

Interested in Mrs. Hester A. Thompson's observations on the relationship between terra cotta and metal plaques, I have tried to discover whether such a relation exists between terra cotta and bronze statuettes. Similarity between the two is not, at first glance, apparent. However, if by a technical study the appearance of the original models for the two can be recreated, the resemblance of the two crafts at this preliminary, actually creative, stage will be striking. I have investigated the period in which, I believe, the two processes began showing similarities, the fifth century B.C. Later on, in the fourth and especially the third centuries, the two crafts were each other's rival.

**Bronze and Terra Cotta Figurine Technique  
in the Fifth Century B.C.**

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The Bronze Casting Process

A model of wax over a rough clay core was analyzed. The wax was then covered with a clay cast, also of rough material. The core was held in place by the insertion of rods through it and the cast. Any channels were made in the cast through which the liquid bronze would be poured. The wax was melted out and the bronze poured in. When the bronze had hardened the cast was taken off and the core removed. The cast, if in two or more pieces was patched where the bronze had failed to flow; the parts were joined and the surface smoothed. The last process must have changed considerably the appearance of the wax model, for the surface of a mold, even when it is deeply etched

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Interested in Mrs. Homer A. Thompson's observations on the relationship between terra cotta and metal plaques,<sup>1</sup> I have tried to discover whether such a relation exists between terra cotta and bronze statuettes. Similarity between the two is not, at first glance, apparent. However, if by a technical study the appearance of the original models for the two can be recreated, the resemblance of the two crafts at this preliminary, actually creative, stage will be striking. I have investigated the period in which, I believe, the two processes begin showing similarities, the fifth century B.C. Later on, in the fourth and especially the third centuries, the two crafts echo each other much more.

I have observed one type only, the female; she is the predominant type in the fifth century. Since this is a technical study involving details which do not photograph, I have used only the material available in Athens, and I have also watched the making of bronze and terra cotta objects in the primitive workshops in the city.

### The Bronze Casting Process<sup>2</sup>

A model of wax over a rough clay core was sculpted. The wax was then covered with a clay cast, also of rough material.<sup>3</sup> The core was held in place by the insertion of rods through it and the cast. Many channels were made in the cast through which the liquid bronze would be poured. The wax was melted out and the bronze poured in. When the bronze had hardened the cast was taken off and the core removed. The statuette, cast in two or more pieces was patched where the bronze had failed to flow; the parts were joined and the surface scraped and polished. This last process must have changed considerably the likeness of the cast statuette to its wax model, for the surface of a newly cast bronze is deeply coated

with carbon and is very uneven. A thickness of as much as one millimeter must be scraped off before the surface can be polished. Also, the surface areas which were directly in contact with the pour channels are of a rougher consistency than the areas between. The roughness is deep and must either be scraped off or patched. This means that the statuette just out of the mould would be merely the general shape desired. All small details, such as hair, eyes, the sharpness around the lips, would have to be incised after the surface had been scraped. It is then inconceivable that the model would have borne small details which the casting process could not preserve. The model must have indicated only the outlines of the various parts. This becomes apparent in looking carefully at a few statuettes.

1. Athens, National Museum. Karapanos Collection, no. 540. (BCH *IV*, 1891. Pls. IX, X.) Standing "Aphrodite" wearing peplos and undergarment. Both arms are outstretched; in her left hand she holds a dove. She wears a fillet which, in back, is twisted around a high knot of hair almost on top of her head. She is made of two pieces. Height: 0.275 m. Found in Goffu. Work of about 460 B.C.

All that must have been achieved before casting was the general surface. Every part of this statuette bears marks of the chisel, marks not thoroughly smoothed over in the finishing. The waves of the hair are done with a very pointed instrument. The brow, eyelids, the mouth, and the folds in the undergarment were made with a broader edged tool. The creases in the drapery are made with at least two tools, a fine one for the most recessed part and flatter ones on the sides of the folds. The skin is chiselled in short strokes with a flat square-edged tool. The back of this figure, although well worked, is very flat compared with the variation of surface on the front.

2. Athens, National Museum. No. 6197. (Langlotz, Frühgriechische Bildhauerschulen, pl. 40b.) Mirror handle. Standing female wearing peplos. Her right hand holds the edge of the peplos at her waist. Her left lower arm is outstretched. Her hair, parted in the center, is wound around a fillet. Height: 0.155 m. Found at Olympia. Work of mid fifth century.

Although the surface of this figure is smoother than that of number one it is apparent that again all the detailed work, such as hair waves, eyelids, and drapery folds, was done after casting. The left hand and the feet, which are untouched by the chisel, are very flat, really shapeless, and have no fingers or toes. The back of this figure is also worked but flat.

3. Athens, National Museum. No. 7605. (Langlotz, Frühgriechische Bildhauerschulen, pl. 23a.) Standing female wearing a peplos. Her right forearm is outstretched, the hand flattened as if it had held something. Her left fist, at her side, is pierced as if to hold a

spear (?). Her hair is long and loose behind. On the right side of her head is a groove which, no doubt, held some ornament, possibly a mirror. Height: 0.11 m. Found in Athens. Work of about 450 BC.

Since all but her hair is very crudely worked, one can see how undetailed a bronze statuette was before the surface scraping. Her left arm seems to grow out of the side of her drapery, no tooling having been done to separate the two parts. Her hands and feet are merely lumps with no detail whatsoever. The facial features were chiselled in the hard metal but are uneven and careless. Like the others', her back is flat but worked.

### The Terra Cotta Moulding Process

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A model was fashioned of clay or of wax . If clay, the model was then baked and the front of it was encased in fresh clay, which when in a "leather hard" state was removed from the model and baked also. This became the mould into which soft clay was pressed and removed when hardened. The flat, completely unworked back of the figure was made by hand. The two pieces of the figure were put together with clay slip. The whole figure was then baked and painted.

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Unlike the cast bronze statuette, the moulded terra cotta's surface, except for paint, remained untouched, and it would have greatly resembled its model had not certain changes taken place in the mould itself. This was the point at which detail, such as hair and eyelids, was added. I believe that the reason for this was that the more often a sharp line is moulded the duller it becomes, and the cutting of lines into the mould would save their precision one step of moulding: the transference of design from model to mould.

The following examples will illustrate clearly the terra cotta technique.

(Fig. 1)

1. Athens, Agora Excavations. No. T2483. Moulded female head wearing pointed sakkos. Preserved height: 0.04 m. Made of Attic clay. Broken from body at neck. Tip of nose, and left side and back of sakkos broken off. Chip over right eye. Patches of white paint preserved on face and sakkos; red on hair. Surface on right side fairly well preserved; left side, especially around eye is very worn.

The hair is fashioned in double scalloped waves which cling to the face. On the sides, there is still preserved a sharp ridge between the upper and lower layers of waves. The hair descends far down over the forehead of which little is seen. The eyebrow itself, gracefully arched, is not raised from the forehead, but there is a very slight depression just over it, differentiating it from the surface of the forehead. The eyelids are designated by two lines in relief, the upper arched, the lower straight. The eyeballs are slightly convex. The right eye is smaller than the left. The nose is straight except for a light depression below the bridge. The impression of height given by the bridge of the nose is achieved by a rapid change of plane from the bridge to the eye socket. The line of the eyebrow and nose is continuous. The nostrils are clearly shown. The mouth, well modelled in the center and flattening out at the sides, turns down at the corners. The lower lip appears heavier than the upper because of the deep depression under it. Actually it protrudes no farther than the upper. In profile the lips and chin protrude equally. The face is long and the jaw slightly squared. Except for the waves of the hair and the sides of the nose, all angles and lines are smooth and rounded. The transition from face to neck is clear. The proportions of this head are excellent. It was found with sherds of the third quarter of the fifth century.

There is no sign of work other than painting having been done to the moulded head. The front hair line, the eyelids and the mouth were cut into the mould; they are definitely lines which were depressed, not built up. Despite the fine proportions of this head, it appears that it was fashioned quickly with little thought given to making it a finely finished product. The mouth is uneven, and as mentioned before the eyes are different sizes; also the chin is higher on one side than on the other as if the clay had not been pressed sufficiently into the mould.

2. Athens, Agora Excavations. No. T2202. (fig. 2). Moulded female head wearing pointed sakkos. Preserved height: 0.062 m. Made of Attic clay. Broken from body at base of neck. Chip off left side of nose and hair in center. Back of sakkos broken off. Traces of white paint on skin, hair and sakkos. Surface well preserved.

The hair is parted in the middle and falls back in two wavy masses. The forehead is high in the center, but because it is almost entirely covered by hair on the sides it appears triangular. The eyebrows are indicated in the same way as those of no. 1, but curve more downward and are arched quite highly. The eye is not set in very far and is shown only as a single convex ellipse. The eyes are slanted, curving downward with the eyebrow. There is no attempt to show the eyelids. The nose is straight, very thick at the nostrils which are hardly indicated. There is little modelling over the upper lip. The lips are farther apart than those of no. 1. The chin is pointed giving the face a diamond shape. The cheekbones are high, the upper cheek broad. The neck is thick and flares out at the base. The back, except for the point on the sakkos is unmodelled and is very flat. Found in an undatable context.

The hair of this figure is the only feature which strikes the eye, as it is the only area which has been worked in detail. The hair is indicated by rows of wavy lines which had been carved into the mould. These lines were probably sharper at one time, but became

dulled from constant use of the mould. Lips were made in the same way as those of no. 1. The space between them is uneven as if the clay had not been pressed firmly into the mould. That the back was hand made is apparent from the scraping very evident on the back of the neck.

(fig. 3)

3. Athens, Agora Excavations. No. T307. A Moulded female head wearing hair tied up in kerchief which is knotted in front. Preserved height: 0.07 m. The clay is not Attic, possibly Rhodian. Broken from body at base of neck. Entire lower half of face broken away. Chip over right eye. Slight traces of white paint on neck and around right eye. Surface good.

The hair is parted in the middle and pulled back in two smooth masses. It is like that of no. 2, except that no waves are indicated. The part line is apparent. In profile the hair turns in a sixty degree angle to the back of the head, half covering the ear which is shown as an indistinct line. The forehead is shaped like that of no. 2. The eyebrows curve in a perfect U, the highest part of the arc in the center. The eyebrow is not raised from the plane of the forehead. The eyes are made as those of no. 1; the eyeball is flatter. The right upper lid turns down sharply and is lost. At this point there is a crack in the mould which runs across the eye and the lid. The left eyelids are very shapely, the lines not being of equal thickness at any point. The cheeks are gradually rounded and tapering. The neck is thick as that of no. 2. The back is unmodelled. This figure was found with sherds of the 3rd quarter of the 5th century.

The creases in the kerchief and the groove between the hair and kerchief were cut into the model; the eyelids were incised in the mould. The right mass of hair was cut into in the mould, probably with the idea of defining it more clearly. The marks of the instrument are apparent. Another proof that this part was reworked after the first modelling is the fact that not only is the hair line more precise on the right side, but it is visibly higher up on the forehead than on the left side.

4. Athens, Agora Excavations. No. T1969. (fig. 4) Moulded female head wearing sakkos or pointed cap. Preserved height: 0.04 m. The clay is red and very soft. Broken from body at neck. Sakkos badly chipped surface very worn. Traces of white paint on face and sakkos; red on hair, forehead and between lips. Head hollow; neck solid.

F Hair is in the same general style as that of nos. 2 and 3, except that the detail is shown by raised dots. The eyebrows are shown in the same way as those of no. 1. The eyes are done as those of nos. 1 and 3; the lids are thicker. The nose and lips are also thick. The cheeks are fleshy. This head was found in a late context.

As usual, the hair detail, the eyelids, and the mouth were cut in the mould. The back of this head appears to be more worked than either of those of nos. 2 and 3. This does not mean, however, that the body of the figure was modelled.

5. Athens, Agora Excavations. No. Th61. Seated female figure, moulded. Preserved height: 0.076 m. Made of Attic clay. Head and neck and lower legs broken off. Traces of white paint. Surface is fair.

She wears a peplos and an undergarment which is visible on her arms. The peplos is clasped at the shoulders. The neck line of the peplos is shallow and U shaped. The folds on the over-fold, wide shallow grooves, are very faint. The side folds of the peplos, hanging in front and in back of the arms are deeper. The right side is more carefully done; on the right the folds continue to the clasp, on the left the folds do not meet the clasp but stop where the arm stops showing. Her arms are at her sides; her hands on her knees. On the hands, just the thumb is distinguishable. The right arm is better worked than the left; also it is smaller and set further back than the left. The chair, with projecting ears, is unworked. This figurine was found with sherds of the late fifth century B.C.

The back of the figure is barely rounded and completely unworked. It shows signs of finger modelling. The arm is fused with the chair arm. It would have been impossible for it to have been moulded otherwise as the arm would have been undercut in relation to the mould and would not have turned out in the moulding. The single mould also accounts for the folds of the drapery all facing in the same direction - forward. This makes the profile view very uninteresting.

Although the terra cottas which were found in any sort of datable context appear later than the bronzes which are stylistically parallel, it is probable that the moulds from which they came are earlier. In any case, contemporaneous with the bronzes or later, the terra cottas do not show as much of an advance in technique. The finished product shows signs of much less care than was taken with the bronze. This is illustrated by features such as the flat backs; uneven eyes, general lack of unfinishing. The effect of the clay figurine of this period was to be gay, and bright paints would cover up mistakes and omissions of the model and mould. This, I believe, is due to the fact that terra cotta figurines, manufactured with the idea of being cheap and abundant for the many who could not afford the more expensive metal works, were considered secondary products and the possibilities of clay for this purpose were not exploited until much later, when, by moulding a figure in many pieces, a more versatile form could be attained. When this was discovered, careful detailing followed.

It is interesting to see how many features of the bronze craft the

proplasts did use. The bronze back is flat but worked; the terra cotta back is flat. The hair on the bronze statuettes is carefully incised all over the head; the hair on the terra cotta figurines may be incised in front, but, for the sake of economy of detail, the back of the head bears a headdress which entirely covers the hair except for a little at the front hairline. The detailing of a bronze is the last step to its making; the detailing of a terracotta is the second process. In neither case is the detailing done in the beginning of the process. But in the very beginning, the models, which, because the technique for making them was so similar that they took <sup>8</sup> about the same amount of skill, may have been made in the same workshop.

I wish to thank Mrs. James A. Thompson whose many suggestions made this paper possible.



## FOOT NOTES

1. Thompson, Dorothy B., "Mater Caelaturae", Hesperia VIII, 1939, pp. 285
2. For detailed account see, of course, Die Antiken Grossbronzen,  
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3. This I observed in the bronze moulds in the Agora Museum.
4. The modern sand casts cannot produce more crude a result than the ancient clay casts. The sand is, if anything, smaller grained therefore giving a finer result than the coarse clay used for this purpose by the ancients.
5. For detailed account see Neutsch,
6. I have come to the conclusion that wax was probably used for this purpose because in the Agora Excavations so few terra cotta models (none of the 5th century) have been found in comparison with the vast quantities of moulds and moulded figures.
7. Cf. Athens, National Museum, two figurines, nos. 17386 and 17387. The backs of the heads are modelled; the backs of the models are flat, unworked.
8. I wish to thank Mrs. Homer A. Thompson whose many suggestions made this paper possible.

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