; frontiers between types of communities are continually shifting. And forests cannot respond immediately and completely to a minor climatic shift. Gradual retreat of the forests in response to a quite old climatic change would obviously continue over a long period.

"In summation, it seems not impossible that the forests have been receding upward, slowly and gradually, perhaps not continuously, over the Southwest generally, ever since a fairly remote period when the tassel-eared squirrels formed
one continuously-distributed species, and that retreat of the forest...occurred even during the period of human occupation of the Southwest, continuing to the present time. No major continuing climatic change need necessarily be inferred from this; and the upward shifting of the forest zones during the last two thousand years need not amount to a great deal vertically" (Reed, 1944, pp. 67-69).

In this connection, by the way, a point of special general interest was the discovery, so late as 1947, of an isolated population (and new subspecies) of Abert squirrel in southeastern Utah, on Elk Ridge below the Abajo Mountains (Durrant, 1952).

"Along the same general line, there has been repeated mention of the idea that specifically in the vicinity of Chaco Canyon there must have been an extensive pine forest until and into the period of heavy occupation and major construction in and around the the eleventh century of our era (e.g., cf. D.D. Brand and others, Tseh So, Albuquerque, 1937, p. 46). I have probably stated this myself occasionally, or at least I have gone along with it, but I have never been really convinced at heart on this until the other day.

"On the morning of July 26, 1962, traveling in a small plane from Chaco Canyon to Farmington at an altitude of somewhat less than 1000 feet, to my astonishment I suddenly realized that I was looking down on a scattered stand of unmistakable ponderosa pine out in the arid shaley badlands. Dr. A.E. Dittert of the Museum of New Mexico, accompanying me on this flight, was able to see around a little better than I did and said there were between 50 and 100 trees. All of them are large, tall, mature pines, so far as observed, and as could be expected. I suppose that each living individual tree might be 200 to 500 years old.

"The locality is about twenty miles from Farmington, 30° E. of S. from the Farmington airport and a few degrees south of west from the Huerfano, which would put it in the headwaters of Hunters Wash, a tributary of the lower Chaco, and at an elevation of between 6,225 and 6,500 feet. Having seen this outlying relict, I now can readily and fully believe that the vicinity of Chaco Canyon was formerly ponderosa forested; and in fact that, within the last two thousand years, the pine forest must have extended pretty much continuously from its present concentrated occurrence near the continental divide westward to beyond and below the surviving remnant described above.

"Even if, within the period we are most interested in (the last two thousand years, and particularly 500-1200 A.D.), the forest did not drop much below the 1,900-meter contour (elevation 6,225 ft.)this would still imply a continuous uninterrupted ponderosa cover from east of Mt. Taylor, near the middle Rio Puerco, right across to the southern end of the Chuska Mountains, Manuelito, and the Zuni country, and on into northeastern Arizona.

"It would also imply, or suggest the distinct possibility of the former existence of yellow pine forest on the mesas along the Animas and La Plata Rivers" (Reed, 1962, pp. 2-3).
A letter of September 7, 1962, from the late Gordon Vivian remarked that he had visited the above-mentioned remnant of "real" pine forest, downstream from the old Wetherill trading post at Ojo Alamo, and that at the time there was some reproduction—"a few trees one to two feet high but they were badly scarred by porcupine and some had been killed."

Another comparable bit of evidence on the same general subject is offered by the two small and sparse surviving relict stands of ponderosa pine on the two highest spots, about six miles apart, on the Kaiparowits Plateau in southernmost Utah (Fowler and Aikens, 1963, p. 3).

Another instance of this kind of situation, better documented than most of my own statements (which are based on general observations and very possibly on selected favorable evidence) has recently been published in connection with the archaeological salvage program in the Navajo Reservoir area, northernmost New Mexico:

"Small (one to several dozen individuals) relictual populations of Douglas fir (Pseudotsuga taxifolia) and, to a somewhat lesser extent, ponderosa pine (Pinus ponderosa) appear sporadically...Stands are associated, in most cases, with rather deep canyons and may appear near the head, within the length of the canyon, near the mouth, or occasionally in various combinations of these positions. In several cases, stands appear on northwesterly slopes along the San Juan and Pine Rivers proper, but most are in tributary canyons. A few scattered trees may occur unassociated with canyons.

Some such stands of Douglas fir may recently have been reproducing successfully, but most entirely lack young trees.

Associated plants may be only those typical of the pinyon-juniper unit or may include plants commonly associated with more mesic associations, such as wild currant (Ribes aureum), chokecherry (Prunus virginiana), gray barberry (Berberis fendleri), and narrow-leaf cottonwood (Populus angustifolia).

"Corings of Douglas fir and ponderosa pine trees associated with Benito Canyon were taken in 1959...Dates for the inner rings from Douglas fir trees were 1723, 1751, 1752, 1763, 1772, 1795, 1822, and 1846; those for two ponderosa pine trees were 1820 and 1841. No evidence was seen at this site of reproduction after these dates. Thus there is indicated rather regular reproduction occurring until the middle of the nineteenth century, with no successful reproduction since" (Harris, 1963, p. 12).

"In the higher portions of the study area, in Colorado, poor to good stands of ponderosa pine and Douglas fir appear. In the better developed areas, Gambel oak, aspen (Populus tremuloides), gray barberry, narrow-leaf cottonwood, and alder (Alnus sp.) also occur. Rocky Mountain juniper is commonly present. In less well developed areas, plants more typical of the pinyon-juniper unit replace the above species to a greater or lesser degree.

"Large ponderosa pines around buildings in the valley of the San Juan River east of Arboles may be remnants of historically larger stands" (Ibid., p. 15).
Until a few years ago I thought that probably the lower portions of Mesa Verde also had been largely covered with ponderosa pine a thousand years ago, that the forest had been removed by the thirteenth century through human activities, and that the species had been unable to re-establish itself in this marginal environment and was replaced by juniper and pinyon in the last few centuries. However, the Anasazi ruins of A.D. 600-1300 yield virtually no ponderosa pine specimens, but an abundance of juniper and considerable amounts of pinyon and of Douglas fir, so that the cover during the period of Anasazi occupation must have been essentially similar to that of the present (personal communication from Robert F. Nichols, August 1964). Obviously this runs counter to the other points brought out above and suggests that an advance of the ponderosa pine took place in the areas discussed above in the comparatively wet period after 1300 and the retreat I have been discussing must have been quite recent.

A separate approach, angle, or aspect which ties in with the foregoing notions is the recognition of the large conifers as pioneers and of the concept of what might be called the ultimate or total or edaphic or general ecological climax.

Generally it has been assumed that, except in deserts and prairie-plains country, trees normally always constitute the “true” climax in ecological succession of vegetation types. The first clear definite portrayal, so far as I know, of succession from woody pioneers to a herbaceous climax is that of Ellison (1954) only fourteen years ago (see also Ellison, 1949, however, for herbaceous vegetation of the Wasatch). But it is quite obvious, once pointed out. On rocky talus slopes, in rough lava fields, and on ledges and cliffs, throughout the Southwest, not grass or shrubs but coniferous trees are seen. Clearly, they prefer shallow and stony well-drained locations and cannot tolerate deep rich soils.

In many areas of the Southwest, above the deserts, the typical pattern consists of broad open valleys with grass or brush and shrubs, with pinyon and juniper on the ridges, mesas, and slopes—in rocks or close to bedrock—with ponderosa pine at higher elevations, but occurring below the upper limit of the pigmy conifers in shaded locations, and with Douglas fir appearing here and there on ledges in coves of north-facing cliffs. Occasionally the north side (open to the sun) of a canyon or narrow valley will be forested with pinyon and juniper, the south (north-facing) side with ponderosa pine with a few Douglas fir in the steepest and shadiest spots. If the valley is relatively broad, the central section with deeper soil is likely to support few or no trees.

Good examples of this kind of thing are seen in the Pajarito Plateau (across the Rio Grande Valley from Santa Fe) and in many parts of the Navajo Reservation and surrounding districts (including the Jicarilla Apache Reservation, the old original Navajo country; a fine example occurs a few miles south of Dulce, New Mexico) and in the canyon at Gila Cliff Dwellings National Monument in southwestern New Mexico.

For the vicinity of Window Rock, Arizona, I can document and supplement my own observations by quoting a couple of passages from Bohrer and Bergseng (1963): “The habitats include open valley land filled with low herbaceous

Instances of pine trees, with little or no smaller plants accompanying them, pioneering on rocky talus slopes and in comparatively recent lava flows are widely to be seen—the area south and southwest from Grants, New Mexico, offers particularly good examples of both.

Generally speaking, furthermore, sagebrush commonly occurs on deep rich or fine soil where conifers do not; “Sagebrush, at first glance, may appear to grow where no other plants can survive. Actually, the reverse is true, for a good stand of this shrub is one of the best signs of the presence of soil fertility and moisture” (Fenley, 1953). Along the same line, A.M. Woodbury (1947) refers to “inability to separate sagebrush and pigmy conifers into separate zones,” and then to the preference of sagebrush for deep, fine, soil.

In this light, the “Black Forest” in eastern Colorado (Livingston, 1949) might be less puzzling if thought of as relict; in western Nebraska, ponderosa pine is found on rough, stony land (Tolstead, 1947). Possibly even the “prairie peninsula” of the northeastern Middle West and relic prairies in Wisconsin (Thomson, 1940) might be interpreted as easily-disturbed climax vegetation.

Whatever validity these more far-flung comments may possess, for the arid Southwest this concept of the large conifers as pioneers, not edaphically climax vegetation, and the indicated picture of a ponderosa pine forest, more or less continuous, across large stretches of country, several centuries ago, surely are of basic significance.

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