

POTTERY-MAKING IN THE SOUTHWEST

BY

E. W. GIFFORD

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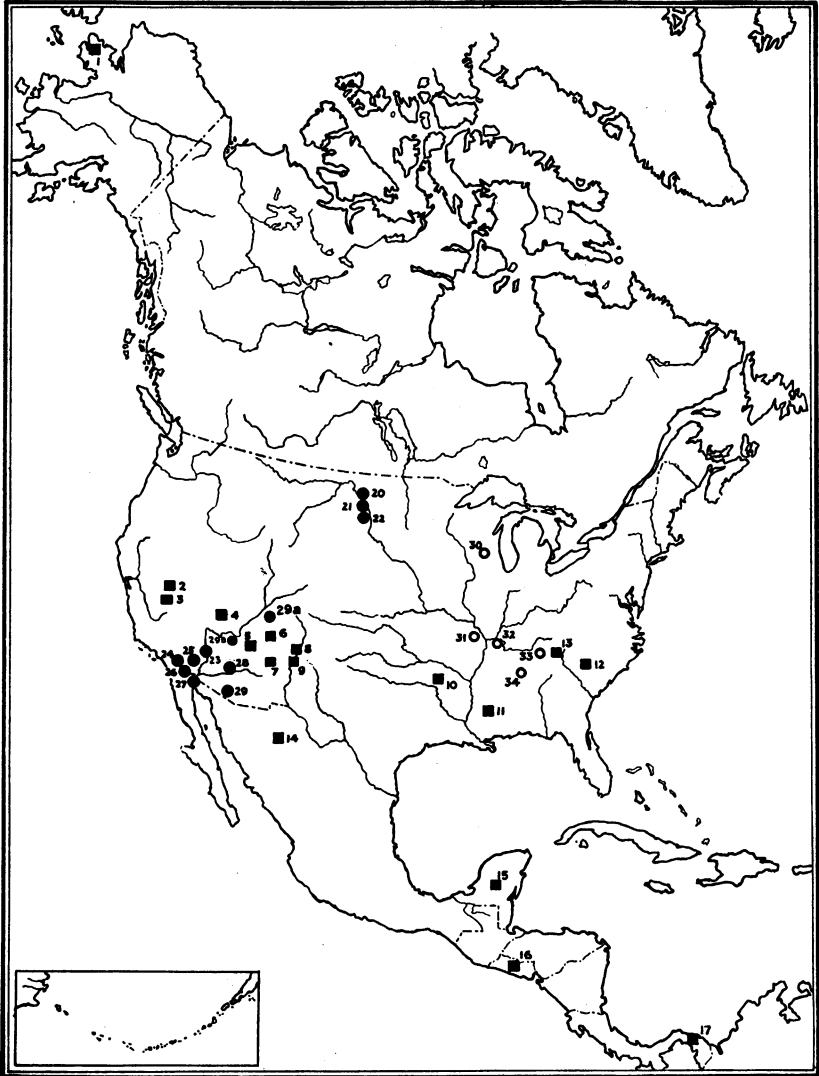
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Pottery-making Methods

Non-paddle method, represented by squares: 1 West Alaska Eskimo, 2 Eastern Mono, 3 Western Mono, 4 Shivwits Paiute, 5 Hopi Pueblos, 6 Navaho, 7 Zuñi Pueblo, 8 Tanoan Pueblos, 9 Keresan Pueblos, 10 Caddo, 11 A Louisiana group, 12 Catawba, 13 Cherokee, 14 Tarahumare, 15 Maya, 16 Village of Guatajiagua, Salvador, 17 Cuna.

Paddle-and-anvil method, represented by black disks: 20 Hidatsa, 21 Mandan, 22 Arikara, 23 Mohave, 24 Luiseño, 25 Cahuilla, 26 Diegueño, 27 Cocopa, 28 Pima, 29 Papago, 29a Ute, 29b Havasupai.

Archaeological occurrence of pottery anvils, represented by circles: 30 Wisconsin, 31 Missouri, 32 Kentucky, 33 Tennessee, 34 Alabama.

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CONTENTS

	PAGE
The two methods	353
Examples of the two methods	354
The non-paddle method in the Pueblo region	355
Distribution of the non-paddle method	356
Pottery anvils	361
Distribution of the paddle-and-anvil method	364
The paddle and anvil for wheel-made pottery	368
Certain doubtful cases	370
Conclusions	371

THE TWO METHODS

Inspection of exhibited museum specimens and perusal of the literature manifest the fact that there are two methods of making coiled pottery¹ in the North American culture area called the Southwest. One method prevails among the Pueblo tribes and the Navaho, the other among certain Yuman, Shoshonean, and Piman tribes. The method of the Apache is not known to me.

The principal criterion of method is the use or non-use of a wooden paddle and a stone or pottery anvil in shaping the vessel. The anvil is held within the pot to receive the force of the blow, as the vessel is shaped and the walls thinned with the paddle. Certain Yuman, Piman, and Shoshonean groups use the paddle² and anvil. The Pueblos do not.

Among most groups the anvil is simply a round cobblestone, but among the Southern Diegueño and Cocopa it is a mushroom-form pottery object, of which examples are shown in the accompanying illustrations. The stem-like projection is the handle by which it is grasped.

¹ The references to coiled pottery in this paper are to the general technique of pottery manufacture known as coiling. The peculiar rough black ware of the Pueblo region, which is sometimes designated as coiled ware, is called by the old designation of "corrugated" ware in this paper. A convincing discussion of its position and development in the history of Pueblo pottery has been written by Earl H. Morris, *The Place of Coiled Ware in Southwestern Pottery*, *Am. Anthr.*, n.s., 19:24-29, 1917. An excellent account of the technique of manufacture, based on a study of ancient examples, is presented by William H. Holmes, *Pottery of the Ancient Pueblos*, Bureau of Ethnology, *Ann. Rept.*, 4:257-360, 1886.

² In museum exhibits the paddle is displayed for the Mohave, Cocopa, Pima. A *curved* paddle is used by the Pima.

EXAMPLES OF THE TWO METHODS

Coiled pottery, made without the paddle and anvil, is characteristic of Pueblo culture, both ancient and modern,³ and is also made by the Navaho.⁴ The following quotations from Guthe's valuable treatise on Pueblo Pottery Making⁵ reveal the outstanding characteristics of this method at San Ildefonso:

The potter first forms a pancake-shaped pat of paste from six to eight inches in diameter; this she presses into the mould, or puki, to form a base. Then the walls of the vessel are built up by the addition of successive ropes, or rolls, of paste laid one upon another. The small bowls are the only exception, for they are formed in the hands of the potter from a single lump. In some cases the building is done all at one time; in others, and always with the larger vessels, a few rolls are added, then the piece is set aside to dry a little before the addition of a few more rolls. The potter usually builds two or more vessels at once in order to permit work upon one while the other is undergoing a brief period of drying. The preliminary shaping of the vessel is done either in the course of the building or after the building has been completed. The obliteration of the junctions between the rolls and of finger-marks is accomplished with the kajepe, or gourd-spoon, and further use of this implement aids in giving the vessel its shape. The final step, the finishing, consists of going over the entire vessel carefully, first with the kajepe, then with the fingers, to remove slight irregularities to even the lip and rim.

On page 36 the compacting process of the non-paddle method is made clearest: "In order to eliminate these small air-bubbles, the pat is pressed down hard upon the puki and the rolls are carefully pinched at every point about the vessel." The puki is the shallow pottery dish in which the growing vessel rests. It will become obvious beyond, that, in the Pueblo non-paddle method, the fingers and hands⁶ take the place of the paddle and anvil.

The essential details of the paddle-and-anvil method observed among the Cocopa in 1927 are appended, by way of contrast to the Pueblo non-paddle method described by Guthe:

The paste (clay and powdered sherds, as temper) was kneaded into a biscuit and worked and patted between the hands into a slightly concavo-convex disk, four inches in diameter and three-quarters inch thick. The disk was placed on the mushroom-form anvil, which had

³ Pliny Earle Goddard, *Indians of the Southwest*, Am. Mus. Nat. Hist. Handbook series, no. 2, ed. 3, 86, 1927.

⁴ *The Franciscan Fathers, An Ethnologic Dictionary of the Navaho Language* (Saint Michaels, Arizona, 1910), 289.

⁵ Carl E. Guthe, *Pueblo Pottery Making, A Study at the Village of San Ildefonso* (Phillips Academy, Andover, Mass., 1925), 31, pls. 13-14.

⁶ See also Guthe, 33.

been dipped in the temper to prevent the paste sticking to it, held in the left hand, and patted with a wooden paddle, with a blade four by four inches in size. The result of this manipulation was a shallow saucer, five inches in diameter and about one-quarter inch thick, at least near the periphery. The saucer was then placed on the potter's left knee, she sitting cross-legged.

The potter then prepared a foot-length cylinder of clay by rolling it out between her hands as she held it suspended vertically. This was of three-quarters inch diameter and proved to be of just the right length for one circuit of the edge of the growing vessel. It was pinched on to the edge with the fingers. The new edge was rubbed with the fingers moistened with water. The anvil was now held vertically within, the vessel's side wall resting on it, to resist the blows of the paddle in the thinning process. The vessel was held on its side on the right knee and revolved to bring each part over the anvil. A bit of the edge which proved too high after the patting process was pinched off with the fingers.

The process of adding concentric coils was continued until the vessel was complete. Three vessels were made at a time. After the vessel had been built up the walls were patted gently with the paddle without the mushroom-form anvil to take the impact. The edge was pinched off with the fingers here and there, where too high. The smoothing of the rough edge was with the moistened fingers. Also the paddle was used gently on the outside edge, but without the anvil to bear the impact.

THE NON-PADDLE METHOD IN THE PUEBLO REGION

The Hopi life-sized group at the Field Museum of Natural History displays pottery-making in typical Pueblo non-paddle method, and shows gourd spoons, polishing stones, and a shallow coiled basket as a base in which the growing pot rests. Elsewhere shallow pottery dishes were observed as bases. Probably shallow baskets and pottery dishes were used interchangeably.

Of modern Pueblo pottery-making tools, such as described by Guthe, sets were seen from various pueblos. An unusual set in the American Museum of Natural History comprised curved corncob smoothers for cooking pots, from the Tanoan pueblo of Picuris. These were evidently used like the gourd and pottery spoons, or smoothers.

There seems little doubt that the non-paddle method has been the only one employed throughout the whole history of Pueblo culture,⁷ for the following reasons:

1. To the best of my knowledge, no paddles are in use today and none have been found in ancient deposits.

2. No mushroom-form pottery anvils or substitutes that would offer resistance, on the inner wall of a growing pot, to the blow of a paddle on the outer wall, have been found.

3. Sets of pottery tools consisting of foundation dishes, gourd spoons, and pottery spoons have been found in the Kayenta region by Mr. S. J. Guernsey, and date from the Great Period of Pueblo culture. Mr. Guernsey was kind enough to show me two sets of these at the Peabody Museum of American Archaeology and Ethnology, Harvard University. Other ancient sets, or parts thereof, exist in museums. Mr. and Mrs. C. B. Cosgrove report such pottery tools from the Mimbres culture, thus affording an additional link of its Puebloan relationship.

4. The black corrugated pottery of the ancient Pueblo periods often bears fingerprints, and obviously could not have been paddle-made without obliterating the coil sutures on the exterior. In other words, the development of the corrugated ware was a by-product of, or was only possible with, the non-paddle method.

DISTRIBUTION OF THE NON-PADDLE METHOD

The non-paddle technique of coiled pottery manufacture is very widespread in America and in the Negro portion of Africa, and occurs sparingly in Oceania. In America the northernmost example is among the Eskimo of the Alaskan shore of Bering strait, the southernmost in Argentina. The following paragraphs cite examples, culled for the most part from the literature.

The pottery made by the Eastern and Western Mono and the adjacent Yokuts of California is very crude and represents the westernmost extension of the Pueblo non-paddle method.⁸

Lowie's account of Shivwits Paiute pottery-making seems to indicate the non-paddle technique of coiling, with a turtle-shell smoother instead of a gourd-shell smoother.⁹

⁷ This excludes Middle ("Lower") Gila culture.

⁸ Information from A. H. Gayton and Julian H. Steward.

⁹ Robert H. Lowie, *Notes on Shoshonean Ethnography*, *Anthr. Papers Am. Mus. Nat. Hist.*, 20:225, 1924.

To the eastward of the Pueblo area the Pueblo non-paddle method is assumed for the Caddo area in Arkansas,¹⁰ and is reported by Butel-Dumont for Louisiana,¹¹ and by M. R. Harrington for the Catawba,¹² of York county, South Carolina. An old Cherokee woman, on Qualla reservation, North Carolina, made pottery for M. R. Harrington, employing her fingers for the shaping, as in the Pueblo non-paddle method. After the vessel had become quite firm, the stamped pattern was applied to the exterior with a design paddle and with only the fingers to support the inside wall against the blows of the paddle. Two of these design paddles and a smoothing stone are pictured by Harrington.¹³ The American Museum of Natural History has a display of Cherokee design paddles.

To the southward the Pueblo non-paddle method prevails among the Tarahumare, judging by Lumholtz's description.¹⁴ He describes the walls as smoothed and thinned with the wet hands, and he mentions an oblong smoother of gourd shell. This description suggests the method and implements described by Guthe for San Ildefonso pueblo in New Mexico.

In a Field Museum exhibit the non-paddle method is represented among the modern Maya at Izamal, Yucatan, where the typical Pueblo gourd spoons and polishing stones are used. Moreover, at modern Izamal is an interesting parallel to the early unfired pottery of the post-Basket-Maker period. At Izamal, this unfired pottery is smeared with a decoction of mimosa bark.

Lothrop¹⁵ has described from Salvador an unusual combination of shaping and coiling, with the bottom of the pot formed last. In this method no paddle or anvil is used, the entire shaping being done with the hands.

The account of pottery-making cited by Lothrop¹⁶ for the island of Chira, Costa Rica, seems to indicate the non-paddle technique of coiling anciently.

¹⁰ M. R. Harrington, *Certain Caddo Sites in Arkansas*, Indian Notes and Monographs, Mus. Am. Indian, Heye Foundation, 1920:158, 159.

¹¹ Georges Marie Butel-Dumont, *Mémoires historiques sur la Louisiane*, 2:271 (Paris, 1753). This account is regarded by Otis Tufton Mason as referring to the Choctaw (Woman's Share in Primitive Culture, 105 [New York, D. Appleton and Co., 1911]).

¹² Catawba Potters and their Work, *Am. Anthr.*, n.s., 10:399-407, 1908.

¹³ Cherokee and Earlier Remains on Upper Tennessee River, *Indian Notes and Monographs*, Mus. Am. Indian, Heye Foundation, 1922:195-204, pls. 63-69.

¹⁴ Carl Lumholtz, *Unknown Mexico* (New York, C. Scribner's Sons, 1902), 1:251.

¹⁵ S. K. Lothrop, *The Potters of Guatajiagua, Salvador*, Indian Notes, Mus. Am. Indian, Heye Foundation, 4:109-118, 1927.

¹⁶ Samuel Kirkland Lothrop, *Pottery of Costa Rica and Nicaragua*, Mus. Am. Indian, Heye Foundation, 1:112, 1926.

In discussing the material culture of the peoples of southeastern Panama, Herbert W. Krieger¹⁷ describes a method of shaping the pot with the hands and pieces of calabash. Apparently the groups to which his description applies are the Tule and the Cuna.

For South America, Linné's¹⁸ account of coiling makes no discrimination between the two methods discussed in this paper. A random sampling of the literature, however, reveals only the non-paddle technique of making coiled pottery.

Among the Carib of the upper Manawarin river, British Guiana, the fingers and a gourd spoon are used in making coiled pottery in Pueblo fashion.¹⁹ The Macusi, one of the Central Carib groups, use fillets of clay, laid on in successive layers, pressed down with the fingers, and smoothed inside and out by rubbing with a pebble and a piece of calabash.²⁰

According to C. F. Hartt, the Indians of Santarem, Grão Para, Brazil, employ the same method, "no other instrument being used except the hands and the gourd or shell, with which alone the vessel may receive not only an extremely regular form, but also a very smooth surface."²¹ The same author says that, "according to Dr. de Magalhaes, 'the pottery of the Carajás, the Carajáis, Chambioás, Chavántes, Cheréntes, Guajajáras of the Araguáya river is always made by coiling, the surface being worked down by the hand and water, and the aid of a sort of spoon-like trowel made of bamboo'."

The same method, with shell instead of gourd or bamboo, is employed by the Conebo of the Ucayali river in eastern Peru.²²

The Cayapa Indians, province of Esmeraldas, Ecuador, shape their coiled pottery with the hands and without the use of the paddle.²³

¹⁷ Material Culture of the People of Southeastern Panama, based on Specimens in the United States National Museum, U. S. Nat. Mus., Bull. 134:64, 65, 1926.

¹⁸ S. Linné, *The Technique of South American Ceramics*, Göteborgs Kungl. Vetenskaps- och Vitterhets-Samhälles Handlingar, Fjärde Följden, Band 29, N:o. 5:76-81, 1925.

¹⁹ Walter Edmund Roth, *An Introductory Study of the Arts, Crafts, and Customs of the Guiana Indians*, Bureau of American Ethnology, Ann. Rept., 38:131, 1924.

²⁰ William Curtis Farabee, *The Central Caribs*, Univ. Pa., Univ. Mus., Anthr. Publ., 10:24, 1924.

²¹ Ch. Fred. Hartt, *Notes on the Manufacture of Pottery among Savage Races*, Am. Naturalist, 13:83, 1879.

²² William Curtis Farabee, *Indian Tribes of Eastern Peru*, Peabody Mus. Am. Arch. Ethn., Harvard Univ., Papers, 10:87, 1922.

²³ S. A. Barrett, *The Cayapa Indians of Ecuador*, part 1, *Indian Notes and Monographs*, Mus. Am. Indian, Heye Foundation, 40:177, 1925.

For the Chiriguano and Chané of southern Bolivia and northern Argentina, Nordenskiöld's account²⁴ seems to indicate the non-paddle technique of the Pueblos of North America. He says the vessels "are made in the usual way by building up layers of strips of clay. Stones, mussel shells, and empty corn-cobs are used for smoothing the vessels." The corncobs recall to mind the Picuris use of these objects as smoothers.

On some Chorote and Mataco vessels "the clay coils themselves are sometimes retained as ornaments."²⁵ Presumably this must produce a corrugated ware like that of the ancient Pueblos. Naturally this implies the non-use of the paddle and the shaping of the vessel with the fingers.

The non-paddle method of manufacturing coiled pottery will probably be found to be distributed generally from the Pueblo area in North America to the southern limit of pottery-making in South America, except where molding takes its place or is a companion process. To the northward of the Pueblo region and southwestern Utah, the non-paddle method does not appear, so far as the consulted literature reveals, until the shores of Bering strait are reached. There the Eskimo method of pottery-making is similar to that of the Pueblos, being coiling and shaping with the fingers,²⁶ but without spoon smoothers. As among the Pueblos, a circular pat is first made. To this, spiral coils are added, until the vessel has been built to the proper height.

Negro Africa, like South America, seems to be an area in which the non-paddle technique of coiling prevails, employing such Pueblo-like accessories as the calabash-shell smoother and an old pot for a base. The method appears in Sierra Leone in the west, in Uganda in the east, and in Rhodesia in the south.

The Timne and Mendi form a pat to which rolls are added. The outside is smoothed with a knife and the inside pressed and thinned with a piece of calabash.²⁷

²⁴ Erland Nordenskiöld, *The Changes in the Material Culture of Two Indian Tribes under the Influence of New Surroundings*, Comparative Ethnographical Studies (Göteborg, 1920), 2:137.

²⁵ Erland Nordenskiöld, *An Ethnogeographical Analysis of the Material Culture of Two Indian Tribes in the Gran Chaco*, Comparative Ethnographical Studies (Göteborg, 1919), 1:217.

²⁶ Edward William Nelson, *The Eskimo about Bering Strait*, B. A. E., Ann. Rept., 18:201, 1899.

²⁷ Northcote W. Thomas, *Anthropological Report on Sierra Leone, Part 1, Law and Custom of the Timne and Other Tribes* (London, Harrison and Sons, 1916), 177, pls. 19 and 20.

The Boloki of the Congo region form long pencils of clay rolled between the hands. These are welded with the fingers to the base.²⁸

The BaGanda employ a broken pot for a base, a gourd-shell smoother, and a short pointed stick to obliterate coil joints on the outside.²⁹ The same method and implements prevail among the BaNyoro.³⁰

The AKikuyu coil their pottery and use the gourd smoother, but make the bottom last.³¹

The non-paddle method is not limited to Bantu peoples in Uganda. The Lango, a Nilotic tribe,³² also employ it. The calabash smoother is used and the coils are added to a saucer-like pat, as among the Pueblos.

In Rhodesia, the BaIla make their pottery of concentric rings of paste and smooth it in Pueblo style with a corncob, a piece of wood, or a piece of bone.³³

In Malaysia the non-paddle method appears to be marginal and presumably ancient; at least, the paddle-and-anvil method appears in Borneo, Celebes, and the Philippines, while the non-paddle method is found peripherally, namely in the Andamans, Nicobars, and Formosa.

In the Andamans, the method is coiling; the scraper and smoother is an *Arca* shell.³⁴

On Chaura island in the Nicobars, pottery is coiled in a dish, Pueblo fashion, scraped with a shell, finger smoothed, and shaped with the hand.³⁵

What is apparently coiling without the paddle is described for the Lam-si-hoan of Formosa. A lump of clay for the base is worked, then added to bit by bit, shaped, and smoothed with the hand and water.³⁶

²⁸ John H. Weeks, *Among Congo Cannibals* (Philadelphia, J. B. Lippincott Co., 1913), 87.

²⁹ John Roscoe, *The Baganda* (London, Macmillan and Co., Ltd., 1911), 399.

³⁰ John Roscoe, *The Northern Bantu* (Cambridge, University Press, 1915), 78.

³¹ W. Scoresby Routledge and Katherine Routledge, *With a Prehistoric People, the Akikuyu of British East Africa* (London, Edward Arnold, 1910), 97-102, pls. 67-77.

³² J. H. Driberg, *The Lango, a Nilotic Tribe of Uganda* (London, T. Fisher Unwin, Ltd., 1923), 88.

³³ Edwin W. Smith and Andrew Murray Dale, *The Ila-speaking Peoples of Northern Rhodesia* (London, Macmillan and Co., Ltd., 1920), 1:191.

³⁴ A. R. Brown, *The Andaman Islanders* (Cambridge, University Press, 1922), 473.

³⁵ C. Boden Kloss, *In the Andamans and Nicobars* (London, John Murray, 1903), 107.

³⁶ George Leslie Mackay, *From Far Formosa* (Edinburgh and London, Oliphant Anderson and Ferrier, 1896), 244.

In New Guinea and Melanesia both methods occur. In describing the non-paddle method of the Mailu islanders, Malinowski contrasts it with the tapping method of the Motu. On Mailu, the method is coiling, with finger welding, and smoothing, scraping, and shaping with the hand and a *Venus* shell.³⁷

On Goodenough island, in the D'Entrecasteaux archipelago, the method appears to be non-paddle coiling.³⁸ The smoother is described as a bean, thus perhaps approaching in size the acorn smoother of the Western Mono of California.

In New Caledonia the method is non-paddle coiling: On a flat stone "he puts a small dab of clay as a beginning. . . . Round this dab, he winds his first rope or ribbon, on this again another, and so on, gradually enlarging the circumference, and smoothing them with his fingers and a small smooth flat stone."³⁹

POTTERY ANVILS

In America, pottery anvils, or trowels and modeling tools, as Holmes calls them,⁴⁰ are found in the middle and upper Mississippi valley, as well as in the lower Colorado River valley. During a recent visit to the East, examples of these pottery anvils were seen in various museum exhibits. They were from Tennessee, Missouri, and Wisconsin.⁴¹ Clarence B. Moore figures one from Kentucky⁴² and another

³⁷ B. Malinowski, *The Natives of Mailu*, Trans. Royal Soc. S. Australia, 39:641, 1915; W. J. V. Saville, *In Unknown New Guinea* (London, Seeley Service and Co., Ltd., 1926), 143-151.

³⁸ D. Jenness and A. Ballantyne, *The Northern D'Entrecasteaux* (Oxford, Clarendon Press, 1920), 194.

³⁹ J. J. Atkinson, *Notes on Pointed Forms of Pottery among Primitive Peoples*, Jour. Anthr. Inst. Gr. Brit. Ireland, 23:90, 1894.

⁴⁰ W. H. Holmes, *Aboriginal Pottery of the Eastern United States*, B. A. E., Ann. Rept., 20:35, 36, 1903.

⁴¹ The specimens observed in museum exhibits were from the following localities: One from New Madrid county, Missouri, in the exhibition of the Missouri State Historical Society at the Jefferson Memorial building, St. Louis. This is a long-stemmed example, no. 902. Two from Kimmswick, Jefferson county, Missouri, in the exhibition of the Peabody Museum of American Archaeology and Ethnology, Harvard University. One bore no. 63639.

Others from Missouri, in the Peabody Museum of American Archaeology and Ethnology, Harvard University, were the following: 12388, mound, southeast Missouri; 12944, mound, southeast Missouri; 14310, low mound, Mississippi county, Missouri; 48627, 3 specimens, mound 10, southeast Missouri; 48628, 2 specimens, mound, southeast Missouri; 48936, no location.

From Tennessee, the Peabody Museum of American Archaeology and Ethnology, Harvard University, has the following: 15908, stone grave no. 91, mound of Gray's farm, Oldtown; 15909, stone grave no. 91, mound of Gray's farm, Oldtown; 17255, 2 specimens, stone grave no. 30, mound inside of earthworks, Rutherford's farm, Summer county; 17327, stone grave no. 49, mound,

from Alabama.⁴³ Holmes characterizes their occurrence as occasional in the central districts of the Mississippi valley. He illustrates a number.⁴⁴ M. R. Harrington pictures⁴⁵ a restored pottery anvil from Hiwassee island, Tennessee river, Tennessee, but did not find the implement in use among the Cherokee on the Qualla reservation, North Carolina.

Although all anvils seem to have convex faces, either circular or oval in outline, there appears considerable variation in the handle, even in anvils from a single locality. In some it is long like the stem of a mushroom, in others short and with a concavity in the center of the end, in others it has two diverging nibs at the end, and in a Cocopa example, in the Cocopa group at the United States National Museum, it is in the form of a ring on edge, through which the operator could readily thrust her finger.

Judging from Holmes's discussion of pottery anvils,⁴⁶ no anthropologist had observed them in use in America. Although I saw them in use only as anvils among the Cocopa, Holmes's suggestion of their use also as polishers seems logical, unless perchance pottery on pottery is not satisfactory for such purpose. The Cocopa use stones and pieces of china as polishers, and the Pueblos use stones as polishers. Holmes's drawing (fig. 6) showing the probable use of the mushroom-form object as an anvil to resist the blows of a paddle is entirely in accord with my Cocopa observations.

Joseph Jones⁴⁷ figures three examples of pottery anvils from ancient sites in the valleys of the Cumberland and Harpeth rivers, Tennessee. He does not connect them with pottery manufacture, but with the pulverizing of maize or the dressing of hides.

Oldtown. "Coal used as smoothing stone" (potter's stone?) in same grave. 31984-5, grave no. 5, Dr. W. H. Jarman's farm, Brentwood, found with large pottery jar and a piece of water-worn coal (potter's stone?).

One specimen from Obion county, Tennessee, in exhibit of Missouri State Historical Society. This is a short thick-stemmed example, no. 245. Two from Aztalan mounds, Jefferson county, Wisconsin, nos. 26542 and 26543, in Milwaukee Public Museum. Two from Cocopa Indians, Lower California, in Cocopa group, U. S. Nat. Mus. Two from the Southern Diegueño Indians, Campo, San Diego county, California, 8-2230, 8-2232, in Museum of the American Indian, Heye Foundation.

⁴² *Aboriginal Sites on Tennessee River*, Jour. Acad. Nat. Sci., Philadelphia, 16: fig. 5, 1915.

⁴³ *Ibid.*, figure 27.

⁴⁴ Holmes (as cited, footnote 40), 20: fig. 6, pls. 34-36.

⁴⁵ Figure 33 (as cited, footnote 13).

⁴⁶ Holmes, *op. cit.*, (footnote 40), 35, 36, 99, 100; also *Ancient Pottery of the Mississippi Valley*, Bureau of Ethnology, Ann. Rept., 4:372, 1886.

⁴⁷ *Explorations of the Aboriginal Remains of Tennessee*, Smithsonian Contributions to Knowledge, 259:143, 1876.

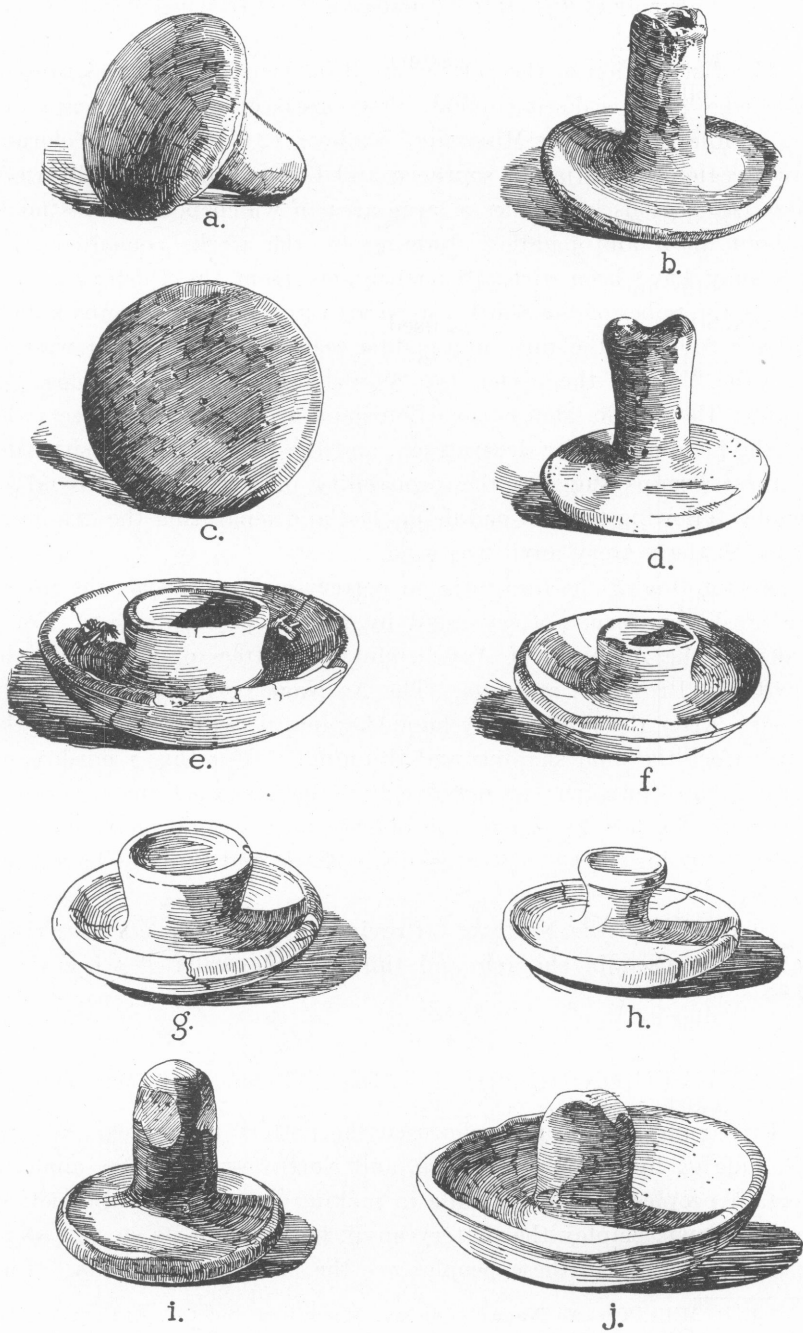


Fig. 1. Pottery anvils. *a, b*, southeastern Missouri, 48627, 12388; *c*, Brentwood, *d*, Oldtown, Tennessee, 31984, 15909, Peabody Museum, Harvard. *e, f*, Cocopa, Colonia Lerdo, Sonora, 3-2949, 3-2950, University of California. *g, h*, Aztalan, Jefferson county, Wisconsin, 26543, 26542, Public Museum, Milwaukee. *i, j*, Southern Diegueño, Campo, California, 8-2230, 8-2232, Museum American Indian, Heye Foundation. Diameter of *b* is 95 mm.; others to same scale.

The distribution of the pottery anvil in America, so far as present knowledge goes, is discontinuous. Two areas of its use appear: (1) the middle and upper Mississippi valley; (2) the lower Colorado River region and adjacent southern and Lower California. Between these two regions intervenes a large area in which pottery was made without anvil and paddle. Judging by the works consulted, this area may have been virtually continuous from the Pueblos in the west to the tribes of the Southeastern area in the east. Groups known to have followed the pure non-paddle technique were, from west to east, the Yokuts, the Mono, the Shivwits Paiute, the Pueblos, the Navaho, the Caddo, at least one Louisiana group, the Cherokee (who use the paddle only for decorating), and the Catawba. The situation of these groups suggests the probability of a continuous band of peoples following the non-paddle method and separating the two areas in which the pottery anvil was used.

A sampling of the literature on pottery-making reveals the use of the mushroom-form pottery anvil by two peoples outside of North America, the Ao Naga of Assam, and the potters of Oudh and the Northwest Provinces of India. The Ao Naga pottery is shaped, not coiled. After the preliminary hand-shaping, it is dried a little in the sun, before the final shaping and thinning. "For this a mushroom-shaped stop (putsiru) of baked clay is held against the inner surface with the left hand and the outside tapped and smoothed with various shaping sticks till the requisite shape and thinness have been obtained."⁴⁸

In Oudh and the Northwest Provinces the pottery anvil and the paddle are used in shaping and thinning the walls of wheel-made pottery.⁴⁹

DISTRIBUTION OF THE PADDLE-AND-ANVIL METHOD

Presumably all peoples who used the pottery anvil used the paddle, judging by Cocopa, Ao Naga, and Northwest Provinces analogy. Certain peoples used the paddle in making pottery, who did not, so far as known, employ the pottery anvil, but used in its stead a stone anvil. In America, these peoples are the Mohave,⁵⁰ Cahuilla,⁵¹ Lui-

⁴⁸ J. P. Mills, *The Ao Nagas* (London, Macmillan and Co., Ltd., 1926), 95.

⁴⁹ H. R. C. Dobbs, *The Pottery and Glass Industries of the North-West Provinces and Oudh*, *Jour. Indian Art*, 7:4, pl. 58, 1897.

⁵⁰ A. L. Kroeber, *Handbook of the Indians of California*, B. A. E., Bull. 78:737, 1925.

⁵¹ A. L. Kroeber, *Ethnography of the Cahuilla Indians*, present series, 8:56, 1908; Lucile Hooper, *The Cahuilla Indians*, present series, 16:359, 1920.

seño,⁵² Pima,⁵³ Papago,⁵⁴ Diegueño⁵⁵ (presumably Northern), Havasupai,^{55a} and Ute of southwestern Colorado.⁵⁶ So apparently the presence or absence of the paddle is to be taken as the primary criterion of the particular coiling method employed.

The pottery of the Middle ("Lower") Gila culture of Arizona⁵⁷ was presumably made in the paddle-and-anvil technique and not in the Pueblo non-paddle technique. The reason for so believing is the presence of wooden paddles, probably used in pottery-making, in certain sites excavated by Cushing, to-wit: Los Hornos, Las Acequias, and Los Muertos. These paddles are on display in the Peabody Museum at Cambridge and appear to be comparable to the modern Pima and Papago pottery paddles.

Kidder⁵⁸ says of the Middle ("Lower") Gila region: "The archaeological remains are also unlike those of any of our other districts, and are in some ways so aberrant that, were it not for the pottery, we should be forced to consider that we had overstepped the limits of the Southwestern culture area." If we substitute the word "Pueblo" for "Southwestern," then it seems quite true that in the Middle Gila region we have left behind us Pueblo culture. Even the pottery, which Kidder cites as the great connecting link with the Pueblo peoples, was apparently made by the paddle-and-anvil method, like the pottery of southwestern Arizona and southern California. Another impressive non-Pueblo trait that the Middle Gila culture shared with the southern California culture was the use of pottery for incinerary urns.⁵⁹

Dr. Gilbert L. Wilson has kindly written me concerning the Mandan-Hidatsa method of pottery manufacture. He observed the process employed by an aged Mandan woman in 1910. The essential points are these: "She started the pot by making a big lump of clay

⁵² Philip Stedman Sparkman, *The Culture of the Luiseño Indians*, present series, 8:202, 1908.

⁵³ Frank Russell, *The Pima Indians*, B. A. E., Ann. Rept., 26:126, pl. 17, 1908.

⁵⁴ Information from Juan Dolores, a Papago.

⁵⁵ Kroeber, *Handbook*, 722.

^{55a} Leslie Spier, *Havasupai Ethnography*, Anthr. Papers Am. Mus. Nat. Hist., 29:139, 1928.

⁵⁶ E. A. Barber, *The Ancient Pottery of Colorado, Utah, Arizona, and New Mexico*, Am. Nat., 10:452, 1876.

⁵⁷ See chapter on "The Lower Gila," in Alfred Vincent Kidder, *An Introduction to the Study of Southwestern Archaeology* (Phillips Academy, Andover, Mass., 1924), 105-114.

⁵⁸ *An Introduction to Southwestern Archaeology*, 105.

⁵⁹ F. H. Cushing, *Preliminary Notes on the Origin, Working Hypothesis and Primary Researches of the Hemenway Southwestern Archaeological Expedition*, *Congrès International des Américanistes, Compte-rendu de la Septième Session*, Berlin (1888), 167, 1890.

and thrusting her thumbs down in the top and so beginning the inside of the pot. She built up the clay sides not by coiling, but working with her hands and thumbs. Also she used a small flat quartz stone inside for an anvil and pounded on the outside with a paddle made of a piece of rough-carved cottonwood bark.”

The Arikara also employ the shaping method together with the paddle and a cobblestone anvil as the compacting implements.⁶⁰

A sampling of the literature reveals the use of the paddle among a number of groups in southeastern Asia, Malaysia, and Melanesia, but not in Africa. Although the anvil is not specifically mentioned in some cases, it is to be suspected that in most cases it is employed. The following are the examples of shaping with a paddle which were noted.

The most interesting parallel to the Cocopa is the use of the paddle and the pottery anvil of mushroom-form by the Ao Naga. For the Lhota Naga, Mills's description⁶¹ mentions the use of a paddle in the shaping, and later, of a string-wrapped paddle in the ornamenting. No anvil is mentioned, and perhaps only the fingers support the walls, as among the Sema Naga.⁶² Apparently in these three Naga cases there is no true coiling, though there is a building up by the addition of small pieces in the case of the Sema Naga.

The use of the paddle, as the means of shaping the vessel, extends eastward through Malaysia and Melanesia to Fiji.

For the Tinguian of Luzon,⁶³ Cole describes a technique which is plainly coiling and paddle-and-anvil shaping. The anvil is a cobblestone. For the Bagobo of Mindanao he mentions⁶⁴ the use of the paddle, but not the anvil, in the making of coiled pottery. Jenks describes the use of the paddle and a stone anvil in the shaping and thinning of the walls,⁶⁵ in the pottery made at the Igorot pueblo of Samoki.

Hose and McDougall⁶⁶ describe pottery-making among the Kayan, Kenyah, Iban, and some of the Klemantan. The vessel is “built up on

⁶⁰ Melvin R. Gilmore, *Arikara Uses of Clay and of Other Earth Products*, Indian Notes, Mus. Am. Indian, Heye Foundation, 2:287, 1925.

⁶¹ J. P. Mills, *The Lhota Nagas* (London, Macmillan and Co., Ltd., 1922), 40.

⁶² J. H. Hutton, *The Sema Nagas* (London, Macmillan and Co., Ltd., 1921), 53.

⁶³ Fay-Cooper Cole, *The Tinguian: Social, Religious, and Economic Life of a Philippine Tribe*, Field Mus. Nat. Hist., Anthr. Ser., 14:428, 1922.

⁶⁴ Fay-Cooper Cole, *The Wild Tribes of Davao District, Mindanao*, Field Mus. Nat. Hist., Anthr. Ser., 12:78, 1913.

⁶⁵ Albert Ernest Jenks, *The Bontoc Igorot*, Ethnological Survey Publs. (Manila), 1:119, 1905.

⁶⁶ Charles Hose and William McDougall, *The Pagan Tribes of Borneo* (London, Macmillan and Co., Ltd., 1912), 1:220.

a hollowed base by squeezing the clay between a smooth rounded stone held by one hand within the vessel and a flat piece of wood, with which the vessel is beaten from without." In the Tempassuk district in British North Borneo, "the clay is mixed with sand, shaped with a stone and finished off with a piece of wood."⁶⁷ This description is obscure, but presumably implies the paddle technique.

In Celebes, Mr. H. C. Raven, of the American Museum of Natural History, observed the paddling process.⁶⁸ In Nias⁶⁹ the pottery is apparently shaped, not coiled, then beaten with a wooden paddle on a stone anvil.

At Delena, and Yule island, British New Guinea, "The whole is done with clay, sand, water, a board on which the clay is mixed, a wooden beater, a stone, and a shell. . . ."⁷⁰

Malinowski⁷¹ describes pottery-making in the Amphlett islands, part of the D'Entrecasteaux archipelago, Melanesia. The method seems to be a combination of coiling and shaping with the bottom made last, as in the Salvadorean example cited from Lothrop. The final shaping is done with a paddle and in large pots this takes about an hour. No method of supporting the wall against the impact of the paddle is mentioned.

In Fiji, Thomas Williams⁷² says of the potters: "Their apparatus consists merely of a ring-like cushion, four flat mallets, and a round stone." This description seems to imply the paddle-and-anvil process. Another writer⁷³ makes it clear that at least the necks of vessels were made by coiling, though it is not clear to me just how the body was made.

Pottery-making among the Ami of Formosa appears to be a form of paddle-and-anvil procedure,⁷⁴ though another group on that island, the Lam-si-hoan, seems to employ the non-paddle technique.

N. C. Nelson witnessed the making of coiled pottery by the paddle-and-anvil method in Yunnan, a stone being used as the anvil. For

⁶⁷ Owen Rutter, *British North Borneo* (London, Constable and Co., Ltd., 1922), 322.

⁶⁸ Information in letter from N. C. Nelson.

⁶⁹ E. E. W. Gs. Schröder, *Nias*, 1:222; 2: afb. 186 (Leiden, E. J. Brill, 1917).

⁷⁰ Alfred C. Haddon, *Head-Hunters*, Black, White, and Brown (London, Methuen and Co., 1901), 200.

⁷¹ Bronislaw Malinowski, *Argonauts of the Western Pacific* (London, George Routledge and Sons, Ltd., 1922), 285.

⁷² *Fiji and the Fijians* (London, Alexander Heylin, 1858), 69-71.

⁷³ Agnes Gardner King, *Islands Far Away* (London, Sifton Praed and Co., Ltd., 1920), 216.

⁷⁴ Janet B. Montgomery McGovern, *Among the Head-Hunters of Formosa* (London, T. Fisher Unwin, Ltd., 1922), 181.

the region between Yunnan and East Cape I have found no clear references to it, but it seems entirely likely that the ancient pottery of the Palae-Asiatic groups may have been made by this method. Indeed, Wissler states that "a method closely paralleling the Mandan-Hidatsa type"—the paddle-and-anvil method—is found on both sides of Bering strait.⁷⁵ Dr. Wissler writes me that this statement is based in part on his examination of pottery in the Stefansson collection.

THE PADDLE AND ANVIL FOR WHEEL-MADE POTTERY

In India, pottery is roughly shaped on the wheel, sun-dried for some hours, then shaped, thinned, and expanded with paddle and anvil, or, as the Indian literature calls them, mallet and pestle. The paddle is of wood usually, the anvil of stone in Assam and Madras, but of pottery in Oudh and the Northwest Provinces. The pottery anvil is mushroom-shaped.

In Madras, the vessel is removed from the wheel for completion with paddle and anvil. Plates 68 and 69 of the cited work⁷⁶ show the process. "The neck and upper part are first completed on the wheel; then the lower portion is cut off; and after partially drying in the sun, the bottom is reconstructed by tapping and drawing out with a wooden mallet and a round stone, the thick edges of the upper part of the vessel, until the orifice is closed."

The Kumars of Assam do not finish their vessels on the wheel. When taken off the wheel, a vessel is sun-dried for a time, then made to assume its final shape by hand. "The method adopted is to beat the exterior surface of the vessel with a flat wooden or earthenware mallet, held in the right hand, against a smooth, oval-shaped stone held by the left hand against the inner surface. When the required shape has been given to the vessel, it is again sun-dried, and the surface is then polished with a sort of earthenware pestle. . . ."⁷⁷

The same method is employed in Oudh and the Northwest Provinces of India.⁷⁸ The roughly formed pot is removed from the wheel and left to dry for twenty-four hours. "Cow-dung ashes are now sprinkled over the whole vessel, and it is beaten out with a pestle and

⁷⁵ Clark Wissler, *The American Indian* (ed. 2; New York, Oxford University Press, 1922), 69.

⁷⁶ Edwin Holder, *Madras Pottery*, *Jour. Ind. Art*, 7:10, pls. 68, 69, 1897.

⁷⁷ E. A. Gait, *The Manufacture of Pottery in Assam*, *Jour. Indian Art*, 7:6, 1897.

⁷⁸ Dobbs, *op. cit.* (fn. 49), p. 4, pls. 57, 58.

mallet." The pestle (pindi) is a mushroom-form pottery anvil. It and the wooden mallet or paddle (thappi) are illustrated in the work cited.

Eastward, Shan pottery is wheel-made, but "when the pot has been modelled, it is decorated by patting it all over with a flat wooden instrument, not unlike a 'butterhand,' on which a raised design has been carved."⁷⁹ No anvil is mentioned and from the illustration it is not clear whether or not one is held within the vessel. The paddle is clearly shown. In Yunnan, N. C. Nelson saw the wooden paddle and stone anvil used for wheel-shaped pottery, as in India. As mentioned above he also saw it used for coiled pottery.

What may be another example of paddle-and-anvil treatment of a wheel-formed pot is reported by E. S. Morse from Canton, China. No anvil is mentioned. "The potter . . . does not separate the pot from the wheel by means of a string, as is usual with most potters the world over, but lifts it from the wheel, the separation being easy on account of the sand previously applied. The pot is somewhat deformed by this act, but is straightened afterwards with a spatula and the hand, as was the practice of a Hindu potter whom I saw at Singapore."⁸⁰

Brinkley⁸¹ explains the markings on certain wheel-made pottery, from early Japanese dolmens, in terms of the paddle-and-anvil process, as follows: "While slowly turning the wheel, the potter pressed against the inside of the vessel a wooden stamp, having concentric circles cut on its head, and at the same time beat the outside with a wooden paddle wrapped in straw matting. Thus the circular markings on the interior, and the pattern of meshes and lines on the exterior, were the outcome of a process for annealing the clay." It seems to me that this could be much more efficaciously done after the pot had been removed from the wheel, as in India.

Presumably the paddle and anvil were used in Korea. In "The Collection of Korean Mortuary Pottery in the U.S. National Museum," Pierre Louis Jouy⁸² writes: "This pottery is of various styles of workmanship, some pieces being modeled by the hand, others paddled into shape by an instrument, others turned on the wheel, while the larger and more elaborate pieces show all of these methods combined."

⁷⁹ Mrs. Leslie Milne, *Shans at Home* (London, John Murray, 1910), 174, also plate.

⁸⁰ E. S. Morse, *Glimpses of China and Chinese Homes* (Boston, Little, Brown and Co., 1903), 199.

⁸¹ Captain F. Brinkley, *Japan* (Boston, J. B. Millet Co., 1902), 8:3.

⁸² Rept. U. S. Nat. Mus. for year ending June 30, 1888 (1890), 591.

At best, the paddle-and-anvil process for wheel-made pottery may be described as a southern and eastern Asiatic one. Its absence from the process of making wheel pottery elsewhere and its proximity to the area of paddle-and-anvil hand-made pottery suggest (1) that it is a process borrowed from the area of paddle-and-anvil hand-made pottery, or (2) that it is a survival from times before the introduction of the wheel.

CERTAIN DOUBTFUL CASES

The markings on much ancient Woodland pottery indicate fabric or string impressions, presumably applied with a wrapped wooden paddle, but perhaps only in the process of ornamenting, as among the Cherokee, instead of in the process of shaping. Ancient Mandan pottery, presumably made by the shaping method, also displays cord-like markings which may have been applied with a paddle.⁸³ Skinner's account of Menomini pottery describes a curious method of shaping over a ball of cord.⁸⁴ It seems an open question whether the ancient pottery in the Woodland area was shaped or coiled.

Tozzer⁸⁵ describes modern Maya pottery-making, apparently as seen at Ticul, south of Merida, Yucatan, the center of manufacture of water jars. He mentions a paddle, also a board, upon which the growing pot rests, and which is revolved with the feet. Whether this method is strictly analogous with the paddle-and-anvil method is not clear. No anvil is mentioned.

⁸³ G. F. Will and H. J. Spinden, *The Mandans: A Study of their Culture, Archaeology and Language*, Papers of Peabody Mus. Am. Arch. Ethn., Harvard Univ., 3:173-179, pls. 37-42, figs. 13-16, 1906.

⁸⁴ Alanson Skinner, *Material Culture of the Menomini*, Indian Notes and Monographs, Mus. Am. Indian, Heye Foundation, 1921:282.

⁸⁵ Alfred M. Tozzer, *A Comparative Study of the Mayas and Lacandones* (Archaeological Institute of America, 1907), 62, pl. 13.

CONCLUSIONS

The inferences as to Southwestern culture history suggested by the present findings on the two pottery coiling techniques are as follows:

1. The likelihood of the independent development of pottery in the Pueblo region, apart from its development in the Middle Gila region and westward, is strengthened. Had pottery-making been learned by the Pueblos from peoples using the paddle and anvil, it is expectable that the Pueblos would have employed it. Thus the gap between the Pueblo culture on the one hand and the culture of western Arizona, western Sonora, and southern California on the other hand becomes more apparent. Presumably, study of other culture elements will serve to enhance it, in spite of the many traits in common.

2. There seems justification for the belief that the non-paddle method is the older, so far as the Southwest is concerned. The typical wares of the Middle ("Lower") Gila, which were probably paddlemade, seem to have flourished, according to Kidder,⁸⁶ "toward the end of the prehistoric period, perhaps at about Glaze 1 times in the Rio Grande, and after most if not all of the pure black-on-white cultures had passed away." This opinion is confirmed in part, at least, by the work of E. F. Schmidt,⁸⁷ who states that Gila polychrome ware was apparently subsequent to the black-on-white ware of the Little Colorado settlements, while the Lower Salt "red-on-yellow" (red-on-buff) ware was synchronous with Little Colorado black-on-white ware, "but to what extent is not known."

3. The technical unity of Pueblo, Southeastern, Middle American, and South American pottery is manifested by the prevalence of the non-paddle technique in these regions. That this is proof of Middle American stimulus or origin for Pueblo pottery I am not certain. Possibly pottery, as well as the bow, came from the north. Such a view is contrary to accepted opinion, but ought to be entertained as a possibility until definite proof is forthcoming that the earliest Middle American pottery antedates the earliest Pueblo pottery. The most serious objection to a northern or Asiatic derivation of Pueblo pottery is the great potteryless area in northern North America.

⁸⁶ *Op. cit.*, 113.

⁸⁷ A Stratigraphic Study in the Gila-Salt Region, Arizona, Proc. National Acad. Sci., 13:291-298, 1927.

4. In spite of the wide geographical separation, the pottery anvils of the middle Mississippi valley and of the lower Colorado River region are so similar as to suggest a single origin. On the basis of the known distribution of American pottery anvils, and the greater development of pottery forms in the Mississippi valley, I am inclined to regard that region as the primary one for pottery anvils in America. Between the Mississippi valley and Assam, the distance and the absence of examples in the intermediate regions would seem to render assertion of a single origin unwarranted at the present time.

5. Apparently the non-paddle technique and the paddle-and-anvil technique have both penetrated into California. The former is the method employed by the Eastern and Western Mono, and adjacent Yokuts of central California. The latter is the method of the southern Californian pottery-making groups. This conforms with Kroeber's suggestion of diffusion from two sources, Puebloan and Sonoran.⁸⁸

Certain points of general bearing suggest themselves:

1. Close study of sherds known to represent the two techniques may reveal microscopic differences in the arrangement of the particles in cross-sections, and thus give a clue to the determination of ancient methods by the examination of potsherds. The surfaces of smooth ware of both techniques are likely to be indistinguishable, because of the scraping, smoothing, and polishing with which they are finished in both techniques.

2. If American pottery-making can be traced to an Old World origin, it may develop that the non-paddle method and the paddle-and-anvil method represent an earlier and a later diffusion respectively, like the simple bow and the sinew-backed bow. Presumably, the pottery-making without the paddle is to be regarded as the simpler process, since the shaping is with finger and hand pressure alone. The peripheral distribution of the non-paddle coiling for the world as a whole suggests that it is the earliest and most widely diffused method.

3. It is possible that the use of the paddle-and-anvil in America was originally connected with the shaping process, as among the Arikara, Mandan, and Hidatsa, rather than with the coiling process, and was taken over by certain of the groups already employing coiling without the paddle.

The same possibility is suggested by the Asiatic data. In Assam the paddle-and-anvil process is connected with shaping, while in Malaysia it is connected chiefly with coiling.

⁸⁸A. L. Kroeber, *Native Culture of the Southwest*, in press, pres. ser., 23, 1928.

The use of the paddle and anvil seems to be the factor that makes possible the forming of delicate, thin-walled pottery by the shaping method. Without these accessories it seems unlikely that fine pottery could be made by hand, except by the non-paddle coiling method.

4. Another possibility is that the hand-shaping process is simply a degeneration, or imitation, of the wheel-shaping process. Distribution suggests this possibility. The location of hand-shaping in North America is closer to the wheel-shaping area than the known coiling of America, with the exception of the Eskimo coiling. In southeastern Asia and Malaysia the same situation prevails. Hand-shaping in Assam is nearer the area of wheel-shaping than is the coiling of Malaysia.

5. The world distribution of three types of pottery manufacture—wheel, paddle, and non-paddle—is in general a distribution in which the first is central, the second intermediate geographically, and the third marginal, notably in South America, Africa, and Oceania. May not this distribution be an argument for but a single invention of pottery in human culture history, with all subsequent pottery the result of diffusion? If this is the case, the logical place to look for the seat of invention is the area of the potter's wheel. Within that area the Egyptian and Mesopotamian regions were probably the earliest to develop pottery.

The alternative interpretation might run thus: Non-paddle coiling is so simple a process that it has probably been invented more than once in the world's history, presumably in Africa, in Eurasia, and in America. The paddle method, although more complicated, has been invented twice, in Asia and in America, but apparently not in Africa. From Asia it spread eastward into Oceania, but not into America. The wheel method was invented in the Old World, but, before the discovery of America, did not spread beyond the peoples of higher culture in the Eastern Hemisphere.

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	Index, pp. 409-411.	
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Index, pp. 331-332.	
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