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RADIOGRAPHIC EXAMINATION OF PERUVIAN POTTERY TECHNIQUES.

By Adrian DIGBY, M. A.

Plate XXXI

The following communication is a brief account of some experimental work undertaken by Dr H. J. Plenderleith of the British Museum research laboratory and the author in the early part of 1939, but interrupted by the war. Some of the photographs obtained were exhibited at the Royal Society's Conversazione of that year, and a brief account of the work was read to the Royal Anthropological Institute during the war. The results were tentative and the further programme of investigation has been held up by lack of equipment. As there seems no immediate hope of continuing the work, the author feels justified in bringing an account of the method and the preliminary results, wich were very promising, before a representative body of Americanists such as are gathered together at this Congress.

Considerable work has been done in the past, notably by Kroeber and Duncan Strong in the United States, and Tello and the Larco Hoyle brothers in Peru, in the stylistic analysis of Peruvian pottery. The author has always felt that valuable though it is as a guide to cultural history the evidence of style alone can be greatly augmented by a knowledge of techniques. For example a style of decoration or even a shape of vessel may be copied fairly readily on a comparatively slender contact, but a structural technique is only likely to be changed by long and intimate contact between two peoples, or by conquest.

In Peruvian archaeology there is a large class of vessels admirably suited to the purpose of the enquiry in hand. As is well known to American archaeologists many Peruvian vessels are constructed with a high appreciation of the laws of hydraulics, presumably to facilitate pouring smoothly from a narrow spout. The problem of admitting air into the vessel to replace the fluid poured out of narrow spouts has been solved in two ways, — by two spouts and by the stirrup spout, where the two openings in the vessel are trunked into one orifice. A modification of the former vessels can be seen in examples with one spout and one head, which is perforated to allow in-

gress and egress of air, and later still the hole in the head is modified into a whistle. The opportunities for variations in the technique of attachment of the narrow spouts and structural addenda to a vessel are obvious, but the difficulty of examining them is considerable. A lot may be done by studying sherds and broken vessels, but complete vessels, especially if they are of artistic merit, are taboo to the destructive activities of the true scientist. The most satisfactory way of dealing with these vessels is to examine them radiographically. Consequently a number of Nasca style double-spouted vessels, similar vessels from other cultures, a number of Mochica and Chimu stirrup pots and whistling vessels were examined, numbering about eighty vessels in all.

The method adopted was to examine the vessels in a viewing screen and to photograph them where they showed any unexpected departure from the normal or were in any way obscure. Where a normal X-ray photograph failed to bring out the construction of a spout mercury was syphoned into the pot, showing as a black silhouette in the resulting photograph.

The first photograph shows three Nasca vessels, in the case of two of them the spout is inserted right through the body of the pot. The third example is a rather indeterminate photograph, wich suggests that the spout is butted into the body of the pot. The size and proportions of the pot throw its authenticity into some doubt, and as it is the only example of a Nasca vessel in which the spouts are butted, it must be left in a suspense account. (Incidentally the radiograph brings out a plaster restoration to the bridge of N° 2.)

Next a photograph of a broken Nasca spout is shown for comparison, and resembles the sketch by Muelle in his paper, « Concerning the Middle Chimu style ».

Continuing the investigation of the double-spouted pot to other cultures and a later time, and examining a Tiahuanacoid vase of uncertain locality but resembling pots of this style illustrated by Kroeber his work *Peruvian Archaeology 1942*, we find the same technique, although the pot, to judge from its conical spouts, may be derived from a metal form.

The next figure shows a blackware pot of apparently late Chimu style in which, as far as can be judged, the same technique is employed, but with the addition of a reinforced collar round the base of each spout.

A whistling vase, (which the author regards as a derivative of the double-spout vessel), of middle or late Chimu style, in white and red ware has the same characteristic inserted spout. The moulded birds and the whistle can be clearly seen. The next photograph of a black-ware whistling vase is not so satisfactory and it is very hard to determine exactly what form the attachment of the spout and the figures takes, but the irregular zig-zag shadows

closely resemble similar shadows cast by pieces of clay still adhering to a hole perforated while the clay was still wet. On the analogy of this example it is reasonable to assume that the spout and figures are simply butted on to the pot.

In short, the tradition of the spout inserted trough the vessel persists, in the samples we have examined, from Nasca A through all periods and in most localities where the double spout occurs into late Chimu times, although two vessels of late date may perhaps have been made by butting the excrescences on to the body of the pot.

A very different history is that of the stirrup spout, so characteristic of the Cupisnique, Salinar, Mochica and late Chimu styles. One method of attaching spouts has been described by Kroeber, who says « handles and mouths are evidently moulded separately and joined on in Proto-Chimu ware, spouts usually being slipped over a shorter and smaller interior spout rising from the vessel's body ». Pots made by a technique allied to the one described above were common, though no example of precisely that method was found. A photograph of a very badly made Mochica pot is chosen because it brings out the technique characteristic of Mochica vessels in the British Museum more clearly than a perfectly made pot would do. In this vessel two short horns are butted onto the body of the pot. The top part of the stirrup, made in two pieces, is normally butted onto the two horns, though in this case they seem to be telescoped *inside* the horns, — not outside as in Kroeber's example.

A very fine moulded blackware vessel, probably of Mochica origin, shows a similar stirrup spout. The joins are very well made and are only detected by a certain haziness about 1 1/2 inches from the body of the pot on the left side. The photograph is interesting because, when mercury was added to the vessel it showed a block in the tube.

A modification of the normal Mochica stirrup described is to be found in those vessels where the stirrup is roughly triangular. In an example of this horns are lengthened to point X where a sharp angled butt joint is made, and subsidiary filling inserted. All vases of undoubted Mochica appearence which were examined conformed to one of these variants, which for convenience has been called the four-piece spout.

The next two photographs show two moulded vessels which are identical except that one is black while the other is red and white. The spouts of both show a beautifully even bore, except of the angle of the T, which has obviously been added later, and in the outer opening. They must have been moulded in two saggital halves before being joined together and attached to the pot.

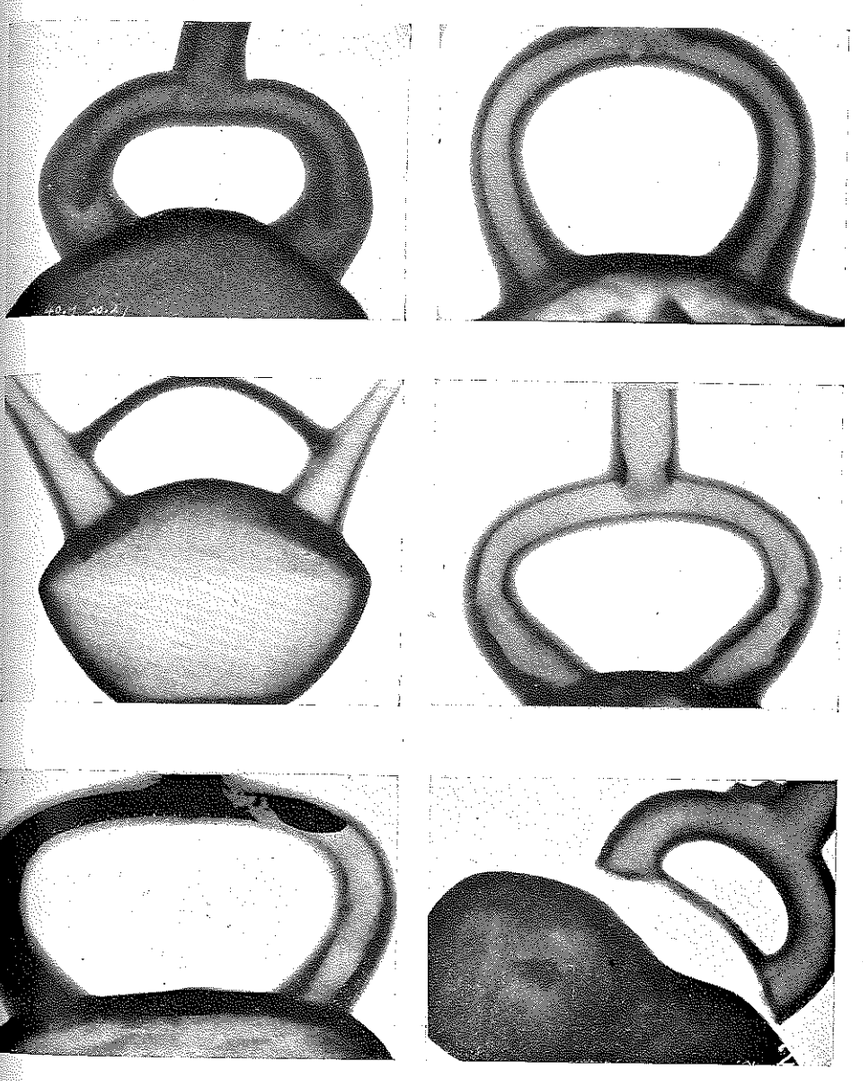
The next photograph of a broken late Chimu pot (which incidentally helps

us to confirm the radiographic diagnosis) shows a further development in which the whole spout is moulded integrally with the pot. In contrast therefore to the double spout vases, which with one possible exception seem to maintain the same tradition of insertion through the pot, the stirrup spout starts by being built up in four pieces and butt jointed. Later they were apparently made by moulding the whole of the stirrup and then butting the two ends to the pot, and applying the spout proper to the stirrup by the same method. The final and logical development seems to be the moulding of the whole spout integrally with the vessel.

A photograph of a broken Mochica pot which has been cut in two confirms the interpretation of the preceding radiographs.

The results are in no sense conclusive, and no doubt other techniques will be found when more vessels are examined. For example Señor Jorge C. Muelle in his stimulating paper « Concerning the Middle Chimu Style » illustrated a double-spouted vase in which the spouts are attached, to quote him, by « raising the borders of the holes pierced in the calotte, thus permitting them to be plugged into the spouts, a feature made visible in this specimen by a break ».

The apparent discrepancy can only be resolved by taking large numbers of X-ray photographs. Statistical analysis may then establish cultural horizons for the varying techniques we have considered, and by a comparison of techniques with styles there seems to be some promise of historical results. But for the moment the author must conclude with a note of interrogation. Will further investigation by radiographic methods confirm the differences in technique for the two types of pottery, or by discovering more examples, demonstrate the existence side by side of differing techniques which were used contemporaneously by different potters.



Peruvian pottery techniques.

1. — Badly made Mochica pot.
2. — Chimu style pot of early date with sagitally moulded spout.
3. — Coastal Tiahuanacoid style vase, attachment by insertion, common to all double spout vessels from Nasca to late Chimu.
4. — Well made Mochica vase, the stirrup is made in four pieces butted together.
5. — Mochica pot with manufacturing flaw detected by mercury. There is a complete obstruction on the left side of the stirrup. (The stirrup is shown upside down for ease of syphoning mercury in.)
6. — Chimu style pot of late date with spout moulded integrally with the rest of the pot.