STIFTUNG PRO AUGUSTA RAURICA

Forschungen in Augst 2

A Pottery of the Middle Roman Imperial Period in Augst

(Venusstrasse-Ost 1968/69)

by
William C. Alexander

1975
Basel Augst Liestal

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Ludwig Berger, Ein römischer Ziegelbrennofen bei Kaiseraugst. Mit einigen Bemerkungen zur Typologie römischer Ziegelbrennöfen. 1969. 43 Seiten, 29 Abb.

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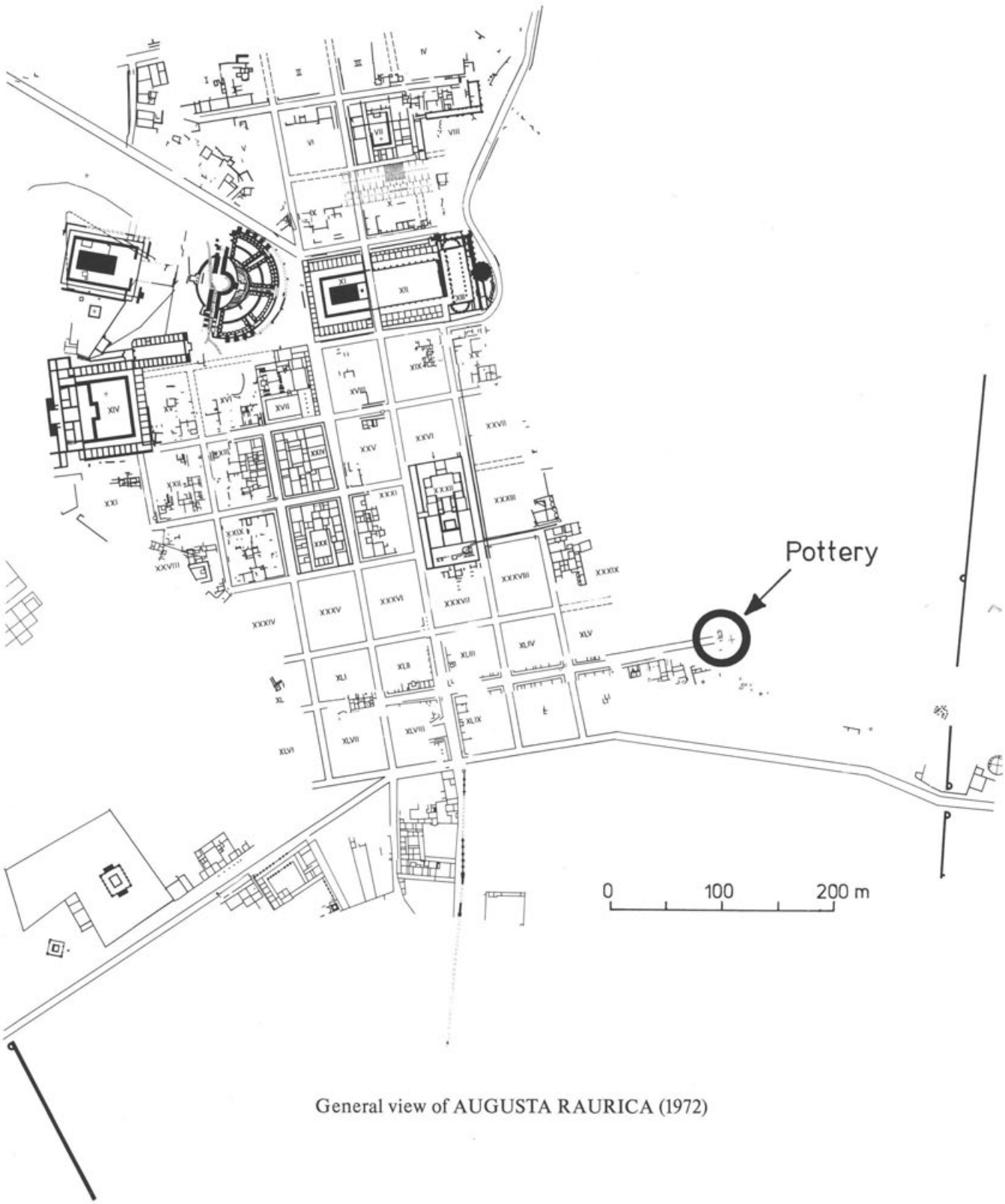
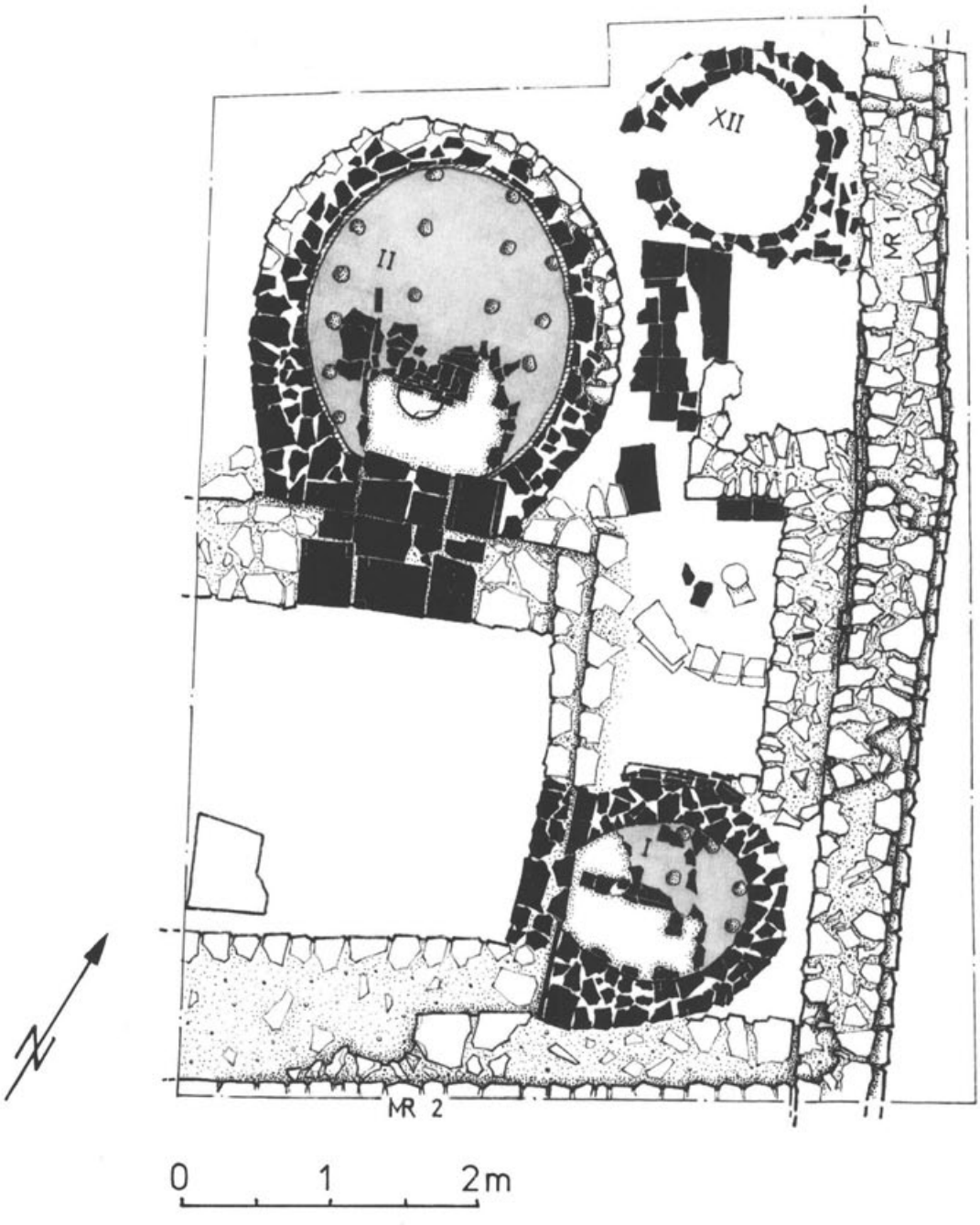


General view of AUGUSTA RAURICA (1972)



Position of the kilns (measurement and drawing Ines Matter).

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Dedication

When Prof. Dr. Rudolf Laur-Belart, the late Conservator of Augusta Raurica, first wrote to me in the fall of 1969 proposing that I come to Switzerland to work on the recent finds in Augst, I was stricken with feelings of mixed emotions. First, I was elated at the possibilities that this unique opportunity presented; and second, I could only wonder that my background and preparation would be equal to the task at hand. From the first day at the museum, Prof. Laur was my advisor, my mentor and my guide through the complex world of European archaeology.

Just as his contributions to Switzerland and to the better understanding of her varied past cannot be measured in finite terms, neither can I put into words the value of his assistance to me in this endeavor. It is to him that this modest volume is respectfully dedicated.

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Associate Professor
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Fort Collins, Colorado (USA)

January 1973

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So many people helped me during the year that I worked in Augst researching this paper that a complete list of those to whom I am indebted would be impractically long. Wherever I turned, I was met with the friendliness and spirit of helpful co-operation which typifies the Swiss character. Even so, I would be seriously remiss were I to omit reference to a few without whom this entire venture would have been impossible.
First and foremost I would like to thank Prof. Dr. Elisabeth Ettlinger for her kind and thoughtful reading of the text and for the invaluable suggestions she offered. It was she who prepared the condensed translations of the text. My colleagues, Dr. Teodora Tomaševič, Dr. Emily Riha and Dr. Ruth Steiger, of the professional staff of the Excavations and the Römermuseum helped me daily in innumerable ways and my debt to them cannot be measured in words. My gratitude to Mr. Werner Hürbin, Technical Assistant at the museum, for his expert advice and help in restoring the finds from the excavation and Mr. Ernst Wälchli, Manager of the Testing Laboratory at the Dachziegelwerk, Frick, for supervising the testing of the raw materials. I am especially grateful to Mr. Arnold Eisenhut for his careful and sensitive rendering of the Profile Plates and Illustrations in the publication.
I would also like to thank Dr. J. Ewald, Conservator of the Stiftung Pro Augusta Raurica and the Kantonsmuseum in Liestal, through whose efforts this publication came to print.

Chronology

One of the first clues in establishing the dating of the finds from Venusstrasse Ost came in the form of negative information in that only a few of our sherds were covered in Dr. Elisabeth Ettlinger's now classic work on the excavation of the *Frauenthermen* in Augst. Since these baths were in use during the Second Century, only a few sherds from that period were deposited and these were found in mixed complexes such as the water drainage canals where no sequential chronology could be established. A few of our form types, particularly the beakers which were probably used as drinking vessels in the hot baths, were well covered in Dr. Ettlinger's text, but the flagon and bottle forms were entirely missing. This implied that the sherds stem from the Second Century.

Efforts to learn a more specific dating were greatly hampered by the scarity of Terra Sigillata (TS) sherds and coins. Of the more than 10 000 sherds taken from the excavation, less than 50 were TS and only 8 of those were dateable. Three TS sherds dating from the Claudian era were found in the service area in front of the kilns which was originally floored with brick. Unfortunately, the strata immediately above and below the floor were excavated as one unit making it impossible to relocate the sherds vertically in the excavation and thereby date the floor. In view of other evidence, however, it now seems likely that the Claudian sherds were *in situ* at the time that the kilns were built and that the floor was laid over them. Three other TS sherds had to be discounted because they came from disturbed strata yielding contradictory evidence. In the final analysis, only two of the TS sherds were of value in dating the finds. The first of these was a large Rim Sherd (RS; Inv. Nr. 68.13945) from a Dragendorff 45 mortarium dated in the second half of the Second Century.[1] The rubbing surface of the mortarium shows no sign of wear which may indicate that it was broken and deposited shortly after importation to Augst. The second dateable TS sherd was a Dragendorff 38 RS (Inv. Nr. 68.14219) dated as Hadrianic to Antonine.

Of the six coins found, only four were dateable and these had to be discounted since insufficient data were available to relocate them in the excavation.

Our best sources of dating proved to be the local copies of Mediterranean TS forms and the comparison with previously dated clay gloss wares. Profile 21 shows a local copy of a TS form which was produced from the reign of Hadrian until the Third Century.[2] Profile 22 was also produced in Augst and is a copy of the Dr. 38 piece mentioned above. A small beaker identical in form to Profile 15A, but somewhat larger, was excavated in Kaiseraugst in 1963 (Inv. Nr. 63.5835). Coins from the same complex date this piece in the second half of the Second Century. Ruth Steiger shows an almost identical piece in her report on the excavations in Augst from 1961; this pot too dates from the late Second Century.[3] Binsfeld shows profiles duplicating 14A and 16A and dated through coins in the reign of Marcus Aurelius.[4] Profile 16A finds other counterparts in excavations in Augst,[5] the Lindenhof,[6] Faimingen[7] and Niederbieber.[8] Ettlinger's examples from Augst come from a complex not more precisely dateable than Second Century; Drexel places his ware from Faimingen well after 150 A.D.[9]; and Vogt reporting on the excavations of the Lindenhof in Zürich dates his pieces in accord with Drexel and on the basis of Helvetic sigillata sherds from the same complex as not before the last third of the Second Century. The Niederbieber sherds could hardly have been deposited before the early years of the Third Century.

A study of the positioning of the sherds from the major Form Types shown in the Profile Plates showed that all of these forms were represented in both upper and lower strata and suggested that all of the sherds were approximately contemporary.
The references given above and the exact duplication of some of our clay gloss forms in Niederbieber indicate that all of the major form types from this excavation were made and deposited in an 50 year period spanning the last three decades of the Second Century and the first two of the Third, i.e. 170–220 A.D.

The Categories of Wares

The excavation produced a surprisingly wide variety of pottery types not only in terms of forms but also in regard to techniques used, and during the course of the investigation it became clear that the techniques used and the wares which resulted from them fell into regular patterns which allowed for a positive categorization. The descriptions of categories which follow apply specifically to the wares produced in Augst and found in the excavation reported on, but there is considerable overlapping with techniques used in other areas. In some cases this necessitated a general discussion to place our finds in a proper context within the picture of Roman pottery as a whole. Much of it applies to all pottery regardless of its time or place of manufacture.

Category I - The Clay Gloss Wares

The clay gloss coatings of the Greco-Roman world have long intrigued potters, archaeologists and scientists alike and research into the phenomenon, which began as early as the 1700's, has continued up to the present day. Most of the investigation has been carried out on Greek pottery since its iron reds and iron blacks produced on the same pot presented the most difficult technical problems, ones which defied rediscovery until comparatively recent times. This was truly one of the lost arts of the ancients. Most of what is presently known about the Greek black polish applies to Terra Sigillata and other clay gloss coatings as well since they are now recognized as a family of finishes all resulting from the same basic phenomenon.

This body of ware, being as it was, a complete technical mystery for a long period of time when other areas of archaeological research had achieved a higher plane of understanding, produced a welter of inaccuracies, many of which are unfortunately still with us today. The term *»Firnis«* is a good example of this and ranks along with the Meso-American »Plumbate« as one of the classic misnomers of all times. The German word *Firnis* translates into English as varnish. The French duplicate the error by naming the ware *vernis* which carries the same meaning. The error no doubt arose due to the superficial similarity between the surface texture of *Firnis* ware and a varnished surface. Admittedly, most people working in the field realize that an organic varnish plays no part in the production of the ware, but we are still harnessed to a terminology which is both technically inaccurate and hopelessly misleading to the layman. Drexel recognized the error in 1929 when he refused to use the term *Firnis*.[17] Unfortunately, he substituted »glazed« *(glasiertes Geschirr)* which, while closer to the fact, is still lacking in technical precision. Since then, others have increasingly resisted the continuation of inaccurate terminology and in recent years suitable substitutes with no misleading connotations have been used in scientific papers on archaeology and ceramic research. R.J.Charleston is credited with the first use of the word »gloss« in *Roman Pottery* and Mavis Bimson continued its useage in her paper on »The Technique of Greek Black and Terra Sigillata Red«.[18] The accepted terminology now used in German is *Glanztonüberzug* which translates as »clay gloss coating«. In point of accuracy, the German term is the better of the two in that it states clearly and concisely the appearance of the surface and - and this is quite important - the material used to produce it. For this reason, I have used the terms clay gloss and clay gloss coated throughout.

Terra Sigillata also deserves some discussion since it, too, is not perfectly accurate if taken literally. *Terra* translates as »earth« and alludes nicely to the earthy nature

of the materials from which it is made, but *sigillata* means »decorated with small figures«.[19] This inaccuracy no doubt got its start because much of the ware now referred to as Terra Sigillata is decorated with small figures. Sigillata is also used in reference to the stamps or seals used to produce the figures, but through misinterpretation it is also sometimes extended to include the name stamps used by the Roman potters to identify their works. I have seen Terra Sigillata translated into English as »sealed earth« which, due to the homograph, is usually understood to mean sealed in the sense of closed off or made impermiable. Strangely enough, this misinterpretation is technically more accurate in describing the ware than the correct one of an »earthy material decorated with small figures«. The fact is that much »sigillate« pottery is completely unadorned. Over the years, the term Terra Sigillata has gained such wide acceptance that there is no longer even the faintest hope of rectifying the error, nor is such necessary in this case since it has evolved in meaning to the point that the original requirement for figurative decoration has been entirely lost and it now clearly refers to the whole body of ware whether decorated or plain. In ceramic terminology Terra Sigillata is usually understood to refer to the clay gloss itself with the result that even such things as sewer pipes are sometimes produced in »Terra Sigillata«. To avoid confusion in this work, I shall restrict the use of Terra Sigillata to references to the ware and shall use clay gloss when discussing the surface finish.

The Technique

Clay gloss coatings are best defined as microscopically thin, vitrified or semi-vitrified engobes which produce a decided sheen *without the need of burnishing.* Only the very finest clay particles will produce the effect and the preparation of a clay gloss slip is a process of separating out sub-microscopic clay crystals through selective flotation. Joseph V. Noble in his excellent work on *The Techniques of Painted Attic Pottery* published electron micrographs of Attic clay and the gloss producing particles which he extracted from it by flotation. The clay itself proved to be exceptionally fine with the largest particles measuring only ten microns in diameter, but in the gloss material the particles ranged from two microns down to several hundredths of a micron with the average crystal size being a few tenths of a micron. This dramatically illustrates the exceptional fineness needed to produce a satisfactory gloss.[20]

It is generally accepted that the ancient potters deflocculated their clay with soluble salts extracted from plant ash.[21] Some clays, particularly those high in iron, do not deflocculate easily and require additional treatment from such materials as tannic or uremic acid, both of which would have been available to the Romans from nut galls and urine respectively. Each clay reacts somewhat differently and the deflocculant used on one will not always work on another. Whatever the materials and techniques used, the basic concept of separating the fine particles from the coarse remains the same.

Not all clays lend themselves to the production of a clay gloss. Residual clays in particular are poorly suited to the purpose since they often lack the fine particles which are needed. Mavis Bimson determined that Illitic clays usually produce the best clay glosses.[22] Montmorillonitic clays, despite their exceptionally fine particle size which may range down into the colloidal scale, do not as a rule produce good glosses. This is probably explained by the excessive shrinkage found in most montmorillonitic clays. Nor can all clays which will yield a good gloss be expected to produce the same results when fired. The clay glosses used on the Terra Sigillata of

Arezzo and Lezoux and the Greek black wares of Attica are usually opaque unless very thinly applied and show a uniform color despite minor variations in thickness. In the body of ware designated as *»Firnis«*, however, the clay gloss is more a semi-transparent coating and thick and thin areas are often revealed by mottled coloring. Despite the fact that iron is the principle colorant in all of the clay gloss coated wares of the Roman provinces, ferric oxide in the case of the red wares and ferrous oxide in the black and grey wares, there are easily recognizeable differences in both hue and chroma from type to type. These variations in color depend upon four factors: the amount of iron present, its fineness (and by extension its dispersal through the gloss), the presence of other oxides which may alter its color, and the firing temperature. The general rule of thumb is, the more iron, the deeper or more intense the color, but two clays with identical iron contents may show decided differences in hue and chroma due to finer dispersal of the iron in one. Most iron bearing clays deepen in color as the temperature of the firing increases. The oxides of calcium, magnesium and titanium will tend to bleach ferric oxide and give a final color lighter than what might otherwise have been expected.

The effect of separating out the finest fraction of the clay is that the larger fusion resistant particles and those which are still flocked together are eliminated. The gloss material then consists almost entirely of flat, plate-like clay crystals which are exceedingly fine. When applied to the piece, they tend to orient themselves in layers parallel to the surface of the pot with their flat sides out. Each crystal acts as a mirror producing a sheen. When fired, usually not higher than about 950° C., the gloss layer sinters forming a relatively watertight abrasion resistant surface over the still porous paste. In most cases, both paste and gloss are made from the same raw material and vary but little one from the other in their chemical make up. The gloss may have a slightly higher alkaline content, due to the soluble salts used as peptising agents, and these are fluxes, but this is hardly enough to account for the wide disparity in sintering points. It is a well-demonstrated fact that finely ground materials fuse more readily than coarser materials of the same chemical composition,[23] and it is widely accepted that the sintering of clay gloss coatings is primarily attributable to the fineness of the particles. In reduced wares, the iron content is also a contributing factor in that ferrous iron (FeO) is a powerful flux. That the iron content plays a significantly smaller role than the fineness of the material is demonstrated by the work of Farnsworth and Wisely.[24] In their research, they were able to reproduce the »intentional red« with the »Greek Black« on the same pot in one firing by simple addition of ochre to the black gloss before firing. The addition of ochre accomplished two things: first, it introduced a non-sintering particle of larger size, and second, it increased the iron content from 8.5 to ca. 11%. At the same firing temperature (ca. 850° C.) and in a reducing atmosphere, the untreated gloss sintered to an impervious coating whereas the same material with the added ochre remained porous and reoxidized when oxygen was introduced into the kiln. This demonstrates clearly that the particle size of the gloss is of considerably greater importance than the iron content.

It also seems likely that the natural iron content of the clay which has been combined over periods of geologic time serves better as a flux than that which is subsequently added. Here, too, the iron would be more finely divided and in more intimate contact with the clay platelets than additions of free iron.

Setting aside for the moment the factor of temperature, we can state that the color, the characteristics and to a degree the quality of the gloss are primarily dependant

upon the raw material used and cannot be completely controlled by the potter. This leads to differences which can be of invaluable aid to the archaeologist in locating wares geographically and by extension in dating them.
A good example of this is the differences which can be noted between the clay gloss wares from Augst and those which were made in other areas. As noted above, the clay gloss on the body of ware designated as Terra Sigillata (usually limited to Arretine pottery and most of the clay gloss wares produced in Gaul) is opaque or nearly so. By contrast, the clay gloss produced in Augst is semi-transparent and shows a definite change in value depending upon the thickness of the gloss. Nor were the potters of Augst ever able to produce the high glance and durability which was achieved in other pottery centers even though the techniques they used were probably very similar if not identical.[25]
For this reason, some of the pots produced in Augst and other areas where the clay did not yield an opaque gloss have a mottled appearance as opposed to the uniform color of Terra Sigillata.[26] This same effect is responsible for the variation in value in the clay gloss wares made in Augst. In the reduced wares the values range from a medium grey to black, and on oxidized sherds thin areas of the clay gloss are indistinguishable in color and value from the paste and thicker applications are darker. It seems unlikely that the potters in Augst consciously regulated the thickness of the clay gloss to produce lighter or darker pots, but our sherds do not present a complete picture and this cannot be definitely stated. It is certain, however, that they regulated their firing methods to produce both oxidized and reduced wares. In spite of the fact that a good many of the sherds bearing a clay gloss must be wasters judging from the percentage of wasters in the other form types, there is a pattern of regularity in that some forms are always reduced and others are always oxidized. For instance, all of our sherds from indented beakers are reduced. This could hardly be chance.
Despite the fact that our sherds were buried for nearly two thousand years, and in some cases are somewhat damaged due to long exposure to humic acid, it seems very unlikely that the potters of Augst were ever able to produce a better sheen than that which remains on some of our best preserved sherds. Two factors point strongly to this conclusion. First, our best preserved specimens were found in the relatively protected complex under the floor of Kiln II in direct association with a large number of white engobed sherds. The engobed sherds from this complex show but little deterioration although laboratory tests showed conclusively that even weak acids over a short period of time seriously weakened the bond between paste and engobe. From this we must assume that there was little or no contact between the sherds from this complex and the humus acid from the overlying strata. Second, we ran a series of tests on clay samples from Augst in an effort to extract a suitable clay gloss. Even though we used modern methods and chemical elutrients which are highly effective and were unavailable to the Romans, we were unable to produce a greater degree of sheen than that on the well preserved sherds from the excavation.[27]
The paste of the clay gloss wares also showed some variations in that some of the pieces were made from a clay which had been blunged and settled and some showed the characteristic unslaked particles found in the clay of Augst when it is not treated (see section on Raw Materials). With invariable regularity, the larger forms with clay gloss surfaces such as profiles 10B, 21 and 22 were made from untreated clay whereas the finer wares – the indented beakers and the decorated pieces of profile 14A – were exclusively made from a fine, even textured paste. Remarkably, the fine textured

paste proved to have a lower specific gravity and higher absolute porosity than the coarse paste. As a rule this would indicate that the more porous ware was fired at a lower temperature, but in this case that could hardly be true in view of the fact that the clay gloss requires approximately the same heat treatment whether applied to a coarse or smooth paste (see section on Raw Materials).

Categories I A and I B differ from each other in the manner of firing the ware. IA pots were fired in an predominantly oxidizing atmosphere so that the color is in the reddish orange range (Munsell 10 R 5/6) and the IB sherds range from a medium olive grey (Munsell 5 Y 5/1) to black with all gradations between. The paste is very fine textured and lacks the lumps which are charactistic of the clay of Augst suggesting that the potters processed this clay in a special way to insure the quality of the ware. Spalling due to lime chips is not as common as in the coarser wares, but may occur. Many of the sherds from Category IA were rather poorly preserved with only a few traces of the gloss remaining, but the IB sherds were for the most part in a fairly good state of preservation. As a general rule, it is possible to say that Category IA sherds are not as resistant to chemical attack and weathering as those of Category IB despite the fact that the only difference between them is the manner of firing. Shepard noted the same phenomenon with regard to Meso-American Plumbate ware and attributes the difference in resistance to a difference in density caused by the greater fluxing action of iron in the ferrous state.[28] The same materials were no doubt used for both types of wares, but there is a regularity in the way the colors appear on the pots which insists that the potters regulated their firings to produce either grey or red wares. The forms which occurred in Category IA were: 14A (all sherds except the profiled piece), 15A, 16 A-C, 13B and 14B-E.[29] The forms appearing in Category IB were: 12, 13A, 14A (profiled piece only), 14D, 14E, 15A, 15B and 17.

Category IC includes all of the rougher clay gloss wares. In our examples the pieces are always oxidized and the clay gloss is of the same color and texture as in Category IA, but the paste differs in that it is rough and unrefined and shows the characteristic lumpiness on untrimmed, unribbed surfaces. It is the same paste used for the flagon and bowl forms. All of the larger and coarser clay gloss wares were executed in this technique; they were: 10A, 10B, 13B, 14B-E, 21, 22, 24, 27, 28, and 29.

Category II - The Carbon Smudged Wares

Carbon smudging is an ancient technique commonly used for the production of black wares. It has been used the world over in primitive and pre-industrial cultures, and is still in use today in parts of Africa, Asia, South America and Mexico.[30] Such well-known types as terra nigra, bucchero nero and »Belgian« ware were done in this technique.

The color of carbon smudged ware ranges from grey to a true black and is achieved by impregnating the ware with carbon during the last stages of the firing. There are a number of methods used, but all depend upon producing a thick cloud of carbon-bearing smoke at the end of the firing cycle which enters the pores of the clay depositing a residue of carbon effectively turning the ware black.[31] The color of the clay used is, then, relatively unimportant and the potters rely on the blackening power of carbon to produce the color.[32]

There are three commonly seen variations of carbon smudged wares and they are the basis for our categories. The first is burnished ware which uses an engobe to pro-

duce the sheen - *Category IIA*. The second is also burnished but has no engobe on the surface - *Category IIB*. *Category IIC* is not burnished.

The Techniques

The pottery of this type made during the Greco-Roman Era was largely wheel thrown, but the technique used to produce the surface sheen is much older and is a continuation of one of the oldest surface treatments in the long history of world ceramics. In surface appearance they may closely resemble the black clay gloss wares of the Greeks, but the techniques used were quite different.

In order to fully explain the phenomenon it is necessary to begin with a brief discussion of the nature of clay. Clay is a cryptocrystalline material which fact was not fully realized until the advent of the electron microscope. Clay crystals are so small that observation through a normal optical microscope reveals no pattern or structure. While there are a number of clay-related minerals, the three major minerals associated with the material designated as clay, Kaolinite, Illite and Montmorillonite, all have a plate-like crystal structure. The peculiar properties of clay are dependant upon this crystal form.

In the dry state clay is no more plastic than sand or any other fine particled material. Only when mixed with water does it realize its special characteristics. Water mixed with clay in the proper proportions, usually 25-35% by weight, serves two purposes. First it encapsulates each clay platelet and acts as a lubricant so that when pressure is applied the crystals can slide one against the other with a minimum of friction, and when the pressure is released, the surface tension of the water holds the platelets in place. Hence, the plasticity of clay.

The plate-like structure of the clay crystal also bears directly on the phenomenon of the sheen produced when clay is burnished with a hard instrument. Burnishing causes nothing more than a physical alignement of the clay crystals so that each crystal is forced to lie horizontal to the surface of the pot with its flat side out. Each crystal then acts as a tiny mirror reflecting light and causing the piece to shine. The water content of the surface at the time of burnishing is critical. The piece must contain enough water to allow the clay crystals to move and align themselves, but not enough to cause any appreciable shrinkage as the piece dries completely. Shrinkage subsequent to the burnishing disarranges the alignment of the crystals and destroys the sheen.[33]

With these parameters in mind, it is easy to see that not all clays will lend themselves to this treatment. In some clays the platelets are not well separated, but are stacked up in bundles known as »flocks« and cannot be aligned sufficiently to produce a sheen. Such clays are as a rule relatively non-plastic. In other cases, the water content needed to align the crystals by burnishing is sufficient to cause a sheen destroying shrinkage on drying. Due to the rarity of clays which take and hold a good sheen when burnished, it has been common practice throughout history to use one clay for the body of a pot and cover it with a very fine grained clay as a polish coat. These were sometimes treasured clays, sparingly used and perhaps imported.

Two characteristics are helpful in distinguishing burnished wares. First, the surface will usually show lines of striation caused by the polishing instrument. These are sometimes hardly noticeable and depend in large measure on the skill of the potter. If the piece has been polished on the wheel, which is common in pottery from the Roman Era, the polishing lines will run parallel to the throwing and trimming lines and may be difficult to distinguish from them. On hand polished pots, the polishing lines are usually somewhat helter-skelter and do not follow the axis of the pot, but

they may be so skillfully done that the entire surface appears to be smooth and unstriated. Identification is further complicated by the fact that some pieces which were finished in a clay gloss were burnished or trimmed prior to the application of the gloss. The burnished or trimmed areas may have a better sheen due to the smoother surface, and this can be mistaken for burnishing on top of a polish engobe. Second, the necessity of burnishing to produce the sheen negates the possibility of relief or depressed decoration such as rouletting. Fine relief cannot withstand the pressures needed to align the clay particles. Hence the pots will be largely unadorned and the forms simple with a minimum of complex handles and the like.
When fired these polished surfaces retain the sheen if the firing temperature is not high enough to cause more than a minimum of shrinkage. This dictates that most wares of this type will be rather soft and porous. The burnishing hardens the surface somewhat due to consolidation of the clay particles, but the paste is usually soft and easily scratched.
When the clay used for the paste both accepts and retains the sheen from burnishing, a polish engobe may be ommited or a slip made from the same clay may be used. This is apparently the case with the piece used for Profile 11A (Inv. Nr. 68.13866). A small sherd from this pot was refired in an oxidizing atmosphere and there was no difference in color to be seen between paste and surface nor does it seem possible that an engobe was used.[35] Few sherds of either category IIA or IIB were found in the excavation of kilns I and II.[36]

Category IIC pots are unburnished and have a matt black surface. The only pieces adhering to this technique in this excavation were bowls of Profiles 23A & B.

Category III - The White Engobed Wares
This category is reserved almost exclusively for container forms such as bottles and flagons although it is also occasionally seen on such things as incense cups. The color ranges from an almost pure white (rare) into a creamy ivory tone (Munsell 10 YR 8/4) which is the norm. When it is very thinly applied the engobe has a pinkish cast caused by the red clay of the paste which shows through. The high calcium content makes the engobe very susceptible to soil acids and the state of preservation is frequently very poor. In some examples particularly those from the humus layer where the acid action is the strongest, the engobe may have been entirely eaten away.

Category IIIA. With the exception of plastic considerations such as the profiling of the lip and the ridging of handles, these pieces are unadorned. The engobe here was used in the classic sense which is to say that its sole purpose was to change the color of the ware. It is neither denser nor harder than the paste so it could not have been expected to waterproof the pot or give it a more abrasion resistant surface.
As with other techniques which are known to have been used in Augst, this is a one-fire process. The engobe was applied to the leather hard pot. This is clearly shown on a number of sherds of which one of the best examples is Inv. Nr. 68.13465. This is a sherd from a Type 2A flagon and has four deep scratches on the under belly. They penetrate the engobe layer and cut into the paste. The sharp edges of the cuts positively show that they occurred while the pot was still damp. On closed forms, only the outside surface is engobed and this was probably accomplished by turning the stiff leather hard pot in a vat of the engobe slip. Drips and runs on the inside are frequent.

Category IIIB. The engobe and techniques of Category IIIB are exactly the same as those of Category IIIA with the exception that the pots have been decorated with a red clay gloss. The red pigment used was the same as that used on the other clay gloss wares and was brushed on over the raw, unfired engobe. This excavation revealed only three patterns, but it seems likely that others may be found in the course of future excavations. (See Profile 3A and illustrations 1 and 2). This technique seems to have been reserved for bottle forms.[37] This sort of form with its wide belly and no handles would have been difficult to use for any practical purpose. More than likely, they were purely decorative.

Category IV – The Mica Gilt Wares

The mica gilt wares form a unified group only in so far that they have all been finished with some form of mica as a surface decoration. There are various techniques of firing and at least three different methods for applying the mica. German language publications make a distinction between *Goldglimmerüberzüge* and *Silberglimmerüberzüge* (gold mica gilt and silver mica gilt, in rough translation). The distinction here is solely the result of the firing technique, oxidizing or reducing, which was used. Our excavation did not furnish enough sherds of reduced fabric to determine whether there was a regularity or pattern by which some forms with mica gilt were always reduced and others always oxidized. For this reason, I have based the sub-categories on the manner of application of the mica platelets, and it may be assumed that the three techniques listed could be used for either oxidized or reduced wares.

Category IVA. This is the simplest and by far the most prevalent technique of gilding on sherds from this excavation. It was found exclusively on the insides and rims of bowl forms, particularly those of Types 18, 19, 20 and the plates of Type 24. The outsides and trimmed surfaces of these forms occasionally show a few scattered flecks of mica, usually on the foot, but so few and so irregular that one must assume them to be unintentional. The explanation of this peculiarity is that the mica was applied before the pots were trimmed. A number of bowl sherds, Inv. Nr. 68.13746 which was used for Profile 18E, for example, show fine, linear striations which do not run parallel to the throwing rings. One also occasionally finds imprints where hairs have been implanted in the surface or the piece and later burned out in the firing process. These two factors dislose that the mica was applied with a brush of some sort while the pot was very soft, presumably just after the throwing process and before it was removed from the wheel. Laboratory tests confirmed that this would have been the opportune moment. Just after throwing, the surface of the pot is fresh and quite soft due to the water used in the forming process. Mica platelets brushed on in water suspension automatically lie flat against the form and partially imbed themselves in the soft clay where they remain firmly seated after firing. This technique was reserved for forms on which the treated surface could remain untrimmed and needed no further treatment.

Category IVB. The materials are the same as used in IVA, but in this case the mica has been applied when the pots were in the leather hard state. By this time, the surface of the pots had hardened to the point that the mica platelets could no longer imbed themselves and would have flaked off unless further treated. To prevent this they were burnished to adhere them firmly to the surface of the pot. This technique

was needed only on pots where the surface to be gilded had first to be trimmed. Profiles 10C and D were finished by this method.

Category IVC. Pieces in this category differ from the others in that the mica particles are carried in an engobe layer. All of the sherds of this type that we were able to observe were bowl forms and were gilded both inside and out. They were no doubt slipped in the leather hard state just after trimming. The scarcity of sherds of this type in this and other excavations in Augst indicates that this was not a common technique.

Category V - The Plain Wares

The wares of Category V were made from the same paste as the other wares of Augst, but their surfaces were left untreated; they carry neither engobes nor clay gloss nor have they been burnished. Decoration, if any, is limited to the use of plastic clay such as the pressed coils seen on Profile 8 or the stamps used on the mortaria of Profile 30. They are as a rule, fired under predominantly oxidizing conditions.

Category VI - The Cooking Wares

The paste for the cooking wares differs sharply from that used in the other wares of Augst in that it contains a large amount of tempering materials. The temper, which probably accounted for 20–30% of the volume of the paste, served to open the clay and give it greater resistance to the extremes of thermal shock to which it was subjected by the uneven heat of an open cooking fire. The materials used as tempering agents are discussed in the section on Materials and from the basis for the subcategories. *Category VIA* sherds which accounted for more than 90% of all the cooking pot sherds from this excavation were gritted with the sharp quartz sand found in *Hupererde. Category VIB* sherds were tempered with a rounded, water-washed sand of mixed composition, and *Category VIC* sherds, of which only a very few were found, used a calcium based grit derived from the fossil remains of early marine animals. *Category VIA and B* sherds were made exclusively on the potters wheel, but all examples of *Category VIC* were hand built. Only very few sherds of this last category were found in this excavation, and their positioning in the dig leads one to speculate that they were of an early type not frequently seen as late as the closing decades of the Second Century.

The Raw Materials

The Clay

The ruins of Augst lie on one of the terraces which step down from the Jura Plateau to the bed of the Rhine in the »V« formed by the confluence of the Ergolz river and the Fielenbach. Excavations in Augst always reach *»gewachsenen Boden«* or original, undisturbed strata in a clay bed which appears to underlie the entire area. Frau Prof. Dr. Elisabeth Schmid, Director of the *Laboratorium für Ur- und Frühgeschichte* of the University of Basel, made a study of this material and identifies it as *»intensiv verlehmter Lösslehm«* (Loess sand heavily infiltrated with clay).[10] E. Schmid's samples were taken from Insula XXIV in Augst which is less than one-half kilometer away from the potteries of Venusstrasse Ost where the same formation crops out in the lower strata of the excavations. Our tests were run on clay samples from Insula XXII where an excavation was in progress giving easy access to an uncontaminated clay deposit.

Samples of the clay and sherds from the excavation were sent to the *Eidgenössische Materialprüfungsanstalt* (the Swiss national materials testing laboratory) where they were tested spectrographically. The results of those tests proved conclusively that this was the clay used by the Roman potters. Table I shows the results of the tests and lists the elements present in each of the samples and their relative quantities in declining order. Sample A was a clay sample from Insula XXII and it proved to be virtually identical in composition to the three Roman sherds of Samples B–D.[11] Sample E was an unfired Roman sherd which, inexplicably, was preserved in the excavation. It showed a considerably higher Calcium content due to the presence of small chips of limestone. As a rule the clay in Augst which comes from areas where the overburden has not been previously removed is practically free of lime, but in open clay pits where the protective overburden has been carried away by erosion or other forces, lime chips are a common contaminant. A great many of the sherds from the excavation have spitouts due to lime particles, so it is very likely that the potters mined their clay from an area where the clay was already exposed. The most likely location is somewhere along the banks of the Fielenbach which lies only 100 m to the east of the potteries.

Clay from Augst does not slake completely in water.[12] Small inclusions of iron bearing minerals, predominantly limonite, have formed small concretions with the clay and sand particles and these remain after soaking as small lumps 1–3 mm in diameter. One frequently sees these on the surface of the pottery particularly on the surfaces which were neither ribbed nor trimmed. The finer wares such as the beakers frequently have a more homogeneous paste with no lumps. In this case the potters probably processed their clay more carefully prior to use and achieved a smoother paste by blunging the clay with water and allowing the coarser portions to settle.[13] The most notable physical characteristics of the clay are its exceptional plasticity and its astounding dry strength. Both of these hint at its fineness. A sieve test showed that only 4.25% of the material was larger than 60 microns in diameter. These particles were largely quartz sand mixed with iron and some mica and none were larger than 0.5 mm in diameter. Throwing tests showed the clay to be very plastic; it can be thrown very thinly and shows little tendancy to slump. The dry strength is excellent and the greenware can be handled without risk of breakage.

Table I - Spectrographic Analyses

	A	*B*	*C*	*D*	*E*
Large Amounts:	Si	Si	Si	Si	Si
	Al	Al	Al	Al	Al
Considerable Amounts:	Fe	Fe	Fe	Fe	Fe
	Mg	Mg	Mg	Mg	Mg
					Ca
Small Amounts:	K	K	K	K	K
	Ti	Ti	Ti	Ti	Ti
	Na	Na	Na	Na	Na
	B	B	B	B	B
	Ca	Ca	Ca	Ca	
Trace Amounts:	Sr	Sr	Sr	Sr	Sr
	Ba	Ba	Ba	Ba	Ba
	Cr	Cr	Cr	Cr	Cr
	Mn	Mn	Mn	Mn	Mn
	Ni	Ni	Ni	Ni	Ni
	Zr	Zr	Zr	Zr	Zr
	Cu	Cu	Cu	Cu	Cu
	V	V	V	V	V
		Zn	Zn	Zn	

Legend: A = clay test from Insula XXII
B = Category IC sherd
C = Category IVA sherd
D = Category IB sherd
E = unfired Roman sherd with lime chips

Table II - Clay Gloss Tests

	A	*B*	*C*
Water	1 l	1 l	1 l
Clay	360 g	360 g	360 g
NaOH	1.5 g	1.2 g	
Calgon			3.5 g
Volume yield	500 ml	360 ml	190 ml
Weight yield	1.0 g	0.7 g	2.35 g
percent yield	0.278%	0.195%	0.653%

Firing tests were run on the clay from Insula XXII in an effort to determine the temperature range used by the potters of Augst.[14] Although the test kilns were equipped with pyrometers, we used pyrometric cones (Seger Kegel) from the Seger Corporation since they more accurately measure the effect of the heat energy on the ware. The test bars were saturated after each firing and the effective porosity calculated and these figures were compared with the results of saturation tests previously run on representative Roman sherds. Tests were fired at every cone level from SK 014 to SK 010. Exact duplication of results from the saturation tests was not accomplished, nor was this expected due to the changes which could have occurred in the Roman sherds during nearly two millenia of burial and the fact that the Roman potters probably fired their wares by eye measurement of the color in the kiln or draw tiles and could not duplicate their firing as accurately as we using the Seger cones. Our tests did, however, show that the Roman sherds were fired in a temperature range of 840° to 880° C or ca. SK 011a. No differences could be detected which indicated that the various wares fired at differing temperatures. Rather, indications were that wares from all Categories were fired at approximately the same temperatures.

Due to the complexities of the process and the short time available for testing and study, no attempt was made to extract a clay gloss from the clay from Insula XXII using primitive methods such as might have been used by the Roman potters. We did, however, test the clay with modern methodology and were able to extract a clay gloss which was virtually identical to the gloss seen on the best preserved sherds from the excavation. Several different deflocculants and combinations of materials were tried, but the best results came from the recipe given by Noble[15] which calls for ½ l water, 2½ g Calgon and 115 g of clay.

In order to test this material further, we used the clay from Insula XXII to throw some copies of the Roman forms and applied the gloss material to them. After firing to SK 011a our forgeries were indistinguishable in color, texture and sheen from their Roman counterparts.

In an effort to extract a finer gloss from the clay, we ran a series of tests using the recipes shown in Table II and allowed the mixtures to stand undisturbed for one week. One liter of each mixture was used for the test. At the end of the settling period the upper layer of each test varied in amount. The two NaOH tests produced the deepest layers of gloss with 500 and 370 ml respectively and in both cases the top layer was only slightly murky. The top layer of the Calgon test was considerably smaller with only 190 ml but was much thicker. The gloss material was evaporated to dryness to determine the amount of gloss it contained and the yield of each recipe. In each case the amount was very small, as shown on the chart. All three produced a decided sheen, but not perceptibly better than our previous tests and still a far cry from finishes seen at Trier and Arezzo. These tests in which only the very finest particles were separated out for use demonstrate that the clay used as a source determines the character of the clay gloss material (See Section on Category I wares for a fuller discussion of this point).

The water of plasticity (that amount of water needed to bring the dry clay to the plastic state) is very high and ranges up to 30% and more. This and the plasticity of the clay would lead one to expect a high shrinkage which was not the case in the tests we ran. The greatest total shrinkage found in our tests was 11% which is entirely acceptable and much lower than the norm for highly plastic clays. The high fraction of loess sand in the clay is probably a contributing factor here since loess is an inert,

non-shrinking material and would tend to retard the overall shrinkage of the clay. In short, the clay is very plastic, throws well without slumping, is hard enough to minimize breakage in the greenware and fires to a suitable density at low temperature. It is an almost perfect natural clay body and needs no additions.

Saturation tests run on the sherds yielded some surprising results. The oxidized sherds, i.e. those from Categories IA, III, IV A, and V A, proved to be within fractional percentage points of each other in the amount of water they could absorb. The reduced clay gloss sherds invariably absorbed 2 to 2½ percent more water indicating a more porous structure. This was an unexpected result since the paste in the reduced wares is usually finer and these sherds give every appearance of being denser and harder than the oxidized sherds. The explanation probably lies in the greater fluxing power of iron in the reduced state. It is a well known phenomenon that clay sometimes becomes more porous as the firing temperature is increased from 850° to 900° C. This is caused by a partial sintering of the clay particles during which they pull back from the pores in the paste increasing pore size. As the temperature increases even further, sintering continues closing off some of the pores and the porosity begins to decrease again. In these sherds, the extra sintering could easily have been affected by the powerful fluxing action of reduced iron. Either a higher or lower firing temperature could also explain the difference, but other factors indicated that there was no temperature differential in this case.

Another possibility is that the elutriation of the clay for the fine wares would have eliminated some of the coarser particles of Loess sand. These particles have a 0% absorption and effectively reduce the porosity and increase the specific gravity of the clay when present.

The White Engobe

The white engobe used in Augst is not a pure white but ranges into a pale cream color. Some sherds are lighter or darker than others, but the great majority fit into the Munsell color chart at 10 YR 8/4. A quantitative analysis of the engobe gave positive reactions on CaO, SiO_2, Al_2O_3, Fe_2O_3, and showed MgO to be present as an important trace element. One of the strongest reactions came from CaO and indicated that the unfired engobe contained a minimum of 25% $CaCO_3$ or other calcium minerals. The iron content gives the engobe its creamy color and it is prevented from giving an even stronger color reaction by the bleaching action of the CaO in the fired engobe.

There are two possibilities for the composition of such an engobe. Some natural marls[16] are sufficiently high in lime to produce a creamy white color when fired despite a relatively high iron content, or mixtures of clay and $CaCO_3$, crushed limestone, for instance, can produce much the same effect. Our attempts to reproduce the color and texture of the engobe were not entirely successful even though we tried both possibilities in a number of combinations. Mixtures of Augst clay and whiting ($CaCO_3$) beginning with 80% clay and 20% whiting and continuing at 10% integrals up to a maximum of 50% whiting were made and fired to SK 011. All of these were too dark and had a decided reddish hue. Another factor which makes it unlikely that this sort of composition was used for the engobe material is the difficulties the potters would have had in getting a very finely powdered limestone or other calcium material. There are a number of ways that this could have been accomplished, calcining the limestone, for instance, but all are rather complicated not to mention expensive and time consuming.

Until recent times, the vast majority of effects produced on pottery were the results of very simple procedures. The fact that the engobe used in Augst was used in large quantities indicates that it was a readily available material and cheaply won.
There is a deposit of marl near the east gate of Augst which was mined for commercial use in modern times. It has not been established that the Romans knew about this deposit, but it is entirely possible that they did. Unfortunately the pit has been partially filled in now and it was not possible to get a sample of the material for testing. We did however test other marls and it was from them that we got our nearest approximations of the Roman engobe. The brick factory in Frick (Kt. Aargau) where we did our firing tests uses marl from a deposit located adjacent to the plant. The best results were produced by simply slaking the marl in an excess of water, blunging briefly and allowing the unslaked particles to settle out. The finer fraction was then decanted, thickened and used as an engobe. After firing to SK 011, the color was the same as that of the Roman sherds, but a shade or two darker in value (Munsell 10 YR 8/3). We can be certain that the potters of Augst did not use the marl from Frick, but we can be almost equally certain that they did use a marl, either from the pit near the east gate or from some other location in the immediate vicinity of Augst, for the white engobe.

The Mica
The mica used on the mica gilt wares was identified as muscovite. This is a very common mineral and would have been available to the potters in Augst from a number of sources. The most likely source of supply would be one of the deposits of decaying granite in the area. There are a number of these particularly on the right side of the Rhine not far from Augst. In such a deposit, the original stone has crumbled due to the forces of nature to a coarse sand. The mica is easily separated out by stirring the material in water. The sand, largely quartz and feldspar, settles quickly, but the platelike structure of the mica keeps it in suspension longer so that it can be decanted off with the water.
For comparison, lepidolite, a lithium mica, was also tested, but its fusibility even at low temperatures caused it to melt rather than retain the platelike crystal which is necessary to the gilded effect.

The Temper
Only the cooking wares showed definite signs that a tempering material had been added to the paste. Mineral determinations for each of the three types of tempering materials were made by Elisabeth Schmid.
The commonest type of temper used in cooking pots is a sharp quartz sand. The most likely source of this kind of sand in this region is a material known as *»Hupererde«*. *Hupererde* is a fine plasic clay which naturally contains a high percentage of quartz sand. This material may have been used unaltered for the cooking pots, or it may have been blended with Augst clay to obtain the proper working, firing and cooking properties.
The second type of temper is a rounded sand composed primarily of quartz and feldspar, but also containing a number of other mineral fragments. The rounding of the sand particles inicates that it is a common river sand and it could have been collected in the Fielenbach, the Ergolz or in the bed of the Rhine itself.

We also found a few sherds from handmade cooking pots with a calcium mineral temper. Some small shell fragments were still visible and were identified by E. Schmid as the fossil remains of *Cocinopora infundibuliformis* which was a form of aquatic life in the Jurassic Period. This material, too, would have been locally available.

The Forms

The Flagon Forms

The main body of flagon fragments falls into two closely related types. The smaller of these appears in six graduated sizes and is represented by more than fifty neck and rim fragments.[38] Only three of the pieces were reconstructable from the original sherds to a degree which made exact profiles possible (see Profiles 2A, 2B and 2C). Even so, the other sherds were sufficiently complete that there can be no doubt that the forms were more or less identical in their proportions with the possible exception of the largest size of this type (2C) where the wider mouth rim may have necessitated some change in form to achieve a pleasing balance of proportions.

These pieces are typically wider than they are tall giving the body a distinctly ovoid form. The neck is quite constricted and is surmounted by a collar which is slightly conical. The majority of the pots have two handles each profiled with three ridges, although there were three examples which had three handles[39] and one which had only one.[40] On the largest pieces of this type, the handles have only two ridges and are simply smaller version of the handles seen on Profiles 1A, 1B and 1C. All sherds from Flagon Types 1 and 2 showed at least some traces of the white engobe used on Category III wares.

The best preserved specimen of this type is shown in Profile 2A. All but approximately one-third of the belly was reconstructed from original sherds. Considering the extreme swelling of the belly and the exceptional thinness of the walls, which average only 3,5 mm in most sections, it is remarkable that it was made in one section. It remains as a testament to the throwing abilities of the potters of Augst. The finishing of the neck is very well controlled and the collar at the mouth was accomplished by a minimal thickening at that point plus a slight, but noticeable form change on the inside. As the Profile shows, the basic form of the pot is that of a rather flattened oval. The line of the shoulder breaks over almost to the horizontal before reversing itself and sweeping up into the cylindrical neck. The curve of the under-belly does not flatten to the degree seen on the shoulder. This gives an uplift to the form and, combined with a slight curve reversal at the foot, gives the piece an elegant stance and avoids the dumpiness so often seen in forms of this sort.

The handles are set on in the approximate middle of the neck and rise slightly before curving over to the shoulder insertion. The trimming of the foot, which is very expertly done, shows a peculiarity which was apparently one of the trade marks of the potters of Augst. The central plain of the foot is not simply recessed, but is set off by a more deeply depressed groove just inside the foot ring. This same treatment was observed on all of the base sherds from this type of flagon and on those of Profiles 1A, 1B, and 1C.[41]

Reconstruction of this piece was considerably hampered by sherd warpage and because of this some of the sherds which were reassembled could not be attached to the reconstructed pot. The neck of the piece no longer sits upright and one shoulder is visibly lower than the other. This could not have been the case when the pot was trimmed else the trimming could not have been so expertly done. Such severe warpage after trimming when the pot was in a stiff leather hard state would very likely have caused cracking in the raw pot such that it would have been discarded at that point. Nor can we assume warpage due to the pressures of overburden, since the sherds were not deeply buried and were in a relatively protected area under the floor of Kiln II. More logically, the piece was broken during the firing of the kiln and is a firing failure.

Profile 2B shows a smaller version of this form type. It is unique in that it is the only piece of this type that shows any signs of having been decorated. The white engobe, and hence the »decoration«, is very poorly preserved, but in those areas where the reddish pigment is still visible, there does not appear to be any regular pattern. Rather, there is a random quality which suggests that this was the result of a shop accident in which some of the red clay gloss was spilled over a finished piece of greenware. Profile 2C shows the largest form of this type from the excavation, and the only size which was thrown in two sections. The handles are broad and straplike and have only two ridges.

The second major flagon type was represented by fragments of at least eight large pieces, three of which are depicted in Profile 1A, 1B and 1C. These flagons were made in two sections. The body of the pot was thrown first and allowed to stiffen somewhat before more clay was added and formed into the neck and mouth rim. Here again, the basic form of the pot is that of an oval, showing a strong relationship to the smaller flagons of Profile 2. The major difference between the two forms other than size lies in the finishing of the mouth rim which in Profile 1 flares rather than constricting as in Profile 2.

Close examination of the sherds showed that four of these pieces were made by one potter and four by another. Both potters were obviously working toward the same form ideal, but their different work habits and particularly the disparity in their technical abilities made it possible to distinguish between them. For ease in reference I have designated them as Potter I (see Profile 1A) and Potter II (see Profiles 1B and 1C). Seven factors can be used as determinants in distinguishing their work.

1. The Necks. In pots made by Potter I, who was by far the more skillful of the two, the added necks are set on so skillfully that it is almost impossible to tell where the joint was made. Even the inside surface is carefully smoothed over and the joinery is so expertly done that none of our four examples cracked at this point. Potter II, by contrast, was not at the least at pains to effect a smooth transition between shoulder and mouth rim and his added necks rise angular and funnel-like from the almost horizontal shoulders. The joint is quite apparent from the inside and may show a deep ridge as indicated in Profile 1C. Cracking at this point is a common flaw in his work.

2. The Handles. Handles made by Potter I show an irregularity (read non-uniformity) which is a result of their having been pulled individually. The edges are rounded in a way that makes Potter I's two ridged handles look almost like two oval straps joined at the edge. The handles broaden somewhat at the shoulder insertion and to a lesser degree where they join the neck. The central depressions dividing the two ridges are weaker toward the shoulder insertion sometimes playing out altogether, whereas they maintain full depth toward the top and disappear undiminished under the neck rim. These two factors indicate that they were attached upside down, i.e. as Potter I stroked them from a lump of plastic clay, the bottom tail, which is usually thinner, became the neck insertion and the thicker top section was attached at the shoulder. Another characteristic of these handles is a roll of clay going down the underneath side of the handle on the right. This is not always seen, nor is it always just on the right side – it may be on both. This aberation is a result of the pulling process and dovetails neatly with the postulation that the handles were attached upside down. Assuming that

Potter I was right handed - percentages favor the aaumption - he would have held the clay in his left hand and stroked it downward with his right, elongating the clay into a handle form which was slightly thicker at the top. The right edge of the handle (later to become the left) would then be controlled by the flap of skin between thumb and forefinger on the right hand. This edge is usually easier to control. The left edge (right edge when inverted and attached to the pot) would have been formed by the crook of the forefinger. This surface is more difficult to control and the result in the case of Potter I is the ridge so often seen on his handles. One last factor is the central depression of the handle, which is usually not just a neat dip between the two oval ridges; rather it has a small sharply raised ridge running just off center the length of the depression. This ridge was caused by the potter's thumbnail as he stroked downward cutting the central line.
Potter II's handles are just as distinctive in an entirely different way. They are much flatter and more rectilinear in profile and lack the subtle rounding of handles by Potter I. One side of the handle, always the right in these examples, is squared off and may even have rather sharp edges. One's first impression is that these handles, too, flare out as they approach the shoulder insertion, but a more careful examination shows that this is the result of bending the outer edges upward rather than an actual change in width. The central depressions maintain full strength from top to bottom ending only where they are smeared out in the process of attaching. These factors show an entirely different technique of manufacture. Potter II almost certainly threw his handles on the potters wheel. He would first have thrown a simple cylinder of the appropriate thickness. Then with the wheel turning slowly, he drew a horizontal line just under the rim using a stick or some other tool. This became the central depression. Then using a sharp pointed instrument, he cut a strap from the top of the cylinder. The upper rim of the cylinder (which became the left side of the handle) could be smoothed and rouded, but the bottom or right side of the handle would be flat and angular as seen on his pots.

3. The Mouth Rim. At least four factors make it possible to distinguish between Potter I and Potter II's mouth rims. First, the general character of Potter I's throwing is precise and well controlled whereas Potter II's work is always a bit inexact at best. Second, the profiles differ consistently in one factor. Potter II's necks are simple spindle forms surmounted by a collar (mouth rim). Potter I, on the other hand, always adds a ridge about 1 cm below the mouth rim and seems to use this as a guide in attaching his handles. Third, the mouth rims themselves are different. Potter I's rims are a bit taller and flare slightly at the top. They are decorated with two depressed lines, one just below the top of the rim and one just above the bottom, with flat band between. In Potter II's work, the rims are not as tall, the lines are not as accurately placed and may be omitted entirely as on Profile 1B.

4. The Foot. Both potters use the same style of foot on their flagon, i.e. the same style as described on Profile 2A, and the differences are mostly matters of workmanship. As one would expect, Potter I's feet are precisely trimmed and any roughened edges will usually be seen to have occurred after trimming and as a result of the slipping operation. The depressed groove setting off the outer ring of the foot is semicircular or nearly so. A Potter II foot may show ragged edges as a result of trimming and the depressed groove is more angular.

5. The Finger Ridges. The finger ridges inside a Potter II pot are usually quite deep cover the entire surface. Potter I's work is much smoother inside and the finger ridges are much less pronounced. The deeper finger ridges indicate that Potter II struggled with the clay and used a great deal of pressure to raise and thin the pot. This is not uncommon with potters whose throwing technique is a trifle faulty. Both potters probably used a rib to control the outer surface, so distinctions here would be difficult to find.[42]

6. Craftsmanship. As repeatedly suggested in the preceding numerals, Potter I's craftsmanship is excellent. His work shows a mastery of technique which is not approached in that of Potter II.

7. The Forms. All of the preceding analyses are based on one type of pot, a wide bellied flagon with a decorative lip and two or more handles and some variations are to be expected in hand work. Craftsmanship plays a large role in this and one's ability to control the material is decisive in determining whether or not a desired form will be achieved. But there is also that intangible factor of aesthetic sensitivity. The most skillful of potters may create works which are technically perfect but decidedly lacking in aesthetic merit. This is not the case with Potter I. His work is not only remarkable from the technical aspect, but his forms are posessed of a grace and elegance which bespeak the best of pottery making whatever the time or place. By comparison, Potter II is a mediocre potter at best. The forms are somewhat dumpy and lack luster. There is little or no distinction to be made between the materials (clay and engobe) used by the two potters. They are for all intents and purposes the same. This and the obvious similarities in form made it likely that all of these pieces are the products of the same workshop. It is logical to assume that Potter I was the master and Potter II was an apprentice or perhaps a slave.

All three of the pots of this type from which we found sufficient sherds for a partial reconstruction are wasters and all failed in the same way as discussed in the section on Wasters and Firing Failures.

Profile 1A defines the type for this form as executed by Potter I and shows all the characteristics discussed above. As in Profile 2A, the curve of the shoulder flattens considerably more than that of the under belly, and the general character of the workmanship strongly suggests that both pieces were made by Potter I. The added neck section is perfectly executed and the line is unbroken from foot to rim displaying great skill in throwing and a prior concept of the finished form while throwing the body section. Even inside, the joinery of the neck is scarcely discernable and is betrayed by only a slightly thickened ridge at the point of juncture. The smoothness of the inside walls and their thinness are remarkable in a piece of this size. The average thickness is ca. 4 mm which gradually increases toward the bottom to a maximum of 7 mm. The trimming of the foot maintains the excellence of the rest of the piece and shows that the pot was perfectly centered when this operation took place. The two handles do not form identical profiles and part of this difference is probably explained by the fact that one side of the pot was dented during the firing process. This dent, caused by pressure on the shoulder and one handle, is evidence that the piece broke in the kiln. Because of sherd warpage surrounding this dent, a complete reconstruction of the pot was not possible.

Profiles 1B and 1C show examples of the form as executed by Potter II. Neither piece

is as well done as Profile 1A and both exhibit the differences in technique discussed above. Sherd warpage shows 1B to be a firing failure. Profile 1D, 1E and 1F show other variations of the form. 1E is an *unicum,* but there were three examples of Profile 1D and four of 1F.

Profile 8 is unique in that it is the only non-intrusive neck fragment in Category V A (all others are coated with the white engobe of Category III A) and it is decorated with finger pressed coils of clay. Two base sherds trimmed in the same manner as the foot of Profile 1A, but also lacking the engobe surface were found in the same location as were several wall sherds with coil decoration, but too few pieces fitted together to allow for a complete reconstruction. The general character of the workmanship, particularly in the finishing of the mouth rim with its carefully profiled ridging and the presence of its extra ridge marking the level where the handles are attached, suggest that this may be the work of Potter I, although the handles are less precisely made than those seen on Profile 1A. The paste, however, proved to be identical when examined under high magnification. Some of the wall sherds show occasional flecks of mica identical to those seen on the bowls of Category IVA wares, but they are too few to be intentional and too large to be natural occurances in the clay. This would suggest that the same pottery produced wares in Category III A, IV A and V A simultaneously. Vogt shows drawings of two wall sherds with similar decoration.[43] He describes his first example as having come from a brown storage jar *(braunes Vorratsgefäss),* but it seems equally likely that the original piece may have been a flagon, but not recognizable as such because the neck was missing.

Profile 9 was pieced together from eight sherds all of which were badly warped identifying this piece as a firing failure. The strong relationship to Profile 1A, 1B and 1C is readily apparent and we may consider this piece to be a variation thereof. There are two raised ridges of clay around the neck and upper shoulder, both of which lie inside the arch made by the handles. These added coils of clay are further decorated with small diagonal indentations. These are so regular that they could hardly have been done by hand and were probably pressed on with a roulette similar to that used to decorate the clay gloss wares. Drexel discusses this type of decoration as having been used during the first half of the Second Century.[44] Our piece comes from an undateable complex, but its form relationship and the similarity in workmanship make it likely that it was made during the second half of the century. Its white engobe and the fact that it is clearly a firing failure label it as a product of Augst and belie Schoppa's supposition that this style of decor was limited to the area around Mainz.[45] The workmanship, the technique used in adding the neck and the style of the handles make it highly likely that this piece was the work of Potter II. The interior groove marking the joint between shoulder and added neck which characterizes his work is readily apparent here as is the flat side of the handle showing it to have been thrown rather than pulled. This raises an interesting speculation with regard to the dating of the various strata in the excavation. Four clearly identifiable examples of Potter II's work were found in the lowest levels of the dig just south of Kiln II in quadrants A3 and 4 and B3 and 4 whereas this fragment comes from the humus layer. If this piece is the work of Potter II, which cannot be stated without some equivocation, the indication is that the entire depth of the dig cannot represent a time span of more than the »working« life of one man, which is to say 20 to 30 years in this case. My feeling is that the major portion of the sherds were deposited over a relatively short time period. Acceptance of this supposition must be tempered by the knowledge that it is un-

supported by any data other than the fact that we were unable to establish a sequential chronology for any of the major form types from the excavation.

The Jug Forms

Fragments of at least 11 jug forms representing two distinct neck profiles were found. The one unifying factor is that in every case the paste is hard-fired and contains a surprizingly large percentage of sand temper. The tempering sand is visually the same as that used in the cooking pot paste. Some of the other forms show small amounts of the same sand, but in no case is the paste as heavily gritted as in the cooking pots and these jugs. This raises the question of the purpose intended for these pots. They would hardly be suitable for cooking vessels with their narrow necks. The added or pinched spouts indicate that they were designed to dispense a liquid of some sort, but offer no explanation for the excess amount of temper.

All but one of the sherds from Profile Types 6 and 7 were found in the humus layer and probably date from the Third Century. This is supported by the fact that similar forms in bronze are commonly found in deposits of the Third Century.

Some of the bottom sherds show string marks and none are trimmed although some have been smoothed with the fingers. Most of the sherds are rather light colored (Munsell 10 YR 5.5/3), but a few are smudged black in the firing process. None show any sign of use.

Profile 6 is a composite reconstructed from the sherds from three different pots. None of our fragments were sufficiently complete for a whole profile, but there is no doubt that this reconstruction gives an accurate picture of the original form. Counting handle fragments alone, there are at least six pots of this type represented. Two handle fragments, one black, the other as above, have small conical thumb lugs just where they curve to descend to the shoulder attachment; they may or may not have come from similar forms, but the paste is much the same.

Profile 7 is unique in the dig, and the pulled spout and the two-ridged handle distinguish it from Type 6. Here again, the paste is very heavily gritted, so much so that it caused some cracking in the wet clay when the potter pulled up the edges of the lip to form the spout.

The Bottle Forms

By far the most distinctive and intriguing finds of the entire excavation are the decorated bottle forms shown in Profiles 3A and 3B. Prior to the excavations on Venusstrasse Ost in 1968, only two other examples of this style of decoration had been found in Augst. The flamboyant if somewhat haphazard decoration which girdles the neck and upper shoulder and distinguishs these pieces is done with the red clay gloss seen on the finer wares of Category IA, and these pots are the definitive examples of Category IIIB.

Profile 3A, which is identifiable as a firing failure because of sherd warpage of the same kind as seen in the flagon forms, is the most complete of our examples. The decoration is composed of a series of rings beginning on the neck and progressing down onto the upper shoulder. The third of these rings is accentuated by diagonal hash marks on either side transforming it into an abstract wreath. Two more bands end the decoration just below the widest point of the belly. These two areas of banding serve to delineate a wide strip on the lower shoulder which carries a striking pattern of alternating trees and »snakes«, seven of each. The trees are carried out in simple

Illustration 1. Schematic drawing of the decorative pattern on Profile 3A.

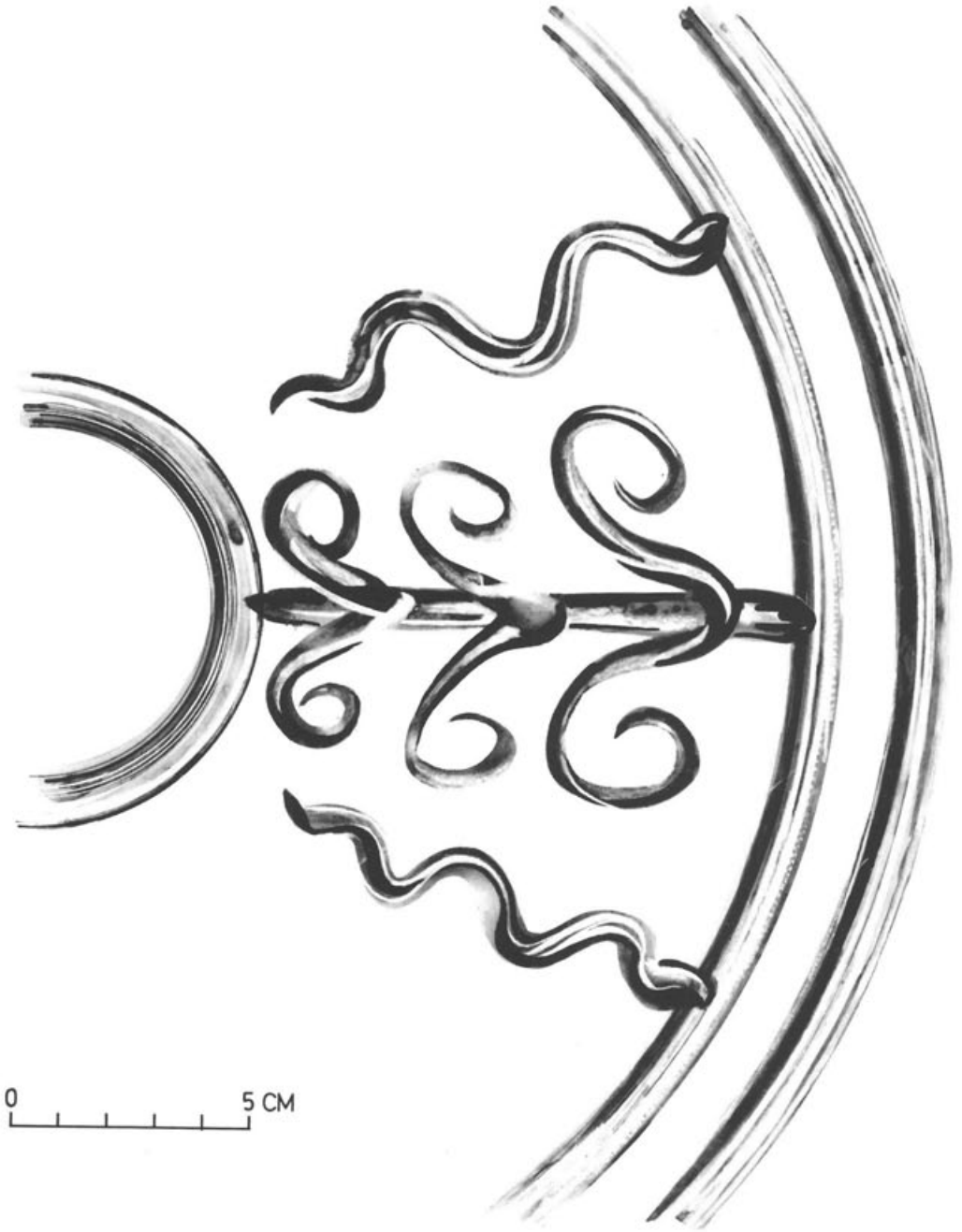


Illustration 2. Schematic drawing of the decorative pattern on Profile 3B.

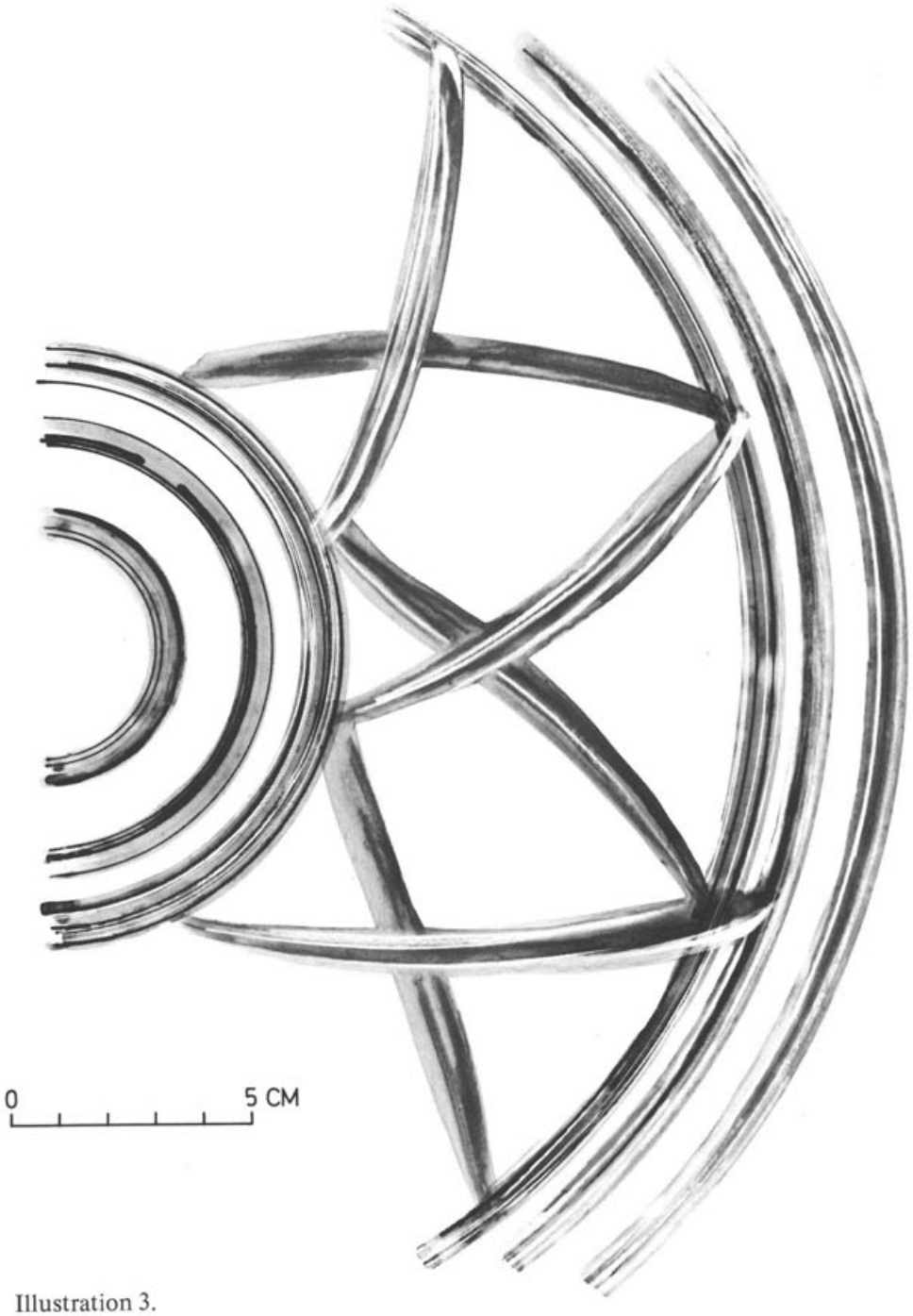


Illustration 3.

straight line brush strokes and some of the trees are further decorated with small hash marks giving them both the form and appearance of pine trees which they were most likely intended to represent. The wavy vertical lines between the trees seem to represent snakes, but they are very abstract and positive identification is uncertain.
Profile 3B duplicates 3A in form and the placement of the design but varies from it in that the tree patterns are formed from a straight vertical line embellished with opposing volutes. There is no suggestion of the pine tree in the form of this pattern and it was more likely derived from one of the deciduous tree. Profile 4 shows a neck fragment which duplicates the small flagon of Profile Type 2 in the treatment of the lip and is decorated with five horizontal bands. The complete pattern of this pot remains an enigma since no other sherds could be found. Illustration 3 shows the reconstruction of the pattern of another decorated bottle somewhat smaller than Profiles 3A and B. Here the pattern is limited to broad cross-hatching in the area set off by the horizontal banding. Profile 5 is an *unicum* in the excavation and its poorly preserved white engobe showed no traces of red pigment.
There can be little doubt that these bottle forms derive from the spherical decorated jars of the La Tène culture, but the question which remains unanswered is their purpose or use in the Roman environment of Augst. The La Tène tendancy to decorate even common household pottery had largely died out by the time these pieces were made as is borne out by the paucity of decorated sherds of local manufacture which have been found in the residential sections of Augst. It seems likely then that these pieces had some special function or purpose, perhaps primarily decorative since they lack the handles of the function oriented flagons. One possibility is that they were in some way connected with religious practice since both trees and snakes figure heavily in the symbology of religions throughout history. In the Gallo-Roman world the most likely point of reference is the Cybele-Attis cult.
A Gallo-Roman temple dedicated to Cybele was excavated in Augst in 1933.[46] Just when the worship of Cybele arrived in Augst is not known, but sherds from the temple excavation show it to have been built sometime in the Second Century.[47] One of these sherds (Inv. Nr. 33.1023) is an exact duplicate of our Profile 1F and establishes a connection in point of time between the sherds of our excavation and the temple. Due to the Gallic form of the temple, it is assumed that Cybele blended with an aboriginal mother-earth-goddess in Augst.[48] This assumption is supported by other factors as well. First, it is known that Cybele is only one of the forms of the architypal mother-goddess which was very widespread in early times. As pointed out by Frazer, the cults of Cybele-Attis, Isis-Osiris and Venus-Adonis are simply different expressions of the same more basic concept of an original mother-earth-goddess and her lover.[49] The Celtic Pantheon no doubt had its own version of this goddess. Second, the patterns of trees and »snakes« on our sherds seem certain to be direct descendants of almost identical patterns on late La Tène sherds from Baden[50] which are dated as early as the First Century and the trees are seen again in both volute and straight line forms on sherds of certain Celtic origin from Nagyvenyim and Aquincum in Hungary. If we assume that both types, the La Tène and our decorated bottles, had some religious signifiance, it follows that the early sherds from Baden were used by a cult which was in existance in the first time of the Roman occupation.
The pine tree, which the pattern on Profile 3A most nearly resembles, is closely connected with the worship of Cybele, or more specifically with her unfortunate ward and lover Attis. Legends surrounding Attis frequently link him with pine trees and

forests.[51] One account of his death has it that he emasculated himself under a pine tree[52] after a lover's quarrel with Cybele[53] thus initiating a series of annual deaths and resurrections symbolizing the autumn death and spring rebirth of the plant world. Hence, pine trees and pine cones, also symbols of eternal life and fruitfullness, became associated with Attis and his cult of vegetation.
The connection of the snake is less clear, but documentable to a degree. Snakes are at one and the same time the most hated and the most revered of all animals. Almost every religion from the Judeo-Christian with its »snake in the garden« to the primitive cultures of aboriginal Australia have had snake dieties, semi-dieties and anti-dieties of one sort or another.[54] Nor is the snake as a symbol foreign to Augst. The snake-cult urn found in Augst in 1898 has been associated with the Sabazius cult,[55] which is in turn related to the cult of Cybele-Attis. Unfortunately, this piece came from an undateable dig, but its exact counterpart was found in Vindonissa which establishes an end date of 101 A.D.[56] The votive hands found in Aventicum and the Great St. Bernard, both attributed to the Sabazius cult, show snakes and the former also features a bust of Cybele and a pine cone.[57] Roman reverence for snakes is documented in *Men and Snakes* by Ramona and Desmond Morris who state that snakes were kept in Roman households and regarded as personal guardians.[58] The Aesculapian snake *(Elaphe longissima)* was apparently not native to the region around Augst in early times, but is now considered to be an indigenous species (Natural History Museum of Basel - Exhibit of Indigenous Reptiles and Amphibians - December 1970). Because this snake was a favored Roman house pet, it is assumed that they were imported to the region by Roman settlers. And, too, Ishtar, the Babylonian equivalent of Cybele, was charcterized by a snake emblem.[59]
There are numerous references to the snake as a symbol of immortality because it sheds its skin. The shedding of skin has also been associated with circumcision[60] and may in the case of Attis have been confused with total emasculation. Snakes were also regarded as messengers to the underworld[61] where Attis awaited Cybele's annual call to come and rejuvenate the plant world.
Of the other sherds of this type found in other excavations in Augst, one is an almost complete bottle with a decoration, which although poorly preserved, is in every way comparable to the trees and snakes of Profile 3A. The form of the piece varies somewhat in that the mouth rim constricts as in Profile 2A and is decorated with two indented rings as in Profile 1A.[62] The other is a small fragment of the shoulder of a decorated piece (Inv. Nr. 1954.237) which was excavated on the site of the present museum building. This piece carries the »snake« design, but replacing the tree is what appears to be a wheel. All of the individual patterns used to compose the decorations on these pieces with the exception of the cross-hatching on Illustration 3 offer rich possibilities for symbolic interpretation.

The Fine Wares
Profiles 10A-D and 12A and B comprise a form family which finds direct counterparts in the beakers excavated in Niederbieber.[63] 10A and B are executed in the red clay gloss of Category IC, whereas 10C and D were finished in the gold mica gilt of Category IVB. This difference in surface treatment accounts for the minor, but noticeable, variations in the forms. On none of the examples of 10C and D did we find the decorative external foot ring seen on 10A and B. This was no doubt omitted in order to facilitate the burnishing needed to adhere the mica platelets to the trimmed surface (see Section on Category IVB).

12A and B are indented beakers and all of our examples are executed in the reduced fabric of Category IB. The color ranges from a medium olive grey (Munsell 5 Y 5/1) to black with all shades between. The black sherds are, however, not comparable to the black of Oelmann's Technique »d«[64] which he describes as having a red paste with an excellent black gloss with a metallic glance.[65] As with the vast majority of the intentionally reduced wares from Augst, the paste of these beakers is grey. Nor is the quality of the gloss comparable to Oelmann's examples. The black sherds come for the most part from the humus layer and are poorly preserved, but it seems very unlikely that they ever had the beautiful sheen of the black clay gloss of Niederbieber, Trier or Köln which are comparable in quality to the black gloss of Attic pottery. The indented beakers also differ from the plain wares in the treatment of the foot. In every case, the feet of the indented forms are trimmed with the recessed groove surrounding a raised circular plane such as seen on the feet of the flagons of Profiles 1 & 2. The plain forms have only a slightly concave foot. Oelmann's pieces also show both variations, but apparently not as regularly as ours in that his small indented beaker (Type 33A) is pictured with a simple foot.[66]

13A is an exceptionally fine, beautifully crafted beaker which is one of the high points of the excavation in terms of mastery of the materials. The paste and gloss are identical to those of the indented beakers and there can be no doubt that they came from the same workshop. Ettlinger found similar forms in the *Frauenthermen,*[67] but none in the reduced grey of our examples. Her descriptions fit better to our Profile 13B which is a larger form with a light brown (Munsell 5 YR 5/6) clay gloss.

14A is a decorated beaker from the most common form type among the clay gloss sherds. Not all of the sherds of this type are decorated and the rim profiles vary as shown in 14D–F. The decoration on 14A consists of two bands of rouletting which set off the raised patterns of »willow leaves«, »horse shoes« and circles. The horse shoes have the small spur at the top which Drexel noted in connection with Swiss clay gloss wares.[68] The gloss on 14A is a dark olive grey (Munsell 5 Y 4/1), but all other sherds showing this decoration are red (Munsell 10 R 5/6) although they have exactly the same lip profile. Profile 14B is a much cruder type and here the decor is limited to three bands of rouletting. 14C shows another variation of the form with a sharper break in the form as the curve reverses itself at the belly. No sherds of type 14C showed a raised decoration. 14F is decorated in the same style as 14A but is very poorly executed. The paste is red and coarse and the black clay gloss is poorly preserved. Ettlinger found examples of this form throughout the Second Century strata of the *Thermen.*[69] She relates the type to Oelmann's Type 30 from Niederbieber, but I have some reservations in assuming a form connection between the two. Oelmann's Type 30a is much smaller, quite thick, apparently has no decoration and has a lip profile dissimilar to any of Ettlinger's or our examples. His Type 30b relates better in terms of form, but again lacks the profiling of the lip and the figurative decoration is a far cry from the reserved patterns of our sherds. A more likely point of reference lies in Drexel's cylindrical beaker form[70] which he describes as having bands of rouletting and a weak lip formation. As Ettlinger noted, this form was not reported in any of the excavations of the Obergermanische-Rätische Limes[71] nor does Vogt show any identical profiles from the Lindenhof in Zürich. His profile Abb. 44,43 shows some similarities, but lacks the inner thickening of the lip which is characteristic of our pieces. The fact that the form first appeared in the Second Century explains its absence in Vindonissa. Considering the differences from similar forms from other areas, it is possible that this form type may have originated in this form in Augst.

15A and B are smaller versions of Type 14. None of the sherds of this type were decorated beyond a simple indented line ca. 1 cm below the rim. Colors of the paste and gloss varied from red to grey to black and in no case was the quality as fine or the workmanship as careful as in the indented beakers or the decorated forms of Profile 14. In contrast to the limited distribution of Type 14, Profile 16A is duplicated by finds in the Lindenhof[72], Niederbieber[73], Faimingen[74] and the *Frauenthermen* in Augst.[75] All but one of our sherds are done in a reduced fabric and range in color from a light grey (Munsell 5 Y 5.5/1) to dark grey (Munsell N3). The one exception has a pinkish paste (Munsell 5 YR 8/6) and a dark red gloss (Munsell 10 R 3/4; these colors were not observed in any of the other sherds from the excavation and it seems likely that this piece was imported). 16B varies only slightly from 16A in the handling of the shoulder which breaks sharply downward from the concave collar of the neck. The band of rouletting is set off at the top by a fine indented line. In all but one example, this decorative band was placed in such a way that the height of the neck and the width of the undecorated band on the shoulder are approximately equal. A larger version of this form is shown in Profile 16C.
The bowl depicted in Profile 17 is an *unicum* in that it is the only bowl fragment from the excavation executed in an intentionally reduced clay gloss and the only non-beaker fragment showing a raised decoration. The fragment is too small to show the complete pattern, but the individual elements show some variations from the other decorated sherds. The horseshoe lacks the spur and the raised parallel lines close at the end like hairpins rather than remaining open as do the willow leaves of Profile 14A. The only other remaining design element is a row of raised dots. Clay gloss and paste are identical to those of the indented beakers, so it is certain that the piece was made in Augst.

The Bowl Forms
The most prelevant form from the excavation, represented by nearly 600 individual rim sherds, is an open, carinated bowl with a horizontal rim and gold gilt finish. These are closely paralleled in the writings of E. Ettlinger where she refers to them as the *»einfache, grobe Schüsseln«* - simple, coarse bowls - characteristic of the Second Century.[76]
Both rounded and carinated forms were found, but the latter by far outnumber the former. The usual form (see Profile 18A) has a flat bottom on the inside, usually not more than 6-8 cm. in diameter; from this, the walls slope sharply outward to nearly the full width of the bowl before angling upward in an almost vertical line which rises 4-7 cm. where the bowl ends in an ornate rim on the outer perimeter. This gives the forms a distinctly angular, somewhat metallic character which is heightened by the gold gilt finish. All of these pieces have been trimmed and the bottoms are simply struck flat with no foot rings. The profiles vary, but do not fall into neat categories; rather, they form general groupings each with a core of virtually identical sherds and others which show deviations in some details and are related to one or more groupings. It was not possible to establish a positive chronological order since profiles which predominated in the lower strata were found in duplicate in the upper layers as well, but the thicker, clumsier rim profiles increase in numbers in the upper strata which does seem to bear out Ettlinger's postulation that this type of bowl became heavier in rim profile as the Second Century progressed.[77]
Profiles 18A, B and C show some of the finer rim types. They were chosen from a

group of some 70 rim sherds which showed very little variation in either profile or competency of execution. The rims were well articulated and are characterized by the sharp under edge. The bowls range in diameter from 22 to 32 cm. Profiles 18D, E and F represent a smaller group of sherds and are closely related to Profiles 18A, B and C by both association of sherds in the excavation and the fact that the external appearance of the original bowls would have been very similar whether the lip drooped as in D, E and F or was more solid as in A, B and C. I hold this kind of variation to be the result of different work habits and the techniques used by the potters rather that signs of progressive changes in the forms. The similarity between Profiles 18 D and E would seem to indicate that the form of the bowl, whether rounded or carinated, did not necessarily dictate the type of rim to be used. In Profiles 18 G and H the mass of the lip is placed somewhat higher, a tendancy which is carried even further in Profiles 18I and J. They stem almost exclusively from the upper strata and are more crudely made and usually not as well fired as examples of Profiles 18A-F. Profile 18J is the only sherd of this form type which shows traces of a red clay gloss; all other sherds have gold mica gilding. Profiles 18K and L are again of a more compact type and were found closely associated with sherds from Profiles 18A-F.

The commonest type of rim sherd from the excavation with more than 250 individual examples is shown in Profiles 18M and N. Here, the heaviness of the rim is quite apparent and is accompanied in most cases by a clumsier treatment of the bowl in general. The sharper rim seen on N and the rounder profile of M were found side by side and in almost equal numbers and represent, in my view, the kind of variation caused by hand work as mentioned above. Profiles O and P show the crudest rim type found and come exclusively from the humus layer.

Profiles 19A-C show a triple ridged rim profile which appears to have been reserved exclusively for rounded bowls. Ettlinger shows similar forms in the *Thermen*[78] and Vogt shows a profile almost identical to ours[79] but describes it as having a red-coating *(roten Überzug)* whereas our examples are done exclusively in the gold mica gilding of Category IV A.

Profiles 20A and B were taken from the only examples of this type in the excavation. Here the form is quite low and open with a slightly constricted collar and carefully executed profiling around the body of the pot and at the rim. These sherds were found in direct association with the sherds used for Profiles 18A-F and were also executed in gold mica gilt.

Profiles 21 and 22 show two bowl forms which were produced in Augst in direct initation of Terra Sigillata forms (Dragendorff 37 and 38 respectively). Both profiles were taken from wasters and both were executed in the red clay gloss of Category IC. Another sherd of the Dr. 38 type (Inv. Nr. 68.14225), although somewhat larger than Profile 22, was done in the gold mica gilt of Category IV A.

Profiles 23A and B show two rim profiles from an enclosed bowl form which enjoyed an enduring popularity in Augst. They are one of the most common bowl types found in excavatins throughout the city despite which only a few of these sherds were found in this excavation. Ettlinger reports very similar if not identical forms from the *Thermen*[80]; she makes reference to the longevity of the form and dates her sherds throughout the First Century. Our sherds were found scattered through all strata of the excavation including positions superior to dateable sherds from the Antonine period, so we must assume that they were continued until well into the Second Century. Due to their scarcity, the workmanship (which is usually somewhat imprecise)

and the absence of any recognizeable firing failures, it is doubtful that they were made in the same workshop which manufactured the mica gilt bowls of Profiles 18–20.
Profile 26B shows a somewhat unusual variation on the commonly found bowl form with externally flanged lip. In each of the six RS of this type found in the excavation, the external flange rises as it leaves the wall and reaches the level of the vertical lip before dropping sharply downward. Another distinctive feature of this type is the carination of the wall which supplants the usual hemispherical shape in other variations of this form. All examples of this form come from the humus or upper strata of the excavation and it seems improbable that they could date from earlier than the early decades of the Third Century.
The remaining RS, which is an *unicum* in the excavation, is shown in Profile 26A. In this case the sharp incline of the wall shows it to have come from a deeper form than is usual. This fragment came from a stratum underlying the major depositions of fragments from bowl forms 18A through F. Patterns of oxidation and reduction on its broken edges prove it to have been a firing failure.

The Cooking Pots
Profile 25A shows the common form of the cooking pots from Augst. The sizes range from 11 to 24 cm. in diameter at the mouth, but the proportions of the body remain unchanged regardless of size. Sixteen of the rim sherds have a ridge on the rim as shown on Profile 25B which was probably intended to accept a lid. These pieces were executed almost exclusively (ten exceptions in more than 500 sherds) in a heavily gritted grey paste (Category VI A). A few oxidized sherds were also found, but these may well be accidents of the fire since grey or black was obviously the prefered color. The reasons for this color preference probably stem in this case largely from aesthetic grounds. In use, these pots would naturally have been smudged from the cooking fires, and this discoloration would have been much less noticeable on a grey pot than a red one. And, too, the grey paste would have been much closer in color to the metal cooking pots which were no doubt more desired. Only a very few of these sherds show smudging which could have been caused by use on an open fire and most are probably wasters.

The Plates
The plate sherds from the excavation showed a remarkable uniformity. Of the nearly 1200 plate sherds found, only three did not conform to Profile 24. The only diversity seen in this group was in the manner of finishing the surfaces. Fourteen sherds were smudged black (but not from cooking fires), 159 had a red clay gloss and 1005 were finished in gold mica gilt. These sherds were found throughout the excavation and ranged in diameter from 18 to 32 cm.

The Mortaria
Profile 27 is an *unicum* in the excavation and a firing failure. The paste shows a grey kernel, but some of the broken edges are reoxidized in a way which could only have resulted from breakage during the firing process. This piece is a provincial copy of Curle Type 21 which was produced in Terra Sigillata during the Antonine Era. The rim and a band on the inner surface extending down to the sanded surface are covered with a red clay gloss (Munsell 10 R 4/6); the outside was left plain. The pouring spout was made by cutting away a section of the vertical ridge on the rim and adding two

fillets of clay to funnel liquid over the outer edge. The bottom has been trimmed and may have had a recessed foot ring as on Curle Type 21.
Profile 28 is very similar in treatment although the profile of the rim is quite different. It, too, has a red clay gloss coating (Munsell 10 R 5/4) identical in placement to that on Profile 27 and the spout is formed in the same manner. The trimming was likely the undoing of the pot since the walls near the base thin down to a scant 2½ mm as opposed to the 1 cm and more usually seen in mortaria. From this evidence alone it is impossible to state that the piece is a certified technical failure, but this seems very probable. In any case, the materials identify it as a product of Augst.
Profile 29B is also a firing failure and duplicates the previous two profiles in the placement of the red clay gloss (Munsell 10 R 5/6), the manner of making the spout and the fact that it is trimmed. Only a small segment of the base remains, but there is no hint of a recessed bottom, and we can assume that the entire base was struck flat as in the bowls of Profile 18. The major change here is that the unsanded portion is distinctly concave demarking it from the rubbing surface below. Ettlinger found identical forms in the *Augster Thermen*[80a] and agrees with Drexel who dated them as having begun in the Second Century A.D.[80b] Profile 29A belongs to the same type as 29B, but is from a larger version.
Profile 30 is a larger and more open form and in some of our examples the external flange curls back on itself at the outer edge. Here the entire inner surface of the bowl is sanded and clay has been added to form the spout giving it a sculptured look. In this case the sand has apparently been applied to the surface in a thick engobe-like layer rather than just sprinkled on the raw clay and pressed in, which is the more usual technique. The engobe is quite soft with the result that the rubbing surface is not very resistant to abrasion. The stamped pattern around the rim was probably made with a fired clay stamp and was applied while the freshly thrown pot was still quite soft, perhaps before it was removed from the wheel. Just under the rim under each stamp, there is a finger mark where the potter supported the rim while stamping to prevent deforming the pot.
Sherds from at least three mortaria of this type were found and the stamp marks on each were apparently made with the same tool indicating that they were all made in the same shop. Sizes vary somewhat and on the larger forms, two stamps are placed side by side on either side of the spout. This may have been a means of indicating size or volume. As the size increases, the cross-section of the rim becomes heavier, but the general character of the profile remains the same. The bases were apparently left untrimmed.
Profiles 31A and B are very closely related types and differ from Profile 30 only in the modeling of the spout. They are not quite the same in that the inner rim on 31A is the highest point of the pot whereas on 31B the outer rim is higher. None of our examples of 31B has a complete spout, but one sherd shows the beginnings of the modeling and they are the same as on 31A. Profile 31C is probably a variant of the two above types and is an *unicum* in terms of size and color. It is the smallest mortarium of this type and has a very coarse sand on the interior. The color of the paste is quite light (Munsell 10 YR 7/4) in comparison with all other mortaria sherds, and is not uniform in that it shows striations of a deeper reddish hue. The clay beds in Augst often have an uppermost layer which is of a lighter color than the deeper strata and this pot may have been made from that clay or it may be an import.
Only two sherds of the type shown in Profile 31D were found and they may belong

to the same pot although they come from different parts of the dig. In both the sanded surface is very fine. There does not appear to be a pattern in the size of the sand used on various sizes of mortaria. Some of the largest examples have fine sand and vice versa. Both sherds of Type 31D came from mixed strata yielding conflicting data although there was some evidence to suggest that they are some of the youngest sherds in the excavation. In any case, they post date Types 31A–C. No tests were run to determine that these two sherds were made in Augst and they may be imports.

Each of these types was found in conjunction with sherds from one of more other profiles and no chronological order could be established. Rather, it seems likely that all forms were produced more or less contemporaneously.

The only T.S. mortarium from the excavation is sufficiently complete to be identified as a Dr. 45 and is dated in Oswald and Pryce as second half of the Second Century.[81]

The Derivation of the Forms

The complex under the collapsed floor of Kiln II yielded a large number of sherds which proved in the course of study to be the most important and informative area in the excavation. Their position in the dig was such that they were deep enough to have largely escaped the damaging acids of the humus layer; hence they are for the most part but little changed in appearance despite the long burial. This is in direct contrast to the sherds which were found in the upper strata where soil acids altered and sometimes destroyed the surface characteristics to the point that even general determinations as to type were impossible to state with any assurance of accuracy. The enclosure of the kiln also afforded the advantage that the sherds were less scattered and more nearly complete pieces could be reconstructed in the tedious task of sorting and reassembling the thousands of sherds found. Most of the pieces which were sufficiently complete to allow for full profiles came from this complex. From the very beginning it was apparent that some of our forms, the flagons for instance, were new in that no counterparts could be found in previously published literature on provincial Roman pottery. The fact that this complex was relatively closed off from the rest of the excavation also presented its problems since it contained no Terra Sigillata sherds, no coins, nor any other items which were easily dateable (see section on Chronology).

As was the case with the entire excavation, many of the sherds found in this complex proved to be from wasters clearly labeling them as products of Augst. Being a small part of a small excavation (ca. 55 m^2 in total), the complex held a surprisingly large number of form types which were sufficiently well represented to suggest that they were standard production items of the potteries of Augst. The study of these forms and its concomitant effort to search out their derivations produced an unrelentingly recurrent pattern which in the final analysis brands them as being closely allied to the forms of indigenous Celtic pottery. There can be little doubt that the potters who produced these wares were native to the region rather than immigrants from the Italian peninsula.

Many of the best preserved flagon fragments came from this complex. All sherds from Profile 1A–C and the best preserved specimens of Profile 2 were found there and none of these could be related to the flagons from the published literature from other sites or even from other excavations in Augst.

The flagon is, in and of itself, a distinctly Roman species. This form with its constricted neck and one or more handles was apparently not used in the pre-Roman Celtic culture[82]; yet our examples find their roots in purely Celtic antecendents. They are notably plastic as opposed to the harder, unyielding forms seen in Oswald and Pryce, Niederbieber and particularly Vindonissa where the military post brought a much stronger and more direct Mediterranean influence.[83] Only in the mouth rims of Profile Type 2 do we find a severity which suggests a metallic or non-clay influence. This mouth treatment is atypical when compared with the finds from other areas and was apparently not common in provincial pottery. The only similar profiles we were able to locate were from pots excavated in Alzey and Worms.[84] Since those pieces date between 350 and 355 A.D., the relationship is tenuous at best.

That the spherical pot of the Gallo-Roman world is a continuation of the La Tène tradition is widely accepted.[85] The most obvious antecedents of our pieces are the large spherical jars reported by Major.[86] A piece which shows strong relationships

to both our pots and the La Tène pieces was reported by Ritterling[87] and may be a developmental link between the two. In our pots, the development has progressed to the adaptation of the form as a flagon without, however, having completely lost its Celtic identity. In the treatment of the feet we find clear indications of the ties to the La Tène prototypes. This style of trimming with its depressed groove just inside the foot ring relates directly to the base treatment on Celtic pots from Basel,[88] Hofheim,[89] Vindonissa,[90] Zürich[91] and others. By far the more common flagon base is a simple stand ring with a recessed interior.

Research into the development of this style of foot ring would probably lead far back into history of the hand formed pottery of the region. In its original form, the unusual modeling was most likely an outgrowth of the forming process. Deeply recessed feet on coil built jars and some kinds of thrown pieces as well are more easily accomplished by adding them in a second process when the freshly formed pot has stiffened to the leather hard state. This technique is strongly suggested in the sharp interior angle at the base of many profiled Celtic pieces.[92] In the flagons of Augst the peculiar foot treatment has been continued as a stylistic device.

There are also obvious differences in the forms. The bottles of the La Tène culture, while quite full and rounded, never approach the exaggeration of form seen in our examples. This may be accounted for by the introduction of a superior potters wheel of Roman design. Most of the pre-Roman wheel thrown pottery of Gaul has a reserved quality which is typical of work done on a rather primitive, slow turning wheel. Later works from the same areas executed under Roman domination most usually have a more flamboyant character and were certainly made on a smooth-running wheel of sophisticated design. Considering Roman achievements in other areas of technology, it seems more than just likely that their potters wheels were also of good quality and that they introduced them to this area. And, too, the Greco-Roman practice of blunging clay to a fine slip and allowing the coarse particles to settle out, thereby realizing its maximum plasticity, may have been a contributing factor. It seems very likely that the practice of blunging clay was brought to this area by the Romans especially in view of the fact that clay gloss coatings which are produced by a variation of this technique found their beginnings in the First Century, i.e. after the beginnings of Roman influence.[93] In combination or alone, these changes would have allowed for more extravagant forms and led to the development of the type of pots seen in Augst.

The bottles of Profile Type 3 show further evidence of their derivation from the La Tène in their decoration and there exist between the two types some interesting parallels as well as some important differences. As a point of comparison, see Emil Major's *Gallische Ansiedelung mit Gräberfeld bei Basel,* Tafel XXII, 15. Both Major's pieces, which we will take to be typical of the sort, and ours display their painted decorations on the upper shoulder and have their patterned areas set off above and below by horizontal banding. These factors alone are not sufficient to assume a derivitive relationship since work in this mode is found in many cultures from such widely scattered areas as Ancient China and the pre-Columbian American Southwest. Nor can we make a favorable comparison between the patterns in terms of either design or execution. The La Tène pot has a tight geometric pattern with an ingenious design of asymetrical balance, carefully planned and painstakingly executed. Profile 3 A, by contrast, was decorated in a manner of minutes with a simple, unsophisticated pattern of trees and »snakes«. There could have been little if any pre-planning

since the trees are not equally spaced around the pot. The fact that there are seven trees seems illogical since a circle cannot be divided into seven equal parts by normal methods of geometry, but this may have some mystical signifiance since the number seven is sometimes held to have magical properties. Despite this seemingly unbridgeable gap, our trees find their roots firmly planted in the painted ware of the Celts as shown by a virtually identical tree pattern on a La Tène sherd found in Vindonissa.[94] Even the »snakes« are foreboded in the zig-zag line from the same sherd.

Neither the white engobes nor the red pigment used on La Tène pottery is comparable to the materials of similar color used on our wares. The white pigment used by the Celtic potters was a white firing clay, perhaps a kaolin or pipe clay, which may have been imported. It was, in any case, used rather sparingly. The engobe used in Augst, on the other hand, is neither pure white nor was there any reservation in using it lavishly. The materials were local and cheaply won (see section on Materials). The red pigment, too, is a sharp departure from Celtic tradition. Whereas the red used on La Tène pottery was a simple iron-bearing clay, carefully applied and perhaps later polished (almost any red-firing clay would serve the purpose), the red decor on our wares is carried out in a clay gloss material. It has a sheen without the need of burnishing and the nature of the material dictated that the pattern be executed in a one-stroke process. As discussed in the section on Clay Gloss Coating, the clay of Augst produced a somewhat transparent gloss. Over-strokes show as such. This, in and of itself, dictated the abandonment of the tight geometric patterns of the La Tène. It was no longer possible to maintain uniformity of color with these new, but available, materials so the old style was discarded in favor of an expedient, but acceptable substitute.

The time lapse between our sherds (the last one-third of the Second Century at the earliest) and the last bloomings of the La Tène culture is minimal in view of the work of E. Ettlinger who proved the continuation of the La Tène into the Second Century.[95] In any case, some intervening period was necessary for the change in style and the acceptance of new methods. The differences discussed above stem almost exclusively from the techniques used and the painted pots of Augst demonstrate the amalgamation of the Celtic and Roman cultures through the use of factors common to each.

This blending of cultures is not unique to Augst and has been noted in other areas as well, most notably in recent years in new finds from Hungary. The striped pottery from Brigetio is contemporary with the painted pots from Augst and also combines the clay gloss and rouletting of Terra Sigillata technique with forms directly derived from Celtic prototypes.[95a] Even more striking parallels to our pots are seen in the painted pots from Pannonia. As noted earlier, both the volute and straight line trees seen on our sherds are also represented on sherds from Nagyvenyim and Aquincum.[95b]

Profile 5 shows a lip formation commonly seen on bottle forms of the Gallo-Roman provinces. Walke and Vogt show identical profiles on decorated bottles from Straubing and the Lindenhof.[95c] The bottles from Straubing also display the peculiar foot treatment discussed above.

In the bowls forms, too, we find positive evidence of Celtic influence. The bowls of Profile Types 18 and 19 fall into the same category as those shown in Drexel on Taf. XII, 3 and 7. Drexel is positive in his discussion of the type that it developed in Raetia from aboriginal prototypes. Schörgendorfer also attributes the development of these carinated bowls to aboriginal, i.e. Celtic, Gaulish prototypes. Our Profile Type 20 bowl shows a definite relationship to the La Tène forms reported by Alfred Haffner.

There are numerous literary references to the non-Roman origins of *»Rätische Firniswaree«* and our clay gloss coated wares are good examples. Virtually every form type in this category of ware finds its form antecedents in Celtic pottery. One of the clearest examples lies in the form family of pots of our Profile Type 10 and their indented counterparts of Profile Type 12. This form with its short neck and wide belly clearly shows its Celtic origins. Early antecedents of the form are shown in Major[96] and Schoppa.[97] Our Profile 11A is an intermediary form and the most likely immediate precursor to Types 10 and 12. Profile 11B shows a small Terra Nigra beaker which was excavated in Augst in 1970 under the direction of Teodora Tomašević and dated through Terra Sigillata sherds from the same complex as having come from the second half of the First Century. Ettlinger found similar forms in the *Frauenthermen* of Augst and noted their relationship to the later clay gloss wares.[98] In discussing a Terra Nigra pot of the same type, Drexel points to La Tène pottery for the precursory forms,[99] and Ritterling expressed similar views.[100] Judging from the nature of the paste, I feel certain that 11B was made in Augst. An interesting feature of this piece is the trimming of the foot which relates directly to the foot treatment on Profile Types 1 and 2 and forms a bridge between flagons and the indented beakers of Type 12 which show an identical foot treatment.

The chief form difference between Types 10 and 11 lies in the treatment of the lip, and this can be explained as a ramification of the different techniques used in finishing the surface. In the Terra Nigra piece at least some burnishing was needed to achieve the sheen; this precluded a complex lip profile since this would have hampered the polishing operation. With the adoption of clay gloss coatings the necessity for simplicity fell away since the gloss was applied in liquid form and could be used over even very complicated surface features. Profile 11A is a Terra Nigra sherd from the excavations on Venusstrasse Ost and shows the beginnings of a lip. Its position in the dig indicates that it is one of the oldest sherds from that excavation, but it is probably more recent than Tomašević's piece.

The Celtic origins of the remaining form types from the complex, Profile Types 12, 13, 14 and 16, are well documented and need not be recapitulated here.[101]

Considering the information given above, we can then state that Celtic influences were very much alive in Augst until very late in the Second Century and perhaps longer as evidenced by their impact on the locally produced pottery of the colony. Even so, it must be realized that all of these pots have undergone substantial transformations not only in form but particularly in technique, and these are of Roman origin. The pots of Venusstrasse Ost, then, represent a blend of Celtic and Roman cultures.

The Kilns

Kiln I and Kiln II rank among the best preserved kilns of Roman origin ever excavated. In both cases damage and deterioration is slight and very little restoration was needed to make them suitable for display. For this reason, they have been enclosed under a protective shelter where they can be preserved for public view and study.
Both of these kilns were built on a basic design principle which was common throughout the Roman Empire as evidenced by numerous finds in such widely scattered areas as England, France and Turkey. Examples of this kind of kiln were still in use in isolated regions of southern Italy as late as 1960.[103] They are simple updraft kilns with a combustion chamber below and a ware chamber above separated by a pierced floor *(Lochtenne)* on which the pots were stacked. In our examples, the pierced floor is supported by a wall which extends forward from the back wall of the combustion chamber and by ledges which corbel out from the side walls forming simple supportive arches. No keystone arch construction was used in either kiln. In areas where bridging was necessary, such as the formation of the floor of the ware chamber and over the fire mouths, either corbelling or post and lintel systems were used. The chambers are oval in shape and are slightly elongated from front to rear.
As is common for kilns of this type, the major portion of both kilns is sunken into a bank of clay which buttresses the walls and provides insulation. The walls of both combustion and firing chambers were built of broken roofing tiles and the like and vary between 15 and 30 cm in thickness.
The potters of Augst apparently did not make special bricks or tiles for their kilns but simply availed themselves of suitable materials from the city's trash pile. The upper rim of Kiln II, which extends above ground level, is surrounded by rough blocks and chunks of limestone which support and buttress the walls at that point. The construction is rough and somewhat haphazard and sherds of pots are sometimes found filling gaps between the larger pieces of broken roofing tile. The only mortar used was clay and this was probably dug at the kiln site. The kilns sit in the upper strata of the clay of Augst, which as discussed in the section on Materials, has a very high sand content. The character and appearance of the mortar suggest that this was the material used. This same clay was used to line the inner surface of the ware chamber and to smooth the pierced floor. As shown by the finger marks on the floor of Kiln II, the clay was smeared on in a soft mush state to a depth of 1–3 cm.
The kilns sit at right angles to each other and their fire mouths open onto a common service area. This suggests that they were built at about the same time and probably belonged to the same potter or pottery. Above the firemouth of each kiln is a narrow walkway and a door leading into the ware chamber.
The ware chamber of Kiln I measures 135 cm from front to rear, 105 cm from side to side and is 85 cm deep. The same measurements from Kiln II are 210 cm, 180 cm and 40 cm respectively. As shown by these figures, Kiln I is proportionately much deeper than Kiln II, but there is no remaining evidence to suggest that the walls of Kiln II were ever much higher than they are at present. A more likely explanation is that they were used to fire different kinds of ware. The size and configuration of Kiln I would have made it ideally suited for firing smaller pieces such as the clay gloss coated ware. These small forms, for the most part beakers, are such that they could be stacked from the floor to the rim of the kiln and fired with no great danger of breakage. The flagon forms, on the other hand, cannot be stacked one on the

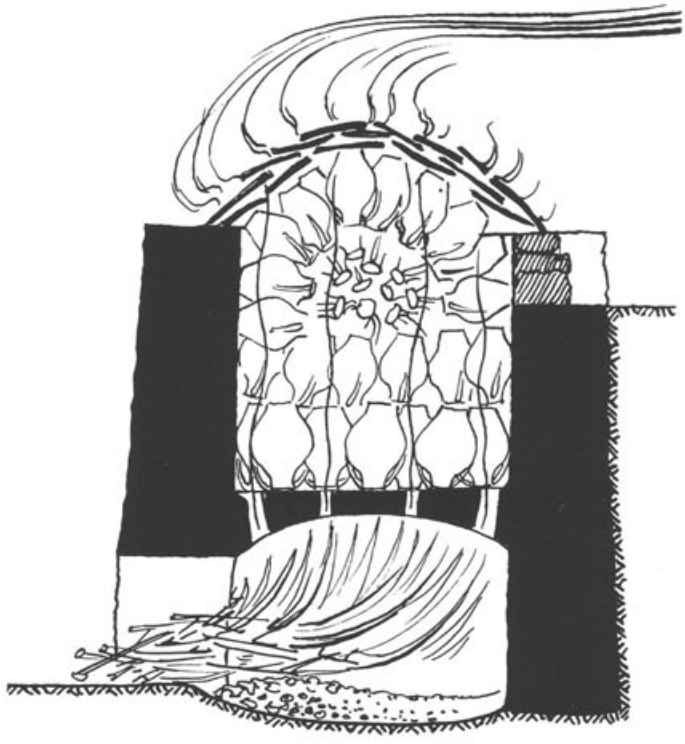


Illustration 11. Cross-section of a contemporary kiln from Santa Lucia in southern Italy which continues ancient traditions and illustrates the basic plan of the kilns from Augst (After Hampe and Winter, p. 35, Abb. 25).

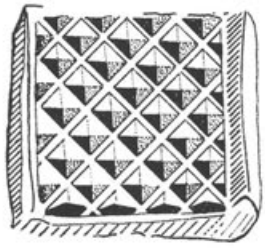


Illustration 12. Stamp of profile 30, plate XII (1:1).

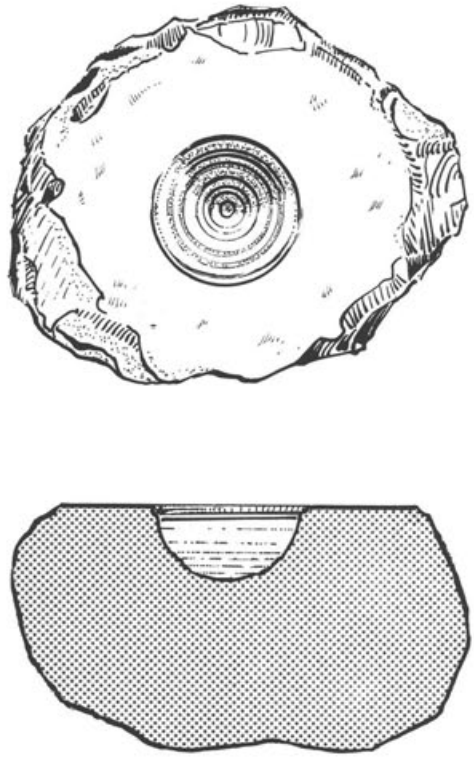


Illustration 13. The limestone cup (1:1).

other to any great depth without the real danger of breakage in the fire and a significant loss in each kiln load. Kiln II with its large floor area and depth sufficient for two or three layers of flagons would have been appropriate. In any case, there can be little doubt that the majority of sherds found in the excavation were not fired in either of the kilns. Many of the sherds were found in the service area at levels above the top of the fire mouths of the kilns, and one must assume that the kilns were no longer used at the time these were deposited.

There is no evidence to suggest that either of the kilns ever had a dome. In either kiln it would have been necessary to raise the vertical walls of the ware chamber by 70 to 100 cm before arching could begin in order to allow for a door tall enough to permit free access to the ware chamber. This would have made the chambers so large that it is very doubtful that the combustion chambers would have been large enough to accomodate sufficient fuel to fire the kilns to the needed temperature. In both kilns, the walls of the ware chamber slope slightly outward as they rise from the pierced floor.[104] Nor were domes necessary. Hampe and Winter report a number of kilns of this design[105] which were closed by simply covering the stacked pots with two or three layers of sherds. The sherds provide little in the way of insulation, but serve to dam the hot gases and slow their passage through the pots. This would have been sufficient for the relatively low firing temperatures used for the ware of Augst and also helps explain some of the effects the potters were able to achieve in their wares.

Kilns which have no stack *(Schornsteinreihe)* do not induce a strong draft in the early stages of firing and tend to burn with a rather smoky flame which produces a predominantly reducing atmosphere. As the firing progresses, the draft may become more lively and with careful management of the fires oxidizing conditions can be maintained.[106] At the end of the firing as the fires are allowed to die down, the draft continues drawing O_2 into the kiln oxidizing the still red hot wares giving the final effect of oxidation. This is the technique by which wares from Categories I A and C, III, IV and V-A were fired and accounts for the reduced kernel sometimes found in these sherds.

In order to maintain reducing conditions until the wares had cooled to the point where no reoxidation was possible, the potters could have simply covered over the top of the kiln with a mixture of soft clay and chopped straw prior to allowing the fires to die and closing the fire mouth. This could prevent the entry of free oxygen and maintain the wares in a reduced state. In order to smudge the pots as in Category II, they could have followed the same procedure as above, being careful to stoke a large quantity of extra fuel just before closing the fire mouth. The heavy carbon smoke thus induced would penetrate the ware smudging it black. Thus it was possible for the potters of Augst to fire oxidized, reduced or smudged wares in these kilns with a simple sherd cover.

The area of the excavation was not large enough to ascertain whether the kilns sat in a building or were in an open court yard. Due to the intense heat that they would have generated, it seems very unlikely that they would have been under a roof. Kiln I sits in a corner formed by two masonry walls and the foundations of the kiln sit on the foundations of the walls indicating that the walls predate the kilns.

The Potters Wheels

Two bits of evidence made it possible to reconstruct in prototype at least the type of wheel used by the potters of Venusstrasse Ost. The first was a small rough-hewn limestone cup (Illustration 13) with horizontal striations in its central depression caused by rotation of a shaft and the other is to be found in the physical characteristics of the pottery from the excavation. Both of these point unmistakeably to the sort of basic wheel design shown in Illustration 4. The outside surfaces of most of the pots are smooth and offer no clue as to the type of equipment used, but the finger ridges on the insides invariably spiral upward to the right (viewed from the inside) and show them to have been thrown on a wheel which rotated in a counter-clockwise direction. The rule-of-thumb in wheel construction is that hand powered wheels turn clockwise and foot powered wheels turn counter-clockwise. There are exceptions, but in the main the rule holds true due to that peculiarity of nature by which most people are right-handed and, to coin the term, also right-footed. The normal motion when setting a hand powered wheel, such as the one in Illustration 5, into rotation is to grasp the outer perimeter with the right hand and pull it sharply to oneself causing a clockwise rotation. Variations on this method, such as using a stick in a notch on the outer edge of the wheel usually produce the same direction of spin. Foot powered wheels, by contrast, are normally driven by kicking away from oneself with the right foot on a momentum wheel causing counter-clockwise rotation. The extreme forms of the flagons and the delicacy of the clay gloss coated wares indicate a very smooth running wheel with considerable momentum and a long duration of spin after each application of power. Hand powered wheels usually have a short duration of spin and low momentum due to the relatively small mass of the working head which also serves as momentum wheel.

The limestone cup confirmed these indications and narrowed the choice of possible designs. Since the inception of the foot powered wheel during Hellenistic times, two basic designs have been developed. The older of the two was a simple adaptation of the even older hand wheel (see Illustration 6). The pivot point remained just under the center of the throwing surface and a momentum power wheel was dropped down over the supporting fixed stake. In the other variation, shown in Illustration 4, the pivot point moves to the base of the shaft which connects the working head with the momentum wheel. Since the gyroscopic action of the two wheels is not sufficient to maintain the wheel in a stable upright position, one other point of contact is needed; this is usually located just under the throwing head. The problem is to secure the shaft and deny it lateral motion while at the same time allowing it to turn freely. In modern wheel construction a variety of bearings and bushings are used for this purpose; early potters, lacking these sophisticated devices, must have used much simpler means to achieve the same purpose. The exact design of the mechanism used by the potters of Augst will probably never be known with certainty since the wheels were constructed of wood and have not survived the long burial.[107] The author knows of two wheels of traditional design which are still in use near Augst. One is in the shop of Mr. Gisler in Dällikon, Kanton Zürich, and the other in one of the potteries of Soufflenheim, Alsace; both are well over hundred years old and both use the same means of securing the shaft. The shaft is simply clamped between two pieces of wood which have been carved out to the half-round; a piece of bacon rind wedged between the two sides of the clamp and the shaft serves as lubricant

and allows the wheel to turn freely (see Illustration 7b). A similar device was probably used in the Roman wheels at Augst. A reconstruction of the wheel in its most likely form is shown in Illustration 7.

Illustration 4

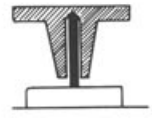
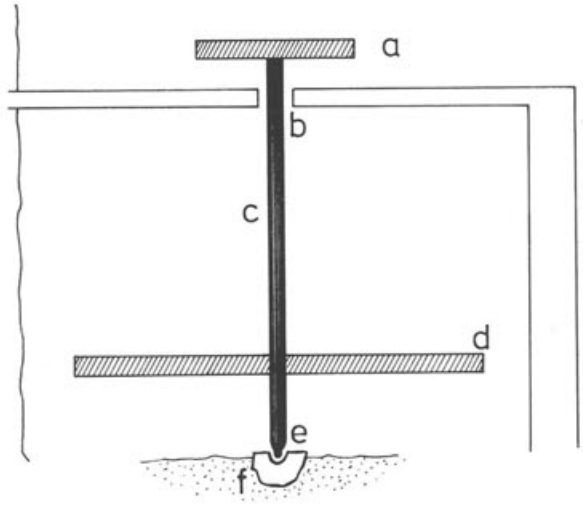


Illustration 5

Illustration 6

(After Rieth, pp. 74)



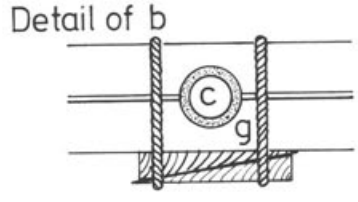


Illustration 7. a) wheel head b) upper pivot point c) shaft d) monumentum wheel e) lower pivot point f) limestone cup g) oiled leather or something similar.

The Wasters

A percentile breakdown of the types of sherds found in the excavation shows clearly that the area excavated was not a »city dump« as was the case with the *Schutthügel* in Vindonissa; the minimal numbers of T.S. sherds and sherds of other known import types clearly indicate this. Rather, the excavation brought to light the rather specialized trash pile of one or more of the Roman potteries on Venusstrasse Ost as demonstrated by the large number of wasters which were found.[108] The wasters from the excavation break down into firing failures which were caused by either the method of stacking or the fire itself, technical failures which resulted from human error or poor techniques and failures caused by problems with the clay.

The flagon and bottle forms are good examples of firing failures caused by the manner of stacking the pots in the kiln to be fired. Profiles 1A–C, 2A and B, 3A and 9 were all taken from demonstrable wasters and all seem to have failed in exactly the same way, i.e. from pressure on a few points on the upper shoulder during the firing. The shelving used in modern potteries is a relatively recent innovation in Europe. Adam Winter and Roland Hampe in their investigations into the pottery of primitive areas of Greece, Italy and Sicily where kilns very similar to those used in Augst are still in use do not mention a single instance of shelving being used to support the ware for firing. With unglazed pottery, shelving is rarely needed even today since raw clay surfaces do not stick together when fired. Illustrations 8 and 9 show two artifacts found in the excavation which were probably used as stacking aids. They would have been of little value in stacking closed forms such as the flagons and were probably used to stabilize stacks of large bowls or mortaria.

As the potters of Augst were no doubt aware, wide-bellied flagon and bottle forms are difficult to stack without the aid of shelving since they cannot be piled in a way which will distribute the weight equally. The only practical manner of stacking these forms would have been to pile the pots in the kiln much as cannon balls are stacked with the first layer set out on the pierced floor *(Lochtenne)* side by side and touching and with subsequent layers offset and resting on the shoulders of the pots below. The clay of Augst is quite strong in the dry state and would have permitted several layers of flagons to be stacked without serious danger of breakage, but the entire weight of all the pots in the kiln would have been localized to a few points on the upper shoulders of the bottom layer of flagons. As the temperature in the kiln increased, these pressure points would be the first to warp or even collapse. If one pot on the bottom layer should be crushed, the whole load could shift causing a disastrous chain reaction of breakage. Such a happening is the bane of a potter's very existance and may have been the case with the large flagons shown in Profile 1A–C since all eight examples of this form type were found in the same complex and all failed because of pressures on the shoulder as described above.

The piece used for Profile 1B was doomed to failure regardless of the manner of stacking and is a good example of the sort of failure attributable to human error. In this case, the wall of the pot as it adjoined the base ring was trimmed so thin that it could not support the weight of the rest of the pot, and it broke at that point leaving the flagon without a bottom. The break no doubt occurred in the kiln, but cannot be blamed on the stacking or the firing; it is, rather, the fault of the potter. This kind of error is frequently seen in the work of beginning potters or those whose technique is poor. As discussed in the section on the flagons, 1B was executed by

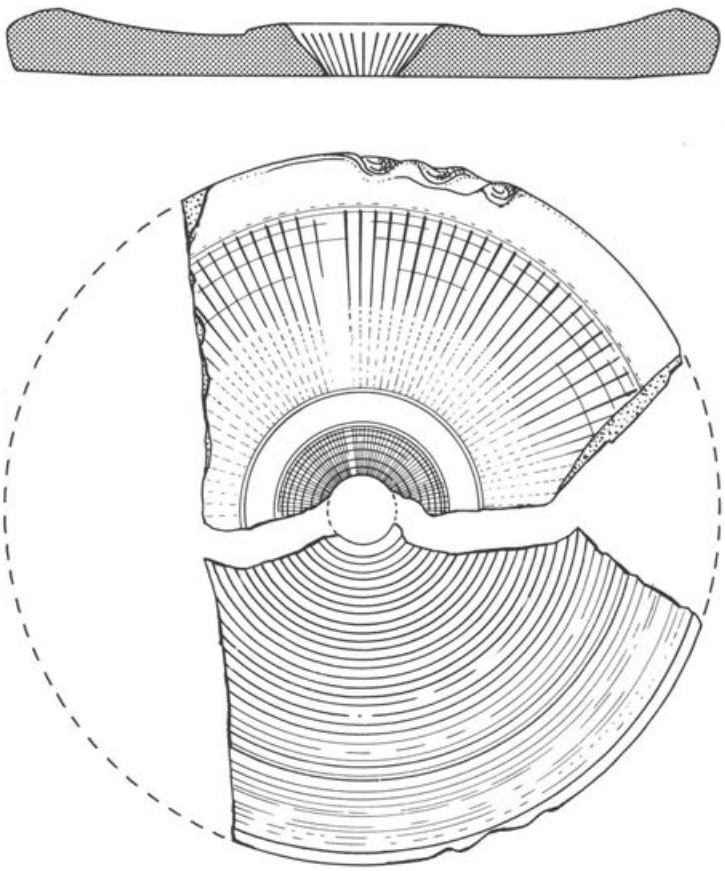


Illustration 8.

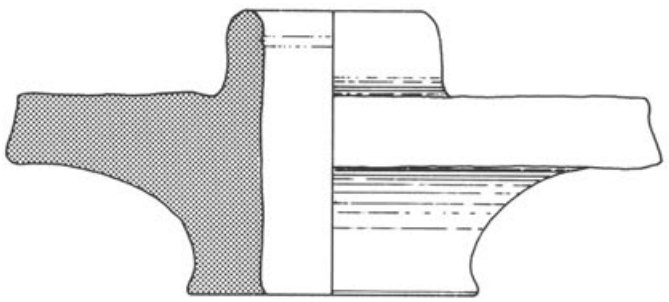


Illustration 9.

Kiln setting devices.

Potter II whose mastery of pottery techniques was far below the standard set by Potter I.

There were also a number of wasters among the bowls, one of the clearest of which is shown in the pot used for Profile 18E. All of the rim, the whole base and a number of wall sherds to this piece were found, but it soon became apparent that reconstruction was not possible due to severe sherd warpage. In this case the failure does not appear to stem from the manner of stacking the bowls, but from their positioning in the kiln. Deep bowls are usually stacked rim-to-rim and foot-to-foot as shown in Illustration 10. This style of stacking is usually preferred to the other alternative of nested (i.e. one in the other) stacks since it distributes the weight more evenly and avoids pressure on the inside of the rims which often leads to rim cracks. Small bowls can be set in large ones to conserve space. The entire weight of the stack is supported by the bottom bowl, but this is usually not a problem since the pressure is evenly distributed around the rim and comes directly from above. The degree of sherd warpage and particularly the warpage of the base sherds suggests that 18E was the bottom bowl in such a stack and that its base rested on an uneven surface in the kiln. Perhaps it was placed in such a way that one-half of its foot extended over one of the holes in the pierced floor. The sherds do not appear to have been overfired, so it is unlikely that heat alone could have caused the base to warp; considerable pressure must also have played a role.

Some times a single sherd offers enough evidence to state that it came from a firing failure, such is the case with 18D. On this large rim sherd the patterns of oxidation and reduction indicate that the pot broke during the firing. One broken edge shows a clearly defined kernel of reduced grey, while the other is fully oxidized. The explanation lies in the change in composition of kiln gases during the firing cycle. In the early stages of the fire, the atmosphere in the kiln was reducing which is to say that unburned carbonaceous gases pervaded the kiln. Such gases are chemically very active and are capable of robbing other materials of their oxygen content. Iron oxide which is present in nearly all kinds of clay is particularly susceptible and is easily »reduced« from red ferric oxide (Fe_2O_3) to black ferrous oxide (FeO). If oxygen is allowed to enter the kiln while the pots are still hot enough for a reaction to take place, i.e. red heat or more, the iron will revert to its ferric state *on exposed surfaces.* If the terminal oxidation period continues long enough or if the ware is quite porous the paste may be reoxidized throughout its entire thickness, leaving no traces of residual reduction. In the case of 18D, one broken surface still shows the reduced core whereas the other does not. The oxidized surface must, then, have been exposed during the final oxidation period clearly indicating that the pot broke in the kiln.

One other point of interest on 18D is that the nature of the reoxidation supports the theory that the potters of Augst stacked their bowls rim-to-rim. On the rim section of the sherd, the reoxidation has penetrated equally from all directions leaving the reduced core in a central position. In the wall, the oxygen penetrated to a depth of 2½ mm from the outside, but there is no penetration from the inside. Since there could be no difference in density, the lack of penetration from the inside must be accounted for by the fact that oxygen was denied access to the interior of the pot. Rim-to-rim stacking accounts for this.

That the potters of Augst also had problems with the clay is evidenced by the base sherds of Profile 10B. In this large beaker form, the base has cracked in a peculiar

»S« shaped pattern. Here, again, the patterns of oxidation and reduction on the broken edges of the sherds show that the cracking occurred prior to the final oxidation of the ware. This kind of cracking is caused by pressures set up in the clay during the throwing process which are not released until the pot is heated in the kiln. Very fine grained clays such as that used in Augst exhibit this difficulty more frequently than coarse clay.

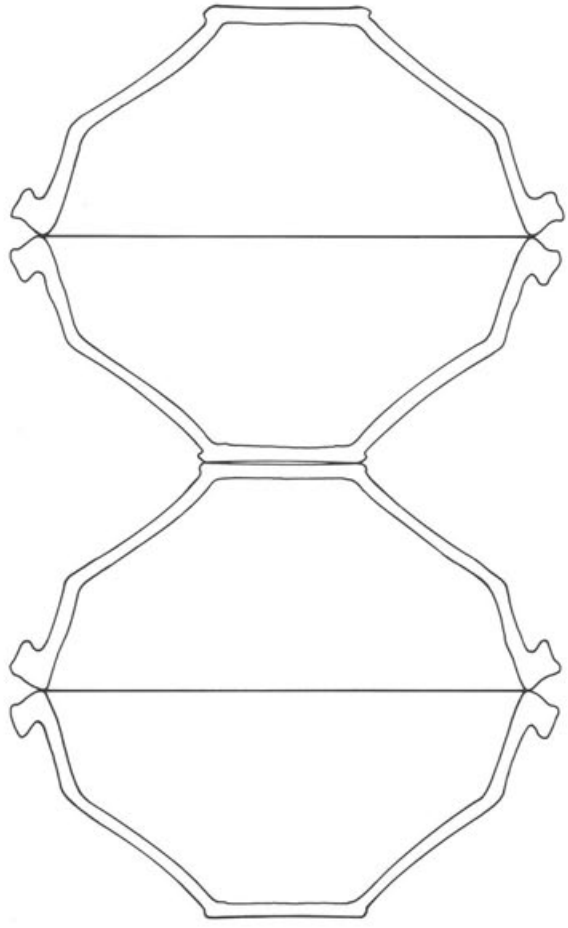


Illustration 10. Bowl forms stacked rim-to-rim and foot-to-foot.

Footnotes

1 Oswald and Pryce - Plate LXXIV and pp. 216/217.
2 Oswald and Pryce - Plate LXXV, 1, and pp. 223.
3 Steiger - Abb. 42,68.
4 Binsfeld - pp. 23.
5 Ettlinger - Taf. 22, 6 and 14.
6 Vogt - Abb. 44, 42, and Abb. 42, 3 and 5.
7 Drexel - Abb. 6, 2.
8 Oelmann - Form Type 32C.
9 Drexel - pp. 81.
10 Loess is an exceptionally fine aeolean sand which takes its name from the enormous deposits in China.
11 The one small difference is that Roman sherds contained a negligible amount of Zinc which was not found in the clay sample from Insula XXII.
12 Slaking is the phenomenon by which any clay disintegrates when dropped in water.
13 This process is known to have been used by Greco-Roman potters and is one of the first steps in the production of clay gloss coatings.
14 Firing and saturation tests were conducted in the testing laboratory of the *Dachziegelwerk Frick, Kt. Aargau,* with the kind permission of Herr Direktor Roth, the General Director of the factory.
15 Noble II - pp. 309.
16 Marl is a heavily calcareous clay.
17 Drexel - p. 80.
18 Bimson - p. 200.
19 Georges - p. 2658 - *»sigillatus, -a, -um, mit kleinen Figuren (in erhabener Arbeit) verziert . . .«*
20 Noble - pp. 38–39 and figures 178–179.
21 Deflocculation is the dispersal of the solid matter in a water suspension through the addition of an electrolyte which effects the positive and negative charges on the surface of the particles causing them to repel rather than attract and affecting a drop in the specific gravity of the slip without the addition of more water.
22 Bimson - pp. 200–204.
23 Parmelee - p. 88.
24 Farnsworth and Wisely - pp. 165–173.
25 Lack of a clear understanding of this phenomenon has contributed greatly to some of the confusion found in the artificial classification of some wares as Terra Sigillata and some as Terra Sigillata imitations. This entire area is sorely in need of clarification and reevaluation.
26 This is not to be confused with »flamed« or »sponge decorated« ware where the mottling was intentional.
27 During the course of our efforts to reproduce the clay gloss used by the potters of Augst, we happened to fire one of the pieces twice. The first firing was done in a reducing atmosphere in the hope that we could achieve the grey to black of Category I B. Due to the fact that we were firing in an electric kiln, we were forced to delay the introduction of the reducing gases until the end

of the firing cycle (carbon monoxide is harmful to the electric heating elements if it reaches them while they are being heated by an electric current). Since the ware was already matured at that point, the clay gloss had already sintered and we accomplished only a partial reduction of the ware. We then applied another coat of clay gloss and refired the piece in a purely oxidizing atmosphere. The second firing was also a failure in that the second layer of gloss, which was very difficult to apply due to the sintering of the first coat and the low absorbency of the surface, peeled badly. This clearly demonstrates that Drack (p. 28) was mistaken in his assumption that the »flamed« or »sponged« wares were made in a two-fire process.

28 Shepard - pp. 220–221.

29 Sherds from types 14 B–E appeared in all three categories of clay gloss wares with no apparent regularity except that the finest examples were done in Category IB and the roughest in Category IC.

30 The most notable modern exponents of the technique are Maria Martinez and her son, Popovi Da, the famed American Indian potters of San Ildefonso Pueblo in New Mexico. Maria's »black-on-black« pottery has brought her international fame and is included in museums and pottery collections in almost every country in the world.

31 The procedure most likely used in the kilns of Augst is discussed briefly in the section on Kilns.

32 In their report on their research on terra nigra (*»Versuch über die Rekonstruktion der Terra Nigra«* - Germania 31, 1953, pp. 67–68) Edgar Denninger and Heinz Ebinger agreed that even clays containing a considerable amount of iron need the additional coloring action of carbon to produce a good black color. Unfortunately, their work was marred by their assumption that it would have been necessary to pack the pots in charcoal for firing to facilitate the carbon impregnation.

33 Polishing the ware after firing as suggested by Drack - p. 27 - is not possible as explained in the description of the process above. In the fired state, it is not possible to rearrange the clay particles; they are permanently fixed.

35 It is a virtual certainity that this piece was made in Augst. The interior surface shows the characteristic lumps of unslaked clay and Augst clay takes an excellent polish when burnished, nor, considering the thriving pottery industry in Augst, would it have been necessary to import ware of this type.

36 A good many forms carried out in this technique, particularly bowl forms, are indiscriminately classified as Terra Sigillata imitations. To be sure some of them do mimic traditional sigillate forms, but others of which Drack Type 20 is a good example are purely aboriginal in both form and technique. Drack himself notes this. Why then the designation as a »Terra Sigillata imitation« when neither the form nor the technique are imitative ?

37 I hold the one exception to this, the piece used for Profile 2 B, to have been a shop accident in which some of red clay gloss was inadvertently spilled over an already engobed flagon. There is no discernable pattern and the remaining areas of red pigment could scarely have been applied with a brush.

38 There can be no doubt that these size graduations were intentional on the part of the potter in that when the rim fragments were sorted into their appropriate size groups, they varied less than 1 mm one from the others. The median

diameters of the six sizes of the mouth rims are: 30 mm, 33 mm, 37 mm, 41 mm, 49 mm and 68 mm.

39 Inv. Nrs. 68.13359, 68.13096 and 68.13452.

40 Inv. Nr. 68.13727.

41 For a fuller discussion of the implications of this treatment, see the section on Derivations of the Forms.

42 A rib is a tool usually made of wood or metal which is used instead of the fingers in throwing pottery. Most ribs are rather flat and have at least one long straight or slightly curved surface. The advantages to using a rib are that the surface of the piece can be smoothed more completely than with the fingers and less water can be used in the throwing process. This is particularly helpful in throwing large pieces since excessive water softens the clay and often leads to slumping.

43 Vogt – Abb. 43,12 and 48,20.

44 Drexel – p. 98.

45 Schoppa – p. 50.

46 Laur – p. 158.

47 Laur – p. 160.

48 Laur – p. 160 and Stähelin – p. 557.

49 Frazer – Chapter I.

50 Ettlinger and Simonett – Taf. 28,7 and p. 9.

51 Vermaseren – p. 6.

52 Frazer – p. 164.

53 Vermaseren – p. 31.

54 Morris and Morris – pp. 11–49.

55 Stähelin – p. 551.

56 Stähelin – p. 552 and Ettlinger and Simonett – pp. 108 and 128.

57 Stähelin – pp. 554, 556.

58 Morris and Morris – p. 33.

59 Morris and Morris – p. 3.

60 Morris and Morris – p. 48.

61 Graillot – p. 3.

62 I am indebted to Dr. Ruth Steiger, Museumsassistentin at the Römermuseum, Augst, for allowing me to mention this piece prior to the publication of her own work on the same subject which was in progress at the time of this writing.

63 Oelmann – Form Type 33.

64 Oelmann – p. 35.

65 *»Roter Ton mit ausgezeichnetem schwarzem oder schwarzbraunem Überzug von metallischem Hochglanz«.*

66 Ettlinger and Simonett show a foot treatment similar to ours on Abb. 14, 11, but their piece is in »rough cast« or »sand faced« ware – a technique which is totally absent from this excavation.

67 Ettlinger – Taf. 23,15 and 16.

68 Drexel – p. 82.

69 Ettlinger – Taf. 22,19; Taf. 23,1–4 and p. 87.

70 Drexel – Taf. XI, 2 and p. 97.

71 Ettlinger – p. 86.

72 Vogt – Abb. 44,42 and Abb. 42,3 and 5.

73 Oelmann – Type 32c.
74 Drexel – Abb. 6,2.
75 Ettlinger – Taf. 22,6 and 14.
76 Ettlinger – Taf. 20,19–43 and pp. 103–104.
77 Ettlinger – p. 103.
78 Ettlinger – Taf. 20,40.
79 Vogt – Abb. 44,34.
80 Ettlinger – Taf. 19,4 and 5.
80a Ettlinger – Taf. 21,12 and 13.
80b See also Vogt – Abb. 40,22.
81 Oswald and Pryce – Plate LXXIV, 2. Among our mortaria sherds there are three identical firing failures and none of the sherds show any sign of use. This leads one to speculate that all of the mortaria found in the excavation with the exception of the T.S. piece are wasters of one sort or another and that the sherds left to us are simply not recognizable as such. This is a logical assumption in view of the nature of the other finds. It is puzzling that the one T.S. mortaria mentioned above is also in pristine condition and the working surface is neither scratched nor worn in any way. Since it is a known import type it cannot be regarded as a waster, and another interpretation is obviously called for. In this case, the lack of wear probably means that the pot was broken soon after manufacture and importation and its value in dating the strata becomes more important, because we can be relatively certain that we are not dealing with the »heir-loom« phenomenon mentioned by Hawkes and Hull.
82 Drexel – p. 73.
83 Ettlinger and Simonett – Profiles 434, 440, 453, and 530; Oelmann – Abb. 27, Nrs. 2b, 2c, 2k, 10a, et al.; Oswald and Pryce – Plates LXXXII and LXXXIII.
84 Unverzagt – Abb. 13,1 and 3 and Abb. 14,12.
85 Prof. Dr. Elisabeth Ettlinger – personal interview, Zürich, Nov. 1970.
86 Major – Taf. XXII, 15.
87 Ritterling – Taf. XXXVII, 120A.
88 Major – Taf. XXII, 13 and 18–20.
89 Ritterling – Taf. XXXVII, 120A and 121.
90 Ettlinger and Simonett – Taf. I,12.
91 Vogt – Abb. 31,1.
92 As a good example of this, see Major – Taf. XXII, 15. It is not unusual in the history of ceramics to find that techniques which were originally dictated by the nature of the materials continued long after the necessity had disappeared and became style factors and characteristics of the pottery of the culture. A good example of this is found in Japan where some potters continue the tradition of making even small pots by a method which combines coil building and throwing rather than the simpler process of throwing them in one section. In earlier times in that region, the clay was so non-plastic that no other technique could be used. Now, despite the availability of better clay, the potters continue this complicated process »because it has always been done so«.
93 Drexel – p. 74.
94 Ettlinger and Simonett – Taf. 28,7.
95 Ettlinger and Simonett – p. 8.
95a E. Bonis in her report on the striped pots from Brigetio (Folia Archaeolo-

gica XXI - Separatum pp. 89) states that the region surrounding Brigetio had no indigenous population and that the forms found there were not developed locally. Nevertheless, one cannot assume that the Vindonissa Legion, which was moved to Brigetio, brought this style of ware with them in this form since no similar pieces have ever been found in Vindonissa. Considering the proximity of Augst to Vindonissa, one can hardly avoid the speculation that the Vindonissa Legion may have carried the influences to Brigetio from Augst.

95b Bonis II - Abb. 2,1 and 2.

95c Walke - Taf. 57 and Vogt - Abb. 42,2.

96 Major - Taf. XXI, 2.

97 Schoppa - Taf. 13 and 14 and p. 54.

98 Ettlinger - Taf. 16,1 and p. 96.

99 Drexel - Taf. XI,26 and p. 76.

100 Ritterling - Taf. XXXVI,121 and p. 349.

101 For Type 13 see Ettlinger - Taf. 23,16 and p. 87; for Type 14 see Ettlinger - Taf. 23,1-4 and p. 87; for Type 16 see Vogt - Abb. 42,3-5 and p. 186 and Ettlinger and Simonett - Taf. 12,247 and p. 53; for Type 12 see above under Profile Type 10; for general information see Ettlinger pp. 82-89, Ettlinger and Simonett pp. 38,41 and Drexel pp. 80-84.

103 Hampe and Winter - Abb. 25,72 and 83.

104 The author is aware of a statement to the contrary in an article by R.M. Swoboda, Der Töpfereibezirk am Südostrand von Augusta Raurica, Helvetia Archaeologica 5 (1971, 2), pp. 7-21.

105 Hampe and Winter - Abb. 25,73 and 83 and Taf. 13.

106 Oxidation and reduction are terms used in ceramics to describe the character of the hot gases passing through a kiln. In oxidation, the gases contain sufficient oxygen that all materials in the kiln can combine with O_2 to their maximum possible, such as Fe_2O_3 in the case of iron. Under reducing conditions the gases contain carbon monocide (CO) which reduces the oxide constituents of the materials in the kiln to their lowest oxide content, or FeO for iron.

107 Rieth (p. 52) reports that a foot powered wheel was found in Cinelli near Arezzo in 1779 and that it was very similar in design to wheels in use in Italy in recent times. Unfortunately this valuable find did not survive the excavation. It, too, was constructed of wood and could very well have been an Italian counterpart of our wheels.

108 Working in German and writing in English has led to some difficulties which merit discussion. In German-language archaeology the term *Fehlbrand* is all inclusive and refers to any pot which failed for any reason during the course of its manufacture, whether it had to do with the firing process or not. For this reason, the obvious translation into English of »firing failure« is inappropriate. »Waster«, however, carries the same connotation and will be used here in place of *Fehlbrand* as a catch-all term, and firing failure will be used for those pieces in which the failure was a direct result of the firing or the stacking.

Foto 1. Kiln I Front view showing stoke hole and entrance to ware chamber.

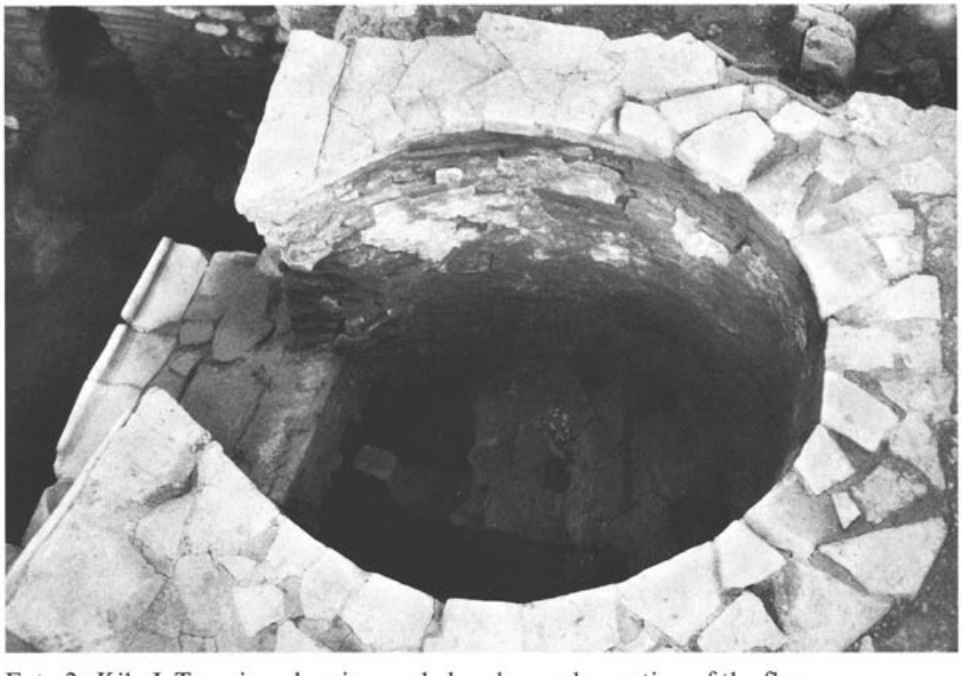


Foto 2. Kiln I Top view showing oval chamber and a portion of the floor.

Foto 3. Kiln II Front view showing the stoke hole and the entrance to the ware chamber.

Foto 4. Kiln II Top view showing the ware chamber and remaining portion of the pierced floor.

Foto 5. Kiln II The pierced floor of the ware chamber. Note the finger marks left by the potters as they smeared the floor with soft clay to smooth it.

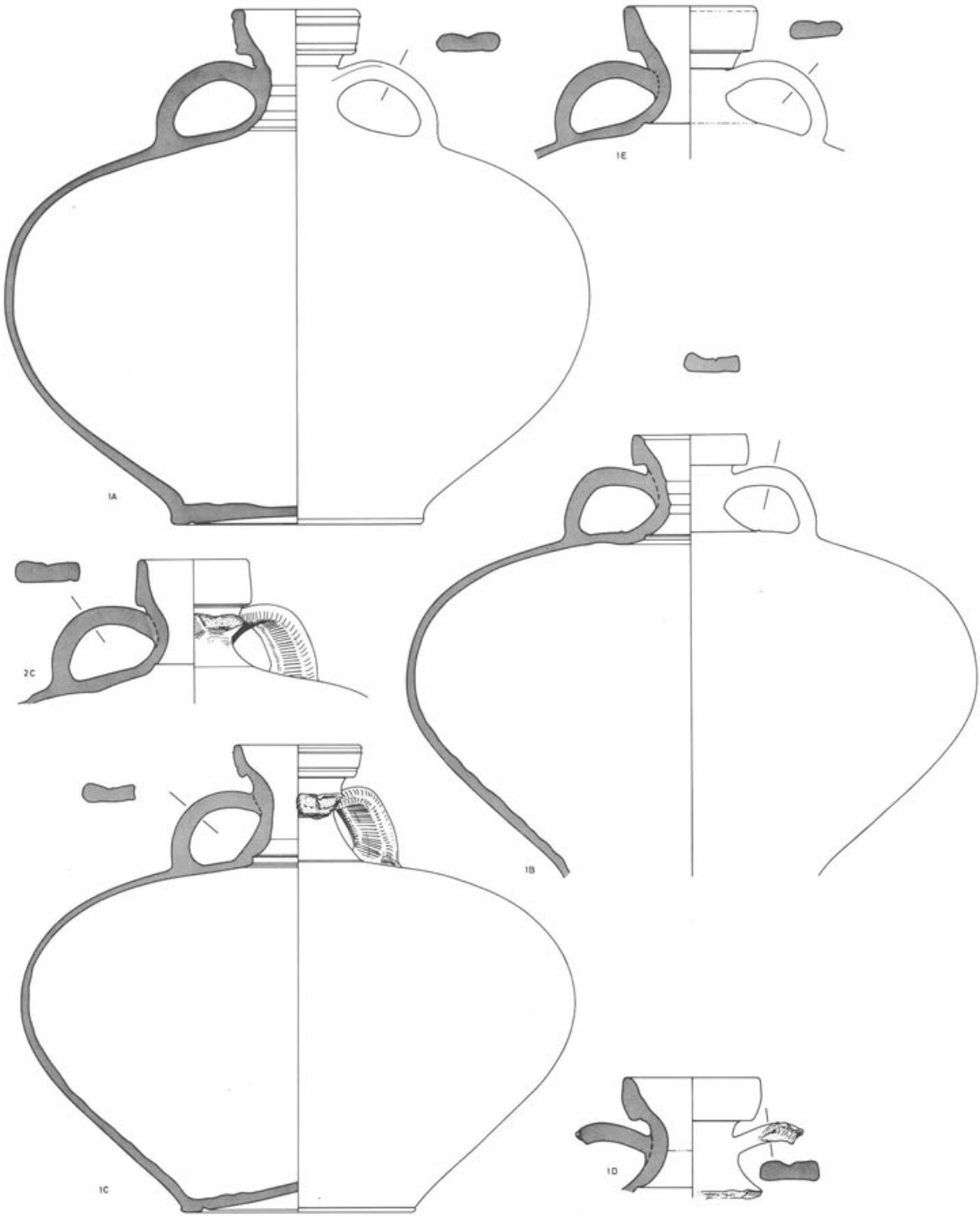
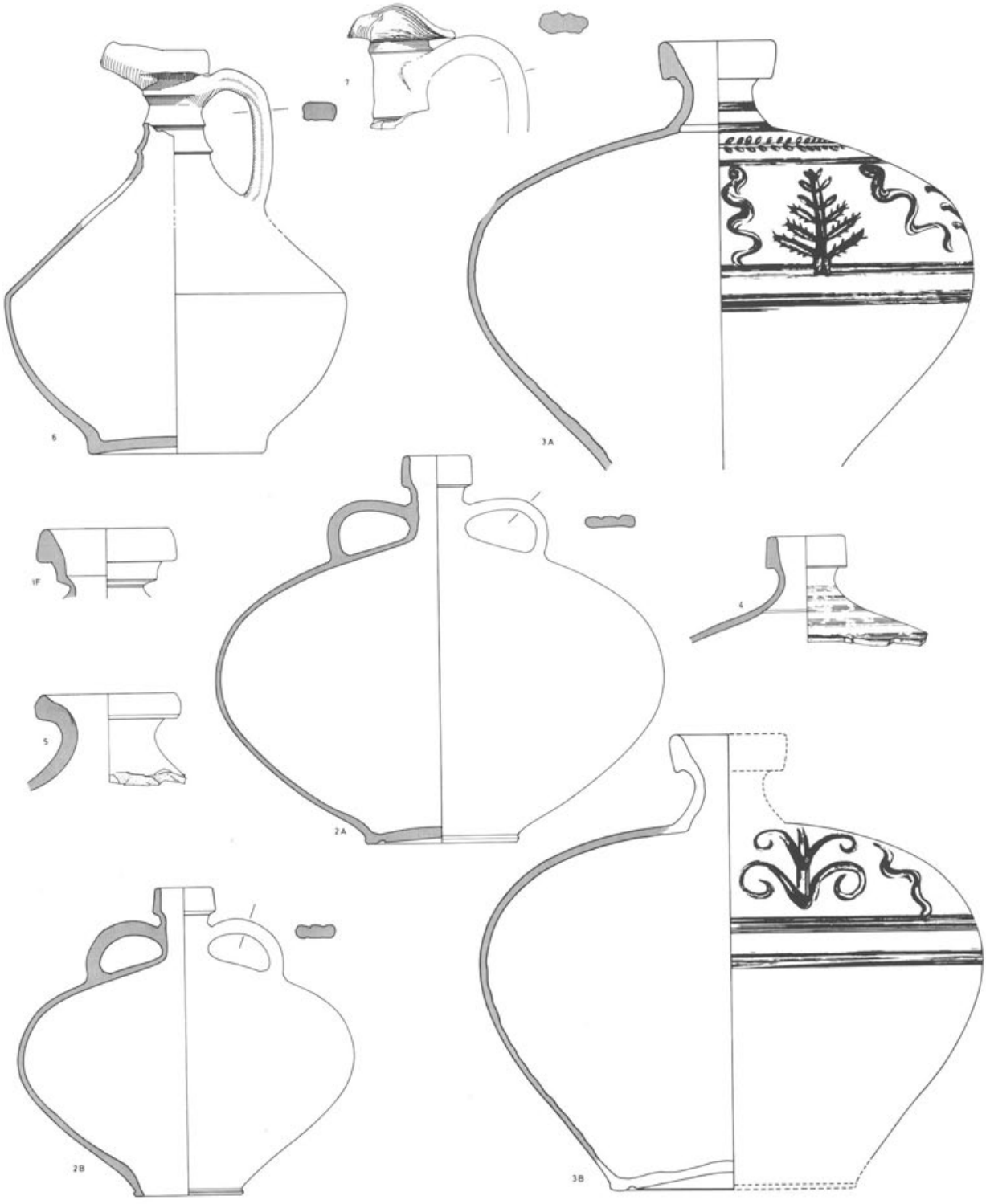


Plate I - 1:4

1A–F and 2A–C - Flagons, reddish paste, white engobe.
3A–B and 4 - Bottles, reddish paste, white engobe, red clay gloss decoration.
5 - Bottle, reddish paste, white engobe.
6, 7 - Jugs, heavily gritted paste, grey to black.


7
6
3A
1F
4
2A
5
2B
3B

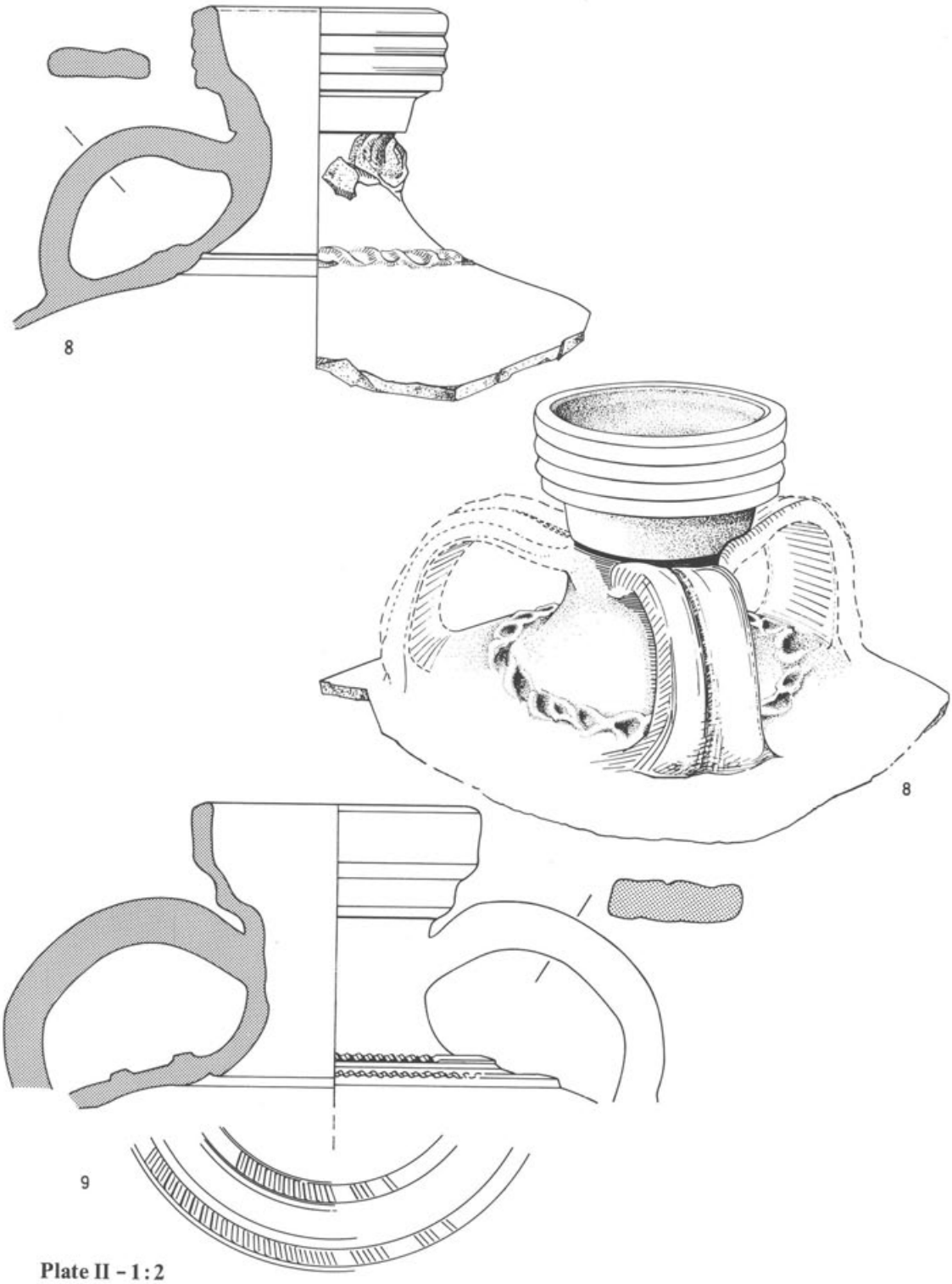


Plate II – 1 : 2

8 – Flagon, reddish brown paste, pressed coil decoration.
9 – Flagon, reddish paste, white engobe, rouletted coil decoration.

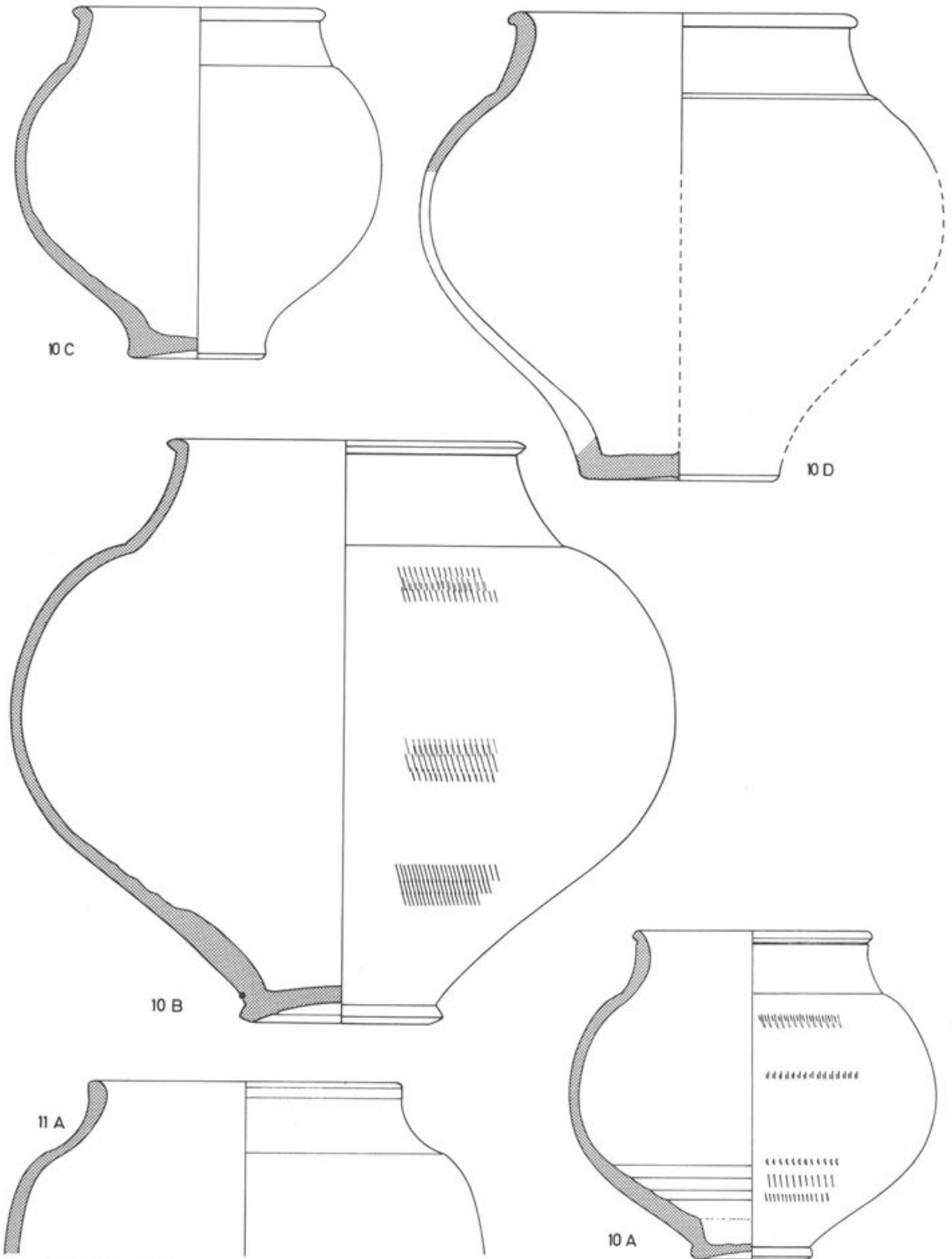


Plate III - 1 : 2

10A-B - Beakers, reddish paste, red clay gloss, rouletted decoration.
10C-D - Beakers, reddish paste, burnished gold mica gilt.
11A - Beaker, smudged black, burnished surface.

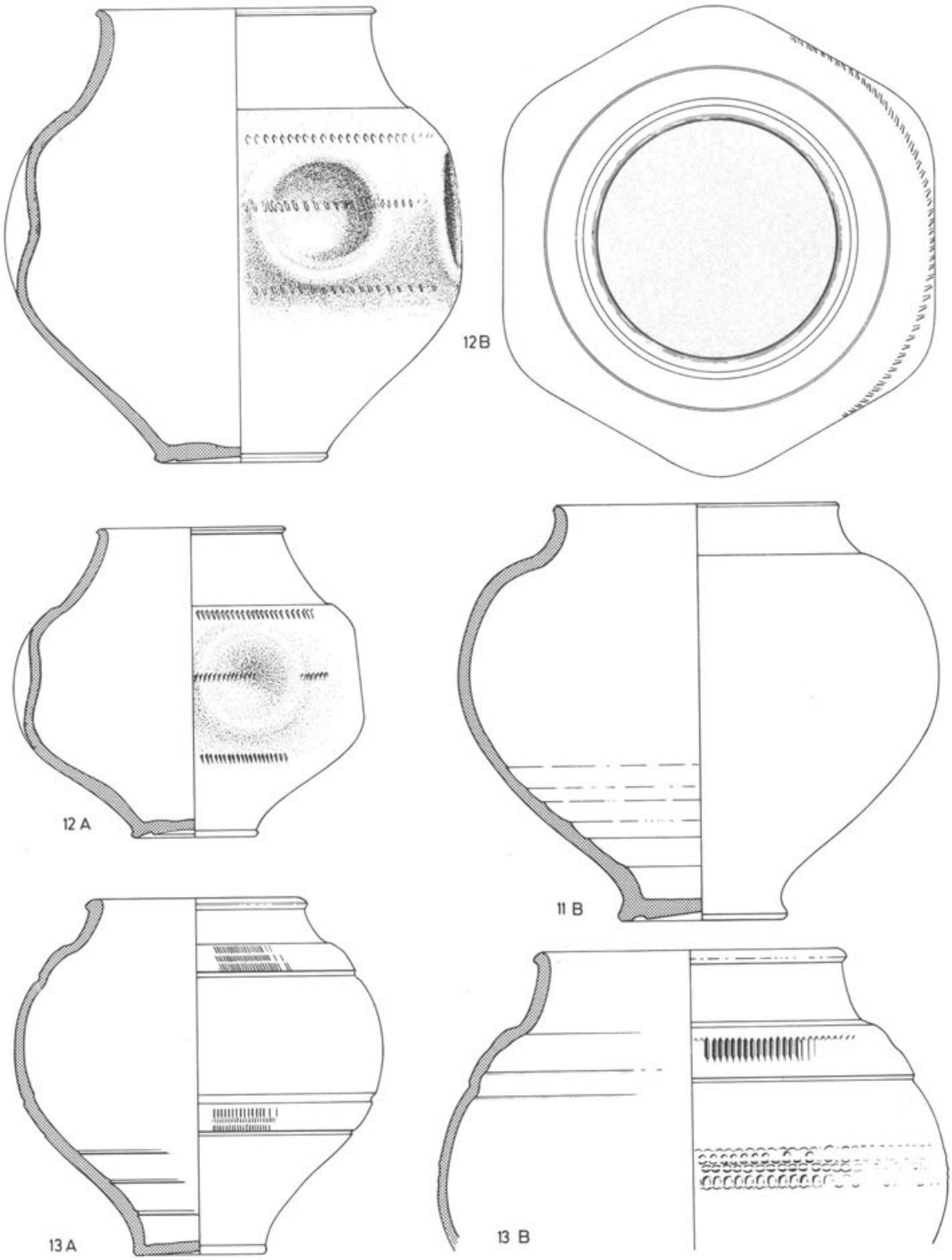


Plate IV – 1 : 2

11B – Beaker, smudged black, burnished surface.
12A–B – Beakers, grey paste, grey to black clay gloss, rouletted and indented.
13A – Beaker, grey paste, grey clay gloss, rouletted.
13B – Beaker, reddish brown paste, light brown clay gloss, rouletted.

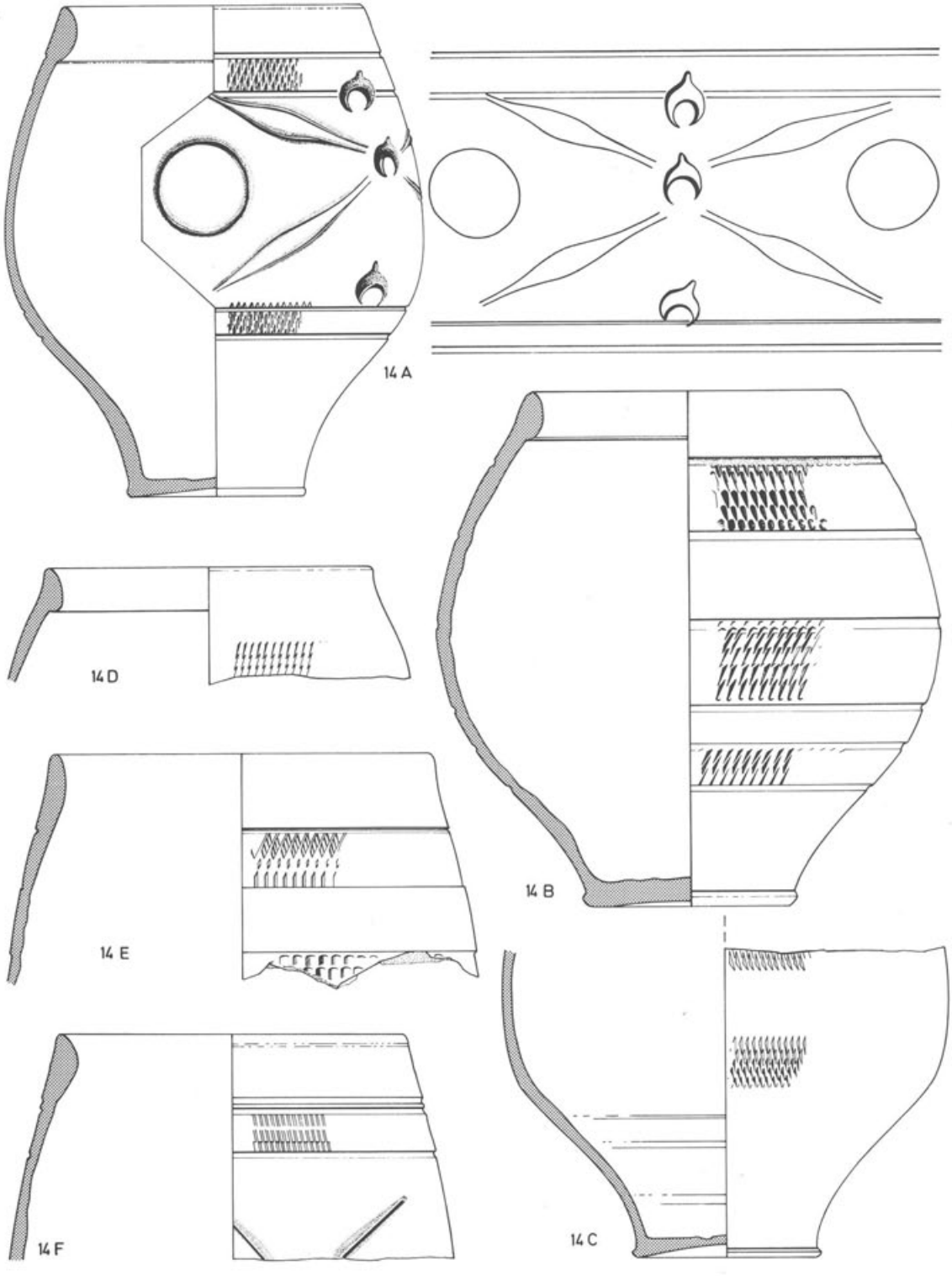


Plate V – 1 : 2

14A–F – Beakers, red, grey or black clay gloss.

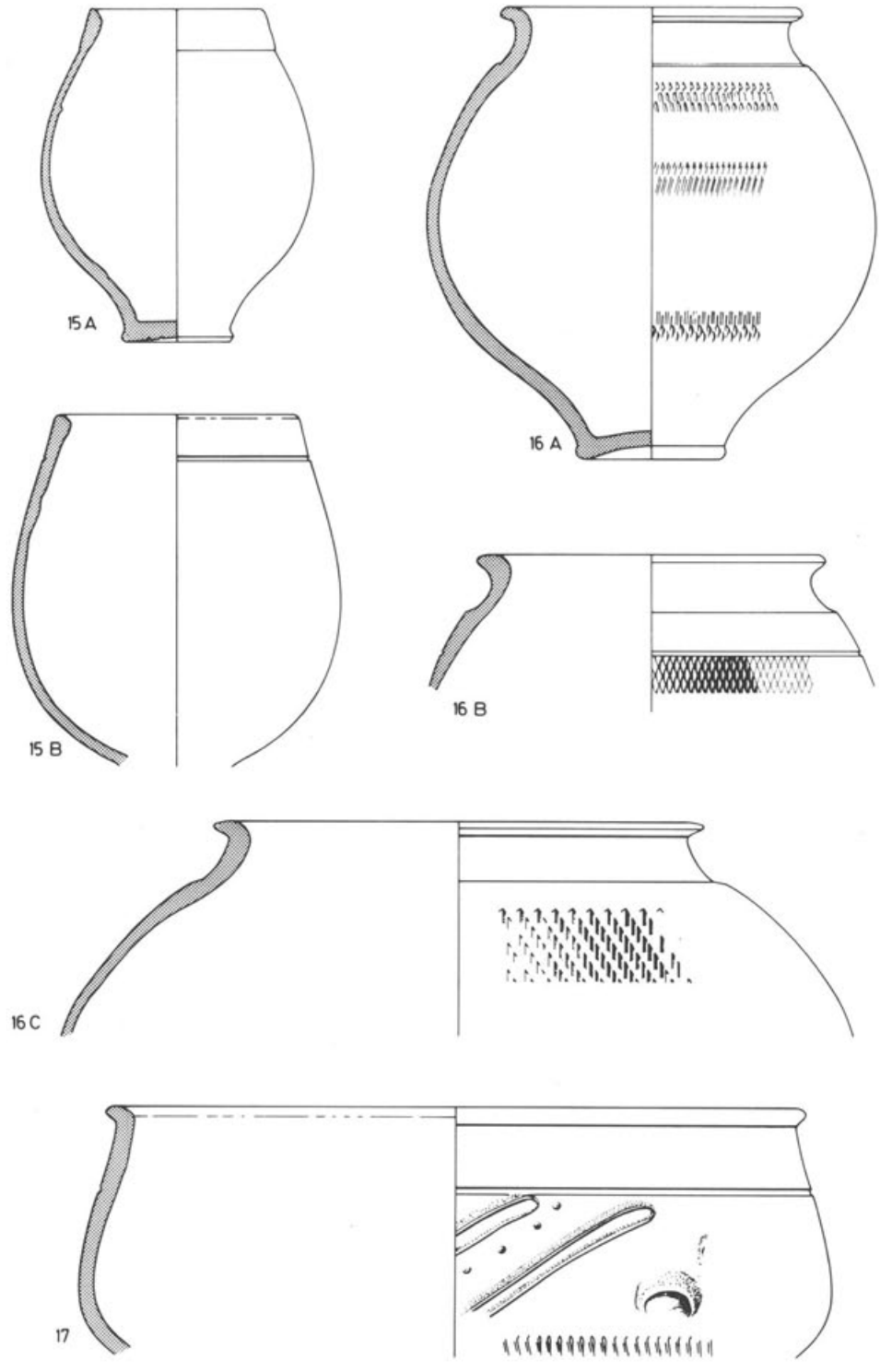


Plate VI – 1 : 2

15A–B – Beakers, red, grey or black clay gloss.
16A–C – Beakers, reddish paste, red clay gloss, rouletted.
17 – Bowl, grey paste, grey clay gloss.

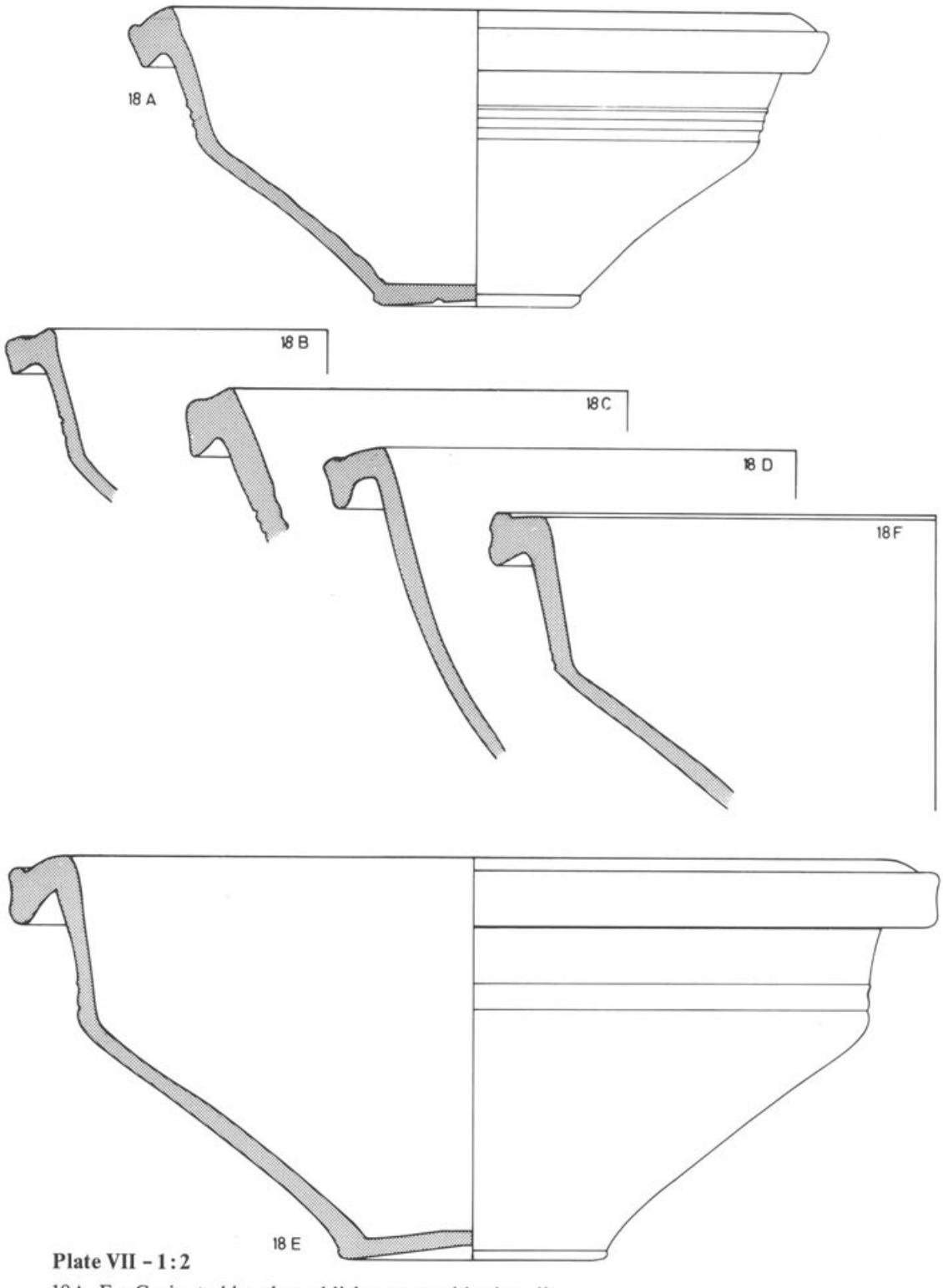


Plate VII - 1:2

18A-E - Carinated bowls, reddish paste, gold mica gilt.

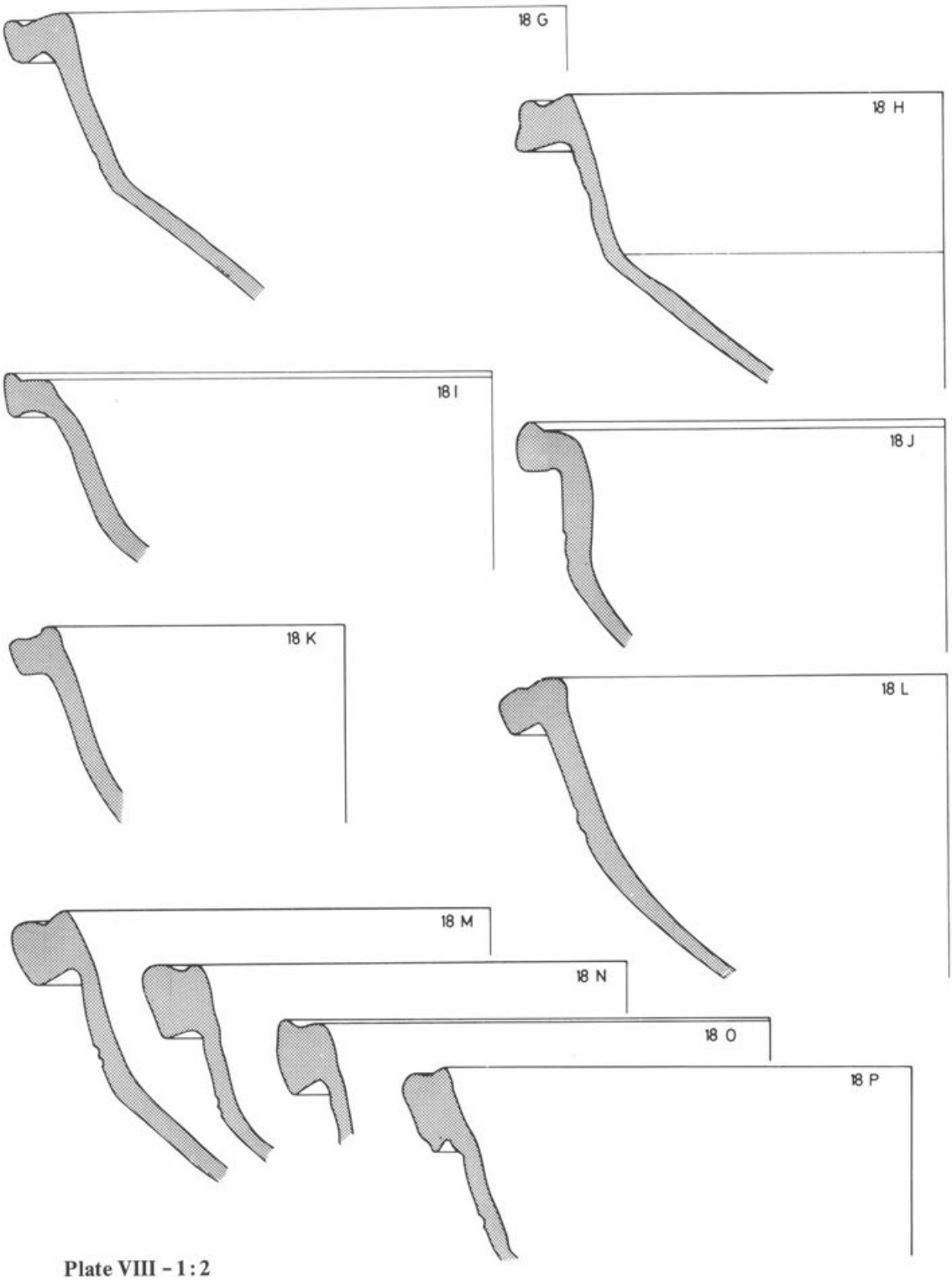


Plate VIII - 1 : 2

18G–I and 18K–P – Carinated bowls, reddish paste, gold mica gilt.
18J – Carinated bowl, reddish paste, red clay gloss.

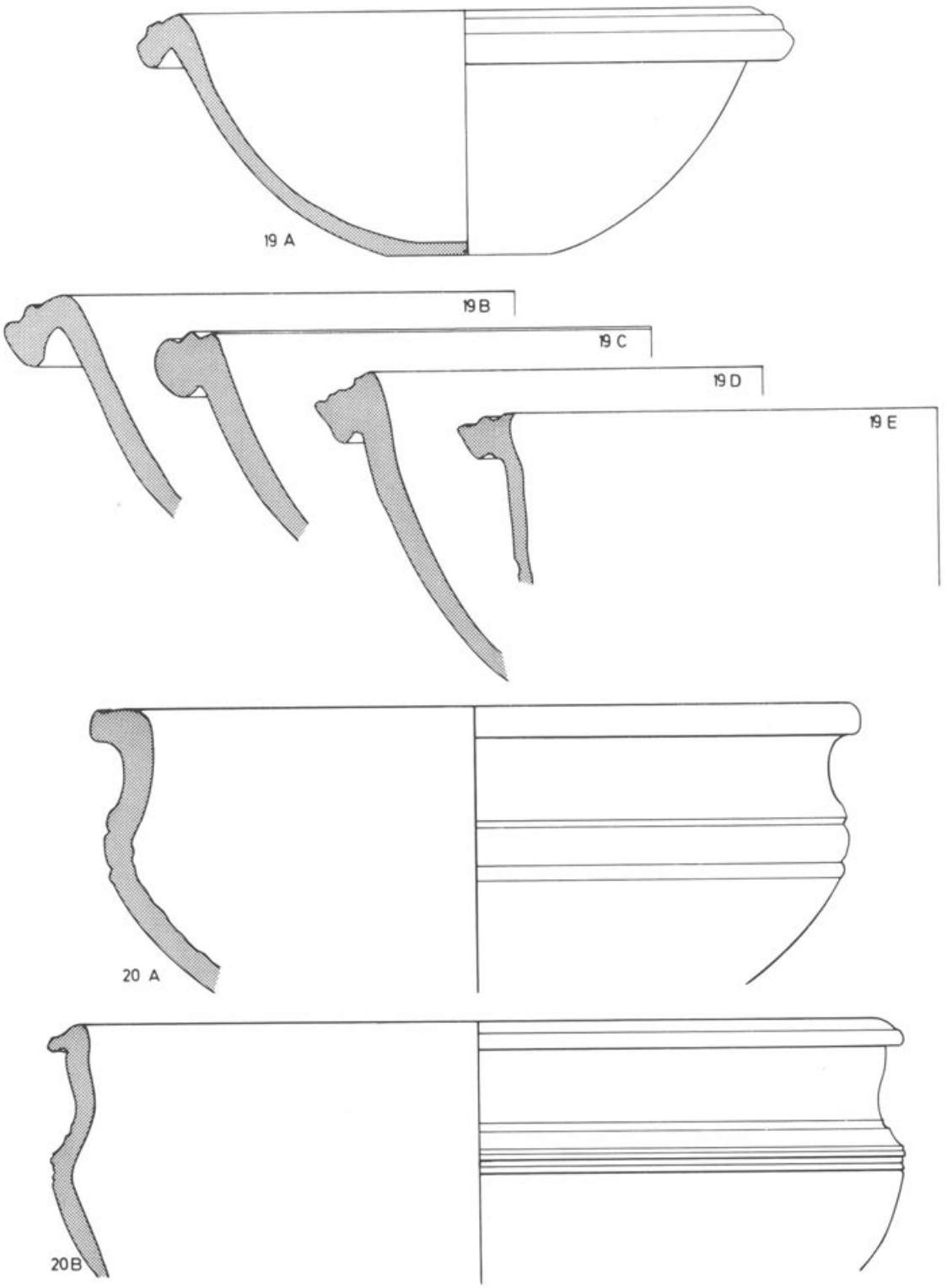
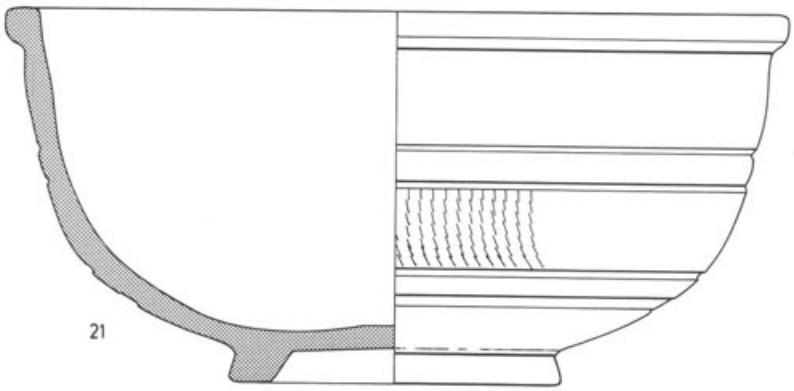
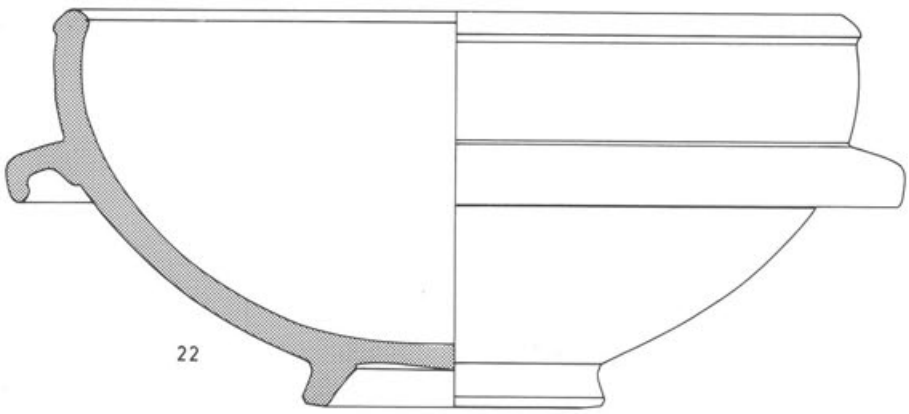
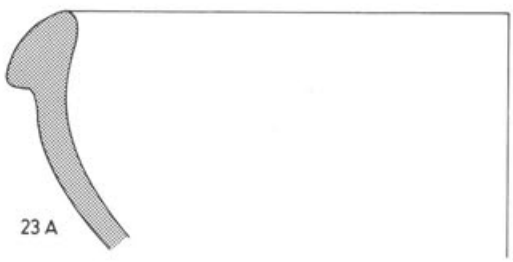


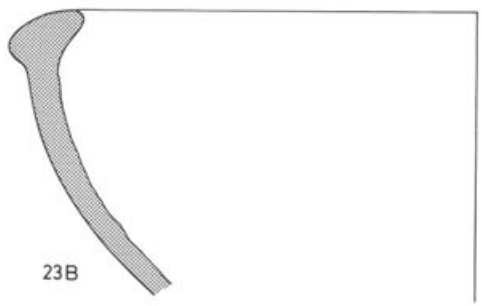
Plate IX - 1 : 2

19A-E - Bowls, reddish paste, gold-mica gilt.
20A-B - Bowls, reddish paste, gold mica gilt.









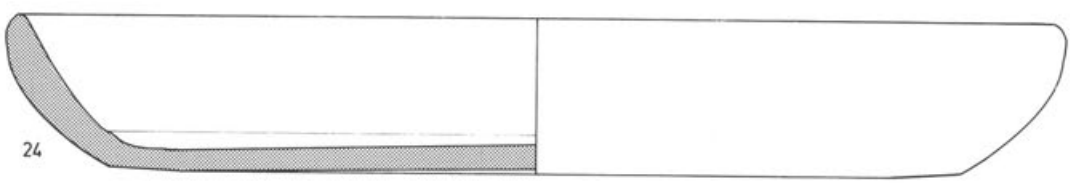
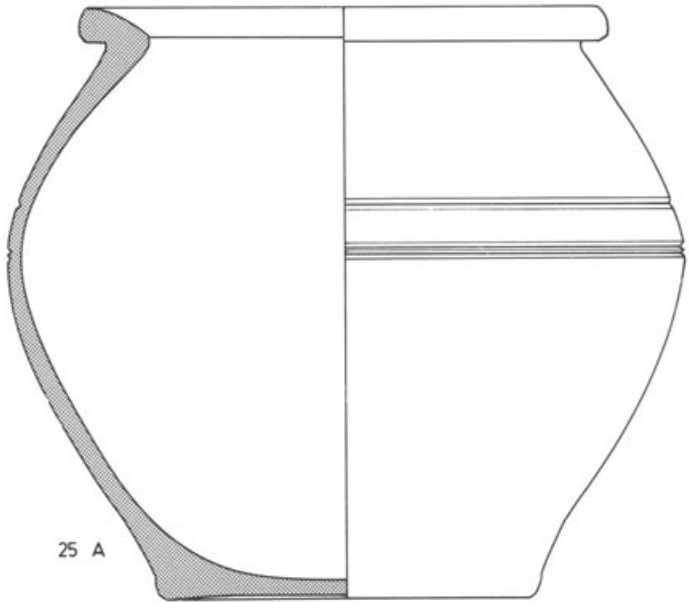
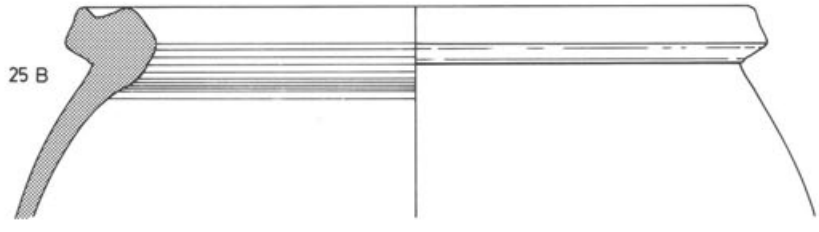


Plate X - 1 : 2

21 - Bowl, reddish paste, red clay gloss.
22 - Bowl, reddish paste, red clay gloss or gold mica gilt.
23A-B - Bowls, grey to black paste, unadorned.
24 - Plates, diverse finishes.





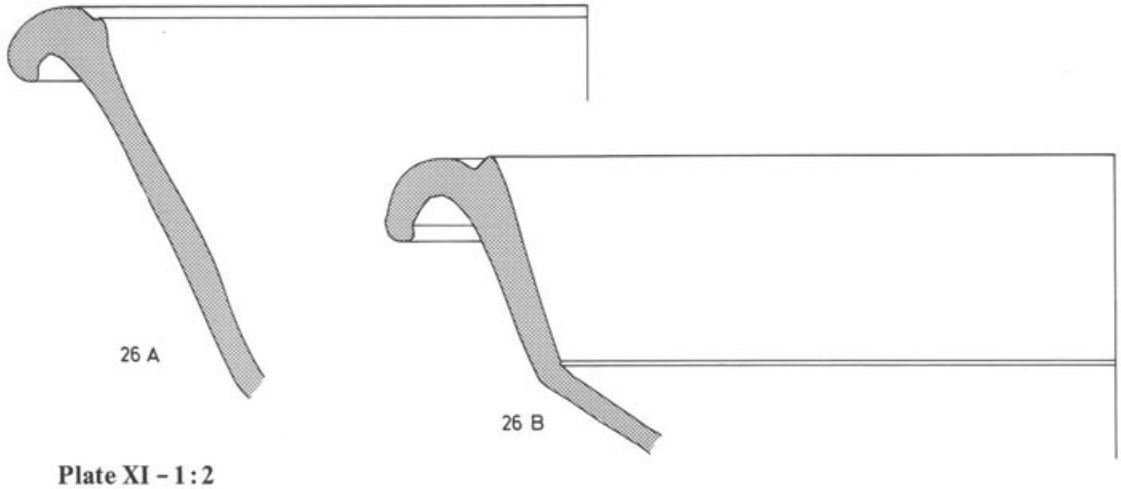


Plate XI – 1 : 2

25A–B – Cooking vessels, heavily gritted paste, grey to black.
26A–B – Carinated bowls, grey to reddish paste, unadorned.

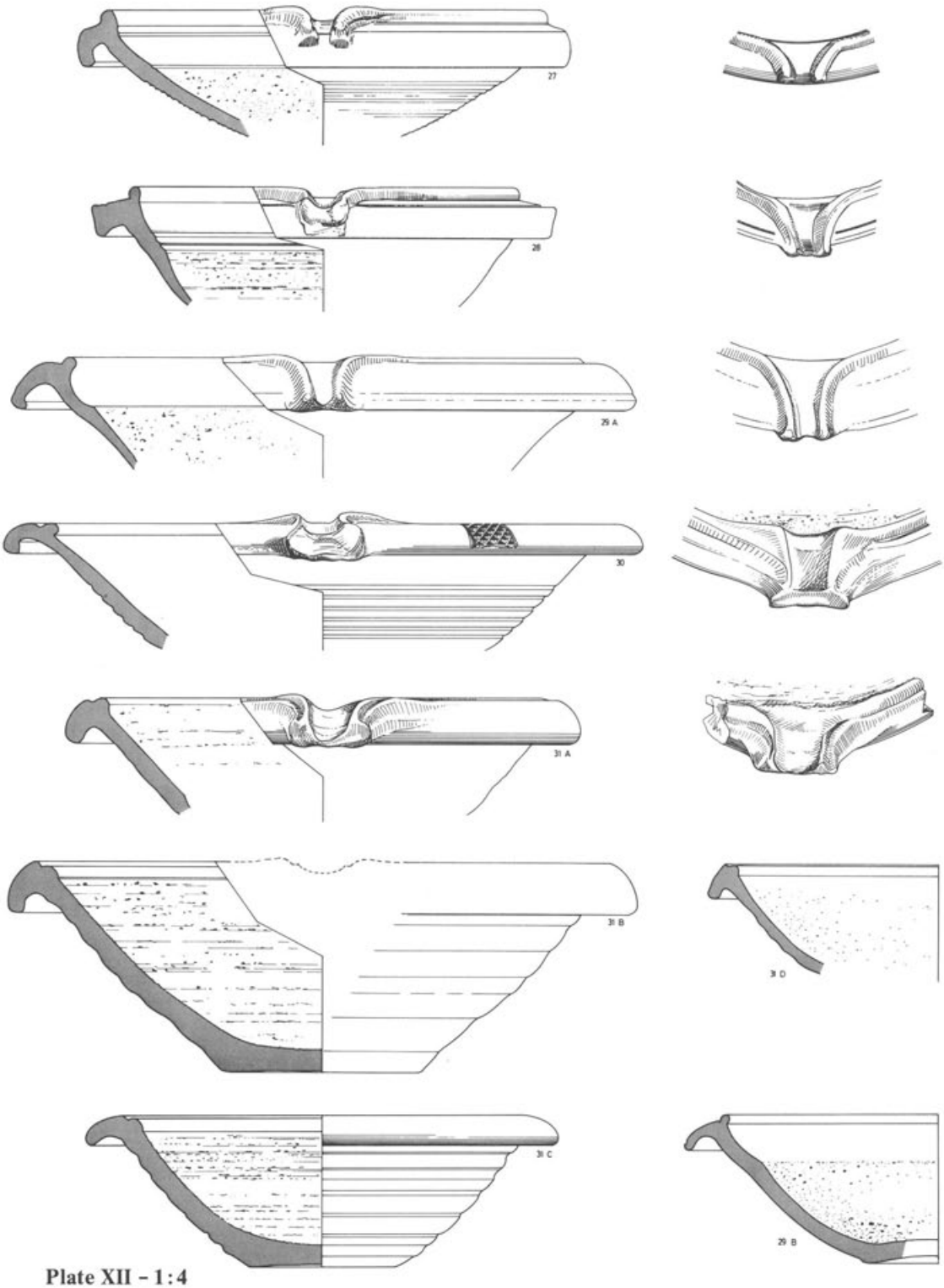


Plate XII - 1:4

27, 28, 29A-B - Mortaria, reddish paste, red clay gloss.
30 - Mortarium, reddish paste, stamped rim (stamp see Ill. 12).
31A-C - Mortaria, reddish paste, unadorned.
31D - Mortarium, light reddish yellow paste with reddish striations.

Inventory of the Excavation

Profile Number	Inventory Number of Profiled Piece	Totals	
1A	68.15024	5	
1B	68.15026	1	
1C	68.15025	3	
1D	68.14161	3	
1E	68.13856	1	
1F	68.14547	3	16
2A rim ø 41 mm	68.14653	18	
2B rim ø 37 mm	68.13503	22	
2C rim ø 68 mm	68.13359	3	
Type 2 rim ø 30 mm		1	
Type 2 rim ø 33 mm		2	
Type 2 rim ø 49 mm		10	
Type 2 size undeterminable		2	58
3A	68.15022	1	
3B	68.15023	1	2
4	68.13796		4
5	68.14554		1
Types 1-5: 1327 WS and 105 BS were discarded			1432
6	68.13897, 68.14066, 68.14539		7
7	68.13731		5
8	68.13844		1
9	68.14545		1
10A	68.13424	3	
10B	68.13426	7	
10C	68.14008	13	
10D	68.13770	8	31
11A	68.13866	1	
11B (not from this excavation)	70.5724		1
12A	68.13386, 68.13400	15	
12B	68.13387, 68.13401	28	43
13A	68.13388, 68.13402	9	
13B	68.13997	1	10

Profile Number	Inventory Number of Profiled Piece	Totals	
14A	68.13385	32	
14B	68.14430		
14C	68.13860		
14D	68.13741		
14E	68.13859		
14F	68.13742	32	64
15A	68.13484	18	
15B	68.14445	1	19
16A	68.13552	10	
16B	68.13906	8	
16C	68.14453	1	19
17	68.14449		1
18A	68.13810		
18B	68.13075	70	
18C	68.13811		
18D	68.13823		
18E	68.13746	29	
18F	68.13748		
18G	68.14054	48	
18H	68.14272		
18I	68.13681	86	
18J	68.13237		
18K	68.13828	16	
18L	68.13815		
18M	68.13668	263	
18N	68.13667		
18O	68.13148	7	519
18P	68.13666		
Type 18: 446 RS, 397 WS and 105 BS (some may have belonged to type 19) were discarded			948
19A	68.13498		
19B	68.13231	18	
19C	68.13674		
19D	68.13153	9	
19E	68.14057		27
20A	68.13830	1	
20B	68.13829	1	2
21	68.13806		4
22	68.14264, 68.14265		6

Profile Number	Inventory Number of Profiled Piece	Totals	
23A	68.13071	8	
23B	68.14610	10	18
Type 23: 53 WS were discarded			53
24	68.13835	4	
Type 24: 1191 WS BS were discarded		1191	1195
25A	68.13443	93	
25B	68.13066	12	105
Type 25: 278 WS and 146 BS were discarded			424
26A	68.14025	6	
26B	68.13876	1	7
27	68.13766		1
28	68.14629		1
29A	68.13696	9	
29B	68.14319	1	10
30	68.13767		5
31A	68.13167	5	
31B	68.14512	10	
31C	68.14028	1	
31D	68.14026	2	18
Ill. 13	68.7579		

Bibliography

Bimson	Mavis Bimson, The Technique of Greek Black and Terra Sigillata Red, Antiquaries Journal 36, 1956.
Binsfeld	Wolfgang Binsfeld, Zu den römischen Töpfereien am Rudolfplatz in Köln, Kölner Jb. für Vor- u. Frühgeschichte 7, 1964, 19.
Bonis I	Eva Bonis, Folia Archaeologica XXI, Sep., Budapest 1970.
Bonis II	Rei Cretariae Romanae Fautorum Acta IX, 1967.
Charleston	R. J. Charleston, Roman Pottery, London 1955.
Drack	Walter Drack, Die helvetische Terra-sigillata-Imitation, Schriften d. Inst. f. Ur- u. Frühgesch. 2, Basel 1945.
Drexel	Friedrich Drexel, Das Kastell Faimingen, Der obergermanisch-rätische Limes Bd. 66 C, Leipzig 1929.
Ettlinger	Elisabeth Ettlinger, Die Keramik der Augster Thermen, Monogr. z. Ur- u. Frühgesch. d. Schweiz 6, Basel 1949.
Ettlinger and Simonett	Elisabeth Ettlinger und Christoph Simonett, Römische Keramik aus dem Schutthügel von Vindonissa, Veröff. d. Ges. Pro Vindonissa 3, Basel 1952.
Farnsworth and Wisely	Marie Farnsworth and Harriet Wisely, Fifth Century Intentional Red, American Journal of Archaeology 62, 1958.
Fischer	Ulrich Fischer, Cambodunumforschungen 1953 II, Mat.hefte z. Bayer Vorgesch. 10, Kallmünz 1957.
Frazer	J. G. Frazer, Adonis, Attis, Osiris, Studies in the History of Oriental Religion, London 1906.
Graillot	Henri Graillot, Le culte de Cybèle, mère des dieux à Rome et dans l'empire romain, Paris 1912.
Georges	Karl Ernst Georges, Ausführl. Lat.-Dt. Handwörterbuch, Basel 1962.
Haffner	A. Haffner, Das Treverer-Gräberfeld mit Wagenbestattungen von Hoppstädten-Weiersbach, Kreis Birkenfeld, Trierer Zs. 32, 1969, 71 ff.
Hampe and Winter	Roland Hampe und Adam Winter, Bei Töpfern und Zieglern in Süditalien, Sizilien und Griechenland, Mainz 1965.
Hawkes and Hull	C.F.C. Hawkes and M. R. Hull, Camulodunum, First Report on the Excavations at Colchester 1930–39, Oxford 1947.
Laur	Rudolf Laur-Belart, Führer durch Augusta Raurica, Basel 1966.
Major	Emil Major, Gallische Ansiedelung mit Gräberfeld bei Basel, Basel 1940.
Morris and Morris	Ramona and Desmond Morris, Men and Snakes, London 1968.
Munsell	Munsell Soil-Color Charts, ed. by Munsell Color Company, 2441 N. Calvert St., Baltimore 18, Maryland 1954.
Noble I	Joseph Veach Noble, The Techniques of Painted Attic Pottery, New York 1965.
Noble II	Joseph Veach Noble, The Technique of Attic Vase Painting, American Journal of Archaeology 64, 1960.
Oelmann	Franz Oelmann, Die Keramik des Kastells Niederbieber, Mat. z. röm.-germ. Keramik 1, Frankfurt 1914.
Oswald and Pryce	Felix Oswald and T. Davies Pryce, An Introduction to the Study of Terra Sigillata, London 1920.

Parmelee	W. C. Parmelee, Ceramic Glazes, Industrial Publications, Chicago 1951.
Rieth	Adolf Rieth, 5000 Jahre Töpferscheibe, Konstanz 1960.
Ritterling	E. Ritterling, Das frührömische Lager bei Hofheim im Taunus, Annalen des Vereins für Nassauische Altertumskunde 40, 1912.
Schonfield	H. J. Schonfield, Those Incredible Christians, New York 1968.
Schoppa	Helmut Schoppa, Die Funde aus dem Vicus des Steinkastells Hofheim-Maintaunuskreis, Veröff. d. Landesamtes f. kulturgesch. Bodenaltertümer Bd. II, Teil I, Wiesbaden 1961.
Schörgendorfer	August Schörgendorfer, Die römerzeitliche Keramik der Ostalpenländer, München 1942.
Shepard	Anna O. Shepard, Ceramics for the Archaeologist, Washington D.C. 1968.
Stähelin	Felix Stähelin, Die Schweiz in römischer Zeit, Basel 1948.
Steiger	Ruth Steiger, G. Theodor Schwarz, Richard Strobel, H. W. Doppler, Insula XXXI 1960/61, Forschungen in Augst 1, Liestal 1975 (forthcoming).
Tomašević	Teodora Tomašević, Die Keramik der XIII. Legion aus Vindonissa, Veröff. d. Ges. Pro Vindonissa 7, Brugg 1970.
Unverzagt	Wilhelm Unverzagt, Die Keramik des Kastells Alzei, Mat. z. röm.-germ. Keramik 2, Frankfurt 1916.
Vermaseren	M. J. Vermaseren, The Legend of Attis in Greek and Roman Art, Leiden 1966.
Vogt	Emil Vogt, Der Lindenhof in Zürich, Zürich 1948.
Walke	Norbert Walke, Das römische Donaukastell Straubing-Sorviodorum, Limesforschungen 3, Berlin 1965.

Zusammenfassung

1968/69 wurde im Südosten der Stadt Augusta Raurica, an der Venusstrasse-Ost ein grosser Töpfereibezirk freigelegt (s. Plan S. 2). Hier wird über die Funde aus einem Teil dieses Bezirkes berichtet (Abb. S. 3). Die untersuchte Töpferei muss etwa von 170–220 n. Chr. in Betrieb gewesen sein.
Besonders guten Aufschluss sowohl in technischer Hinsicht wie in Bezug auf den Formenschatz lieferte ein Komplex, der sich unter dem zusammengebrochenen Boden des Töpferofens II fand. Hier liessen sich ganze Profile aus den Scherben wiedergewinnen und die Oberflächen der Keramikstücke waren nicht durch Bodeneinflüsse angegriffen. Damit eignete sich dieser Fundkomplex in besonderer Weise für die technischen Beobachtungen und Untersuchungen, denen diese Studie eines modernen Keramikfachmannes gilt.
Die ausführliche Beschreibung der verschiedenen hier in Augst gefundenen Töpferwaren dürfte weitgehend auch für andere Orte und Zeitabschnitte ihre Gültigkeit haben. Es werden als Kategorien vorgelegt:

I Glanztonwaren mit eingehender Analyse der Herstellungstechnik. IA und IB unterscheiden sich nur durch den oxydierenden oder reduzierenden Feuerungsprozess, welcher im einen Falle die Keramik rot-orange, im anderen olive-grau bis schwarz erscheinen lässt. Dass die unterschiedliche Farbgebung gewollt war, zeigt sich an den weitgehend verschiedenen Formen in beiden Kategorien. IA = Profile 14A, 15A, 16A–C, 13B, 14B–E. IB = 12, 13A, 14A (nur das profilierte Stück), 14D und E, 15A und B, 17. IC umfasst gröbere Glanztonwaren mit den Profilen 10A und B, 13B, 14B–E, 21, 22, 24, 27, 28 und 29.

II Geschmauchte Ware. Sie wird erzeugt, indem im letzten Stadium des Brandes eine dicke Rauchwolke durch den Ofen gelassen wird, deren Kohlepartikel sich in den Poren des Tones festsetzen, der damit grau bis schwarz gefärbt wird. Bei IIA wird eine Engobe gebraucht um den Glanz zu erzeugen, die ausserdem noch geglättet wird. Bei IIB wird die Oberfläche nur geglättet und erhält einen Überzug.
Der Glanz-Effekt durch Glättung kommt bei bestimmten, sehr feinen Tonen zustande, wenn sie nach der Glättung keiner starken Schrumpfung mehr ausgesetzt sind, also auch nicht bei hohen Temperaturen gebrannt werden.
IIC ist graue Ware mit matter, nicht geglätteter Oberfläche, nur in den Profilen 23A und B.

III Weisse Engobe, nur bei flaschenartigen Behältern vorkommend. Der matte Überzug ist selten rein weiss, meist elfenbeinfarbig. Er wird sehr leicht durch Bodeneinflüsse angegriffen (Säuren!), was bis zur fast gänzlichen Auflösung führen kann. IIIA: Gefässe, die nur mit weisser Engobe versehen sind. Bei IIIB kommt noch eine Bemalung mit Glanztonfarbe hinzu.

IV Ware mit Glimmerüberzug in drei Varianten. Bei IVA wurde der Glimmer zumeist innen und auf dem Rand von Schüsseln mit einem Pinsel direkt nach dem Drehen auf der Scheibe aufgetragen (Profile 18, 19, 20, 24).
Bei IVB wurde der Glimmer im lederharten Zustand aufgetragen und dann eingeglättet (Profile 10C und D).

Bei IVC handelt es sich um Schüsseln, die in lederhartem Zustand und nachdem die Oberfläche fertig überarbeitet war, innen und aussen mit einem Glimmerüberzug versehen wurden. Solche Stücke sind sehr selten.

V Tongrundige Gefässe ohne spezielle Behandlung der Oberfläche.

VI Kochtöpfe, mit 3 verschiedenen Sorten von Magerung. Dabei war auffällig, dass die wenigen Scherben handgeformter Ware sich auch in der Magerung strikte von den anderen unterschieden. Diese Stücke dürften älter sein als die sonstige hier besprochene Keramik.

Eine Untersuchung über das *Rohmaterial* der Töpferei ergab, dass der in Augst selbst reichlich anstehende »verlehmte Lösslehm« verwendet wurde. Es liess sich ferner feststellen, dass alle Sorten der besprochenen Keramik bei etwa 840°–880° C gebrannt worden waren. Es wurden auch Brennversuche mit dem Augster Lehm angestellt, welche formgleiche Kopien der römischen Gefässe mit Glanztonüberzug ergaben, die in Farbe, Struktur und Glanz von den echten nicht zu unterscheiden waren.
Die weisse Engobe zeigte in ihrer chemischen Zusammensetzung, dass hier wahrscheinlich Mergelton verwendet wurde, der nahe beim Augster Osttor zu finden ist.
Der Glimmer besteht aus Muskovit, den man leicht aus zerfallendem Granit ausschwemmen kann.
Alle beschriebenen Formen dürften gleichzeitig hergestellt worden sein. Die Häufigkeit der einzelnen Typen ist aus dem Inventory ersichtlich. In vielen Fällen sind Fehlbrände erhalten.
Die auffallendsten Formen sind zweifellos die zwei- oder dreihenkligen Krüge des Typus 1 und die nahe verwandte Form 3, die fast denselben Umriss zeigt, jedoch keine Henkel besitzt und dafür mit einer roten Glanztonbemalung auf der Schulter dekoriert ist. Es liess sich nachweisen, dass Krüge der Form IA von der Hand eines anderen (bessern!) Töpfers stammen als die gleichartigen Krüge 1B und C.
Krüge des Typus 2 sind immer mit weisser Engobe versehen. Die Kannen der Profile 6 und 7 bestehen immer aus gemagertem Ton wie die Kochtöpfe und sind teils helltonig, teils grau.
Von den zahlreichen, gut bekannten Becherformen 10–16 sei hervorgehoben, dass 10A und B mit gut profiliertem Fuss immer roten Glanztonüberzug tragen, während 10C und D mit nicht abgesetzter Fusspartie mit Glimmerüberzug versehen sind.
Der weitaus grösste Anteil an der Gesamtmenge fällt auf die Schüsseln der Profile 18 und 19 sowie auf die einfachen Teller Typ 24. Bei beiden Formen überwiegt der Glimmerüberzug weitaus den roten Glanzton.
Die Profile 1–16 zeigen eine starke Affinität zu alten Latèneformen, was an vielerlei Einzelheiten aufgezeichnet werden kann.
Die beiden *Öfen* sind sehr gut erhalten. Ihre Abdeckung wird man sich am besten durch mehrere Lagen von Tonscherben zu denken haben, die beim reduzierenden Brand noch mit weichem Ton und Stroh überdeckt wurden.
Einen Hinweis auf die *Töpferscheibe* bildet eine kleine runde Kalksteinplatte mit Mittelloch und Drehspuren.

(Elisabeth Ettlinger)

Résumé

Un vaste quartier de potiers a été dégagé en 1968/69 au sud-est de la ville d'Augusta Raurica, Vénusstrasse-Est (cf plan, p.2). Les trouvailles d'un secteur déterminé, une poterie en activité approximativement de 170 à 220 de notre ère, sont étudiées ici (fig. p. 3).
De précieux renseignements concernant technique et typologie ont été donnés par un ensemble trouvé sous le sol effondré du four de potier II. Ces tessons, dont les surfaces n'ont pas été altérées par le séjour sous terre, ont permis la reconstitution de profils complets, fournissant ainsi le matériel nécessaire aux observations et recherches technologiques d'un expert-céramiste moderne.
La description détaillée des différents types de poterie découverts à Augst devrait valoir, en général, pour d'autres endroits et d'autres périodes. Les catégories suivantes nous sont présentées:

I - Poterie lustrée, avec une analyse détaillée de la technique de fabrication. La seule différence entre IA et IB réside dans le procédé de cuisson, résultant soit en oxydation, soit en réduction, provoquant une coloration rouge-orangée dans un cas, ou olive-grisâtre à noire dans l'autre. Les poteries de ces deux catégories étant de formes dissemblables, il est évident que la différence de teinte est voulue. IA = Profils 14A, 15A, 16A-C, 13B, 14B-E. IB = Profils 12, 13A, 14A (profil seulement), 14 D et E, 15A et B, 17. IC = Poteries lustrées grossières, profils 10A et B, 13B, 14B-E, 21, 22, 24, 27, 28 et 29.

II - Poterie fumée. Elle s'obtient ein faisant passer un épais nuage de fumée par le four au dernier stade de la cuisson. Les particules de charbon se déposent dans les pores de l'argile et lui donnent une coloration grise a noirâtre.
IIA: pour obtenir le lustre, la poterie est enduite d'un engobe ultérieurement lissé.
IIB: poterie sans engobe, à surface lissée. Le lustre est obtenu par simple lissage de la surface de certaines argiles très fines a condition de ne plus exposer la poterie à une réduction et d'éviter une cuisson à trop haute température ultérieurement.
IIC: pterie grise, à surface mate, sans lissage. Profils 23A et B seulement.

III - Engobe blanc. Employé uniquement pour des récipients à usage de bouteille. L'enduit, mat, est rarement blanc pur, plutôt ivoire. Facilement altéré sous les influences acides du sol, il peut disparaître presque entièrement. IIIA: récipients à engobe blanc. IIIB: récipients a engobe blanc ultérieurement lustrés.

IV - Poterie micacée, en trois variantes.
IVA: en général, le mica est appliqué avec un pinceau à l'intérieur et sur le rebord des plats immédiatement après tournage sur tour. Profils 18, 19, 20 24.
IVB: le mica est appliqué sur la poterie alors qu'elle offre la consistance du cuir. La surface est ensuite lissée. Profils 10C et D.
IVC: il s'agit de plats enduits de mica à l'intérieur et à l'extérieur après terminaison du travail de la surface, l'argile ayant encore la consistance du cuir. Ces pièces sont très rares.

V - Récipients en terre glaise, sans travail spécial de la surface.

VI - Pots (marmites). Emploi de trois sortes de dégraissants. Les quelques tessons de cette catégorie, façonnés à la main, se distinguent des autres poteries par le choix des dégraissants. Ces pièces sont probablement plus anciennes que celles dont nous avons parlé jusqu'ici.

L'examen des matières premières utilisées à l'atelier de poterie en question a prouvé l'emploi fréquent, à Augst, de la terre glaise locale. Les céramiques énumérées ont été soumise à la cuisson à la température approximative de 840°-880° C. Les essais de cuisson faits avec l'argile native d'Augst ont donné de véritables copies des poteries romaines lustrées, impossibles à distinguer des originaux quant à la coloration, la structure et le lustre.
La composition chimique de l'engobe blanc laisse supposer l'emploi de l'argile marneuse d'Augst, dont un gisement se trouve près de la porte de l'Est.
Le mica est du »Muskovit« facile à extraire du granite en désagrégation.
Toutes les *formes* décrites datent probablement de la même époque. Le tableau en fin de texte indique la fréquence de chaque type. Dans plusieurs cas, des rebuts de cuisson nous sont parvenus.
Les cruches à deux ou trois anses du type 1, et celles, apparentées, du type 3, de forme semblable, mais sans anse, avec un lustre rougeâtre sur l'épaule, sont, sans conteste, les formes les plus remarquables. Il est prouvé que les cruches forme 1A sont de la main d'un potier plus expert que celles semblables 1B et C.
Les cruches du type 2 sont toujours enduites d'un engobe blanc. Les pots des profils 6-7, en terre glaise enrichie de dégraissant comme les pots (VI), sont tantôt de teinte terreuse, tantôt grisâtres.
Au sujet des formes de gobelets 10 à 16, nombreux et bien connus, remarquons que 10A et B, au pied nettement profilé, sont couverts d'un lustre rouge, alors que 10C et D, dont le pied n'est pas profilé, sont enduits de mica.
La plus grande partie de la poterie consiste en plats des profils 18 et 19, et en assiettes du type 24. Dans les deux cas, l'enduit micacé prédomine sur le lustre rouge.
Les profils 1-16 dénotent une grande affinité avec d'anciennes formes de LaTène, reconnaissable à de nombreux détails.
Les deux fours sont très bien conservés. Il faut les imaginer recouverts de débris de poterie en plusieurs couches et d'un supplément en argile molle et paille lors de cuissons pour obtenir une réduction.
La petite plaque circulaire en calcaire, avec un creux au milieu, portant des traces de tournage, indique le tour du potier.

(Traduction par Yvonne Carjat)