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PREVIOUSLY UNKNOWN MODELS OF RHEINZABERN SIGILLATA-KILNS AND THEIR RELATION TO THE RECONSTRUCTION OF RHEINZABERN SIGILLATA-KILN NO. 6[1]

The 'Kaufmann-models'

The "Historisches Museum der Pfalz" in the city of Speyer, Germany, owns five small-scale models of ancient Roman kilns[2]. Being replicas of Roman 'terra sigillata'-kilns, two of these largely identical models are of exceptional importance (**fig. 1**).

According to latest research results, the "Historisches Museum der Pfalz" acquired these models in the years 1856 and 1858 from a bricklayer named Johann Michael Kaufmann (1791–1861), a resident of the town of Rheinzabern[3]. In the 19th century, numerous original artefacts of the Roman period from Rheinzabern were excavated and sold by this Johann Michael Kaufmann[4]. Alongside, Kaufmann established a business in fake 'antiquities', which is unprecedented to this day. He managed not only to sell his fakes to private collectors in the region, he also deceived many experts and museums in Germany, France, Switzerland and Luxembourg. In contrast to Kaufmann's faked antiquities, the kiln-models are not forgeries, but most likely works commissioned for the collection of the "Historisches Museum der Pfalz".

In order to discover original Roman antiquities, Kaufmann organized several 'excavations', which he documented in an astonishingly conscientious way. As he discovered and documented numerous Roman kilns during his excavations, it is very likely that there is a direct link between Kaufmann's pottery-kiln-models and the discoveries which have been made in the modern excavations of the Roman terra sigillata production centre of Rheinzabern.

Drawings of Roman sigillata-kilns excavated by Kaufmann in the 19th century in Rheinzabern are known from his estate (**figs. 2–3**)[5]. Because of the high correspondence between the details shown in the drawings and the kiln-models, these drawings served most likely as patterns for the making of the sigillata-kiln-models.

Both sigillata-kiln-models have distinctive characteristics:

1) In the interior of the firing chamber, kiln-tubes (so called *tubuli*) stand above the vent-holes of the floor, with further tubes of smaller diameter put inside them (**fig. 4**). Such arrangements of tubes of different diameter, put into each other, are known from the direct vicinity of original sigillata-kilns from Rheinzabern[6].
2) The *tubuli* placed above the circular flue channel, which surrounds the floor of the kiln-models, are not free-standing but covered with a coat of clay, building a closed wall towards the interior of the firing chamber (**figs. 5; 7**). To this day, such coats of clay covering the *tubuli* of the circular flue, are only documented for a part of the known sigillata-kilns (Heiligenberg, Eschweiler Hof, Luxeuil [**fig. 6**], Mareuil, Lezoux; possibly Montans)[7]. This construction not only reduces the inner diameter of the firing chamber, but also its capacity for the kiln-load.
3) At the back wall of the firing chamber (on the opposite side to the stoke-hole) there is a small opening, a useable access to the interior of the kiln. This detail is not shown in the drawing, but only in the models (**fig. 7**). To this day no archaeological evidence has been found of an access to the firing chamber through the back wall of a Roman kiln. However, this could be the result of the fact, that the lower edge of the opening, if it actually existed, was probably situated above the floor. And to this level nearly no excavated kiln was ever preserved.
4) Important elements of the kiln construction (like length and width of the stoke-hole, width of the lateral flues, diameter of the *tubuli*, and so on) are provided with measurements both in the drawings and the kiln-models (e.g. **fig. 5**). These measurements show a close correspondence to the archaeological record of Roman sigillata-kilns at Rheinzabern[8].

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[1] We thank: R. Petrovszky for providing the kiln-models; J. Winkelmann for creating the photos and scans; Ph. Kenrick for his help in translating; N. Cuomo di Caprio, A. Weigel, S. Zabehlicky-Scheffenegger and R. Schulz for valuable discussions and advice.

[2] A museum catalogue of the late 19th century even lists a sixth model, which is now missing; s. L. Mayrhofer, Katalog der historischen Abtheilung des Museums in Speyer (Speyer 1880) 15.

[3] see Hissnauer/Thomas 2011, 19 ff. 125 ff.

[4] see ibid. 7 ff.; M. Thomas, Der Fall Johann Michael Kaufmann. Ein Beispiel antiker Fälschungen und deren Herkunft. In: R. Stupperich (ed.), Zwischen Original und Fälschung. Zur Ambivalenz der Nachahmung in der Antikenrezeption. H. Arbeitskreises Theorie u. Gesch. Kunstgeschichtsschreibung 5 (Stendal 2006) 85–93; id., Der Rheinzaberner Maurermeister J. M. Kaufmann und seine gefälschten Altertümer. Thetis 5/6, 1999, 301–312.

[5] see „Ortsakte Rheinzabern" of the Historisches Museum der Pfalz, Speyer (Germany).

[6] see Reutti/Schulz 2010, 582 note 43.

[7] see ibid. 576 ff. with notes. – We thank Jacques Prudhon and the "Association des Amis de Saint Colomban", Luxeuil-les-Bains, for the excellent new photo of the kiln at Luxeuil (**fig. 6**).

[8] see D. Hissnauer, Ein Werkstattbereich des 3. Jahrhunderts n. Chr. der römischen Sigillata-Töpfereien von Rheinzabern. Forsch. Tabernae/Rheinzabern 2/Forsch. Pfälz. Arch. 4 (Speyer 2014) 80; Reutti 1983, 46 ff.; Reutti/Schulz 2010, 567 ff.

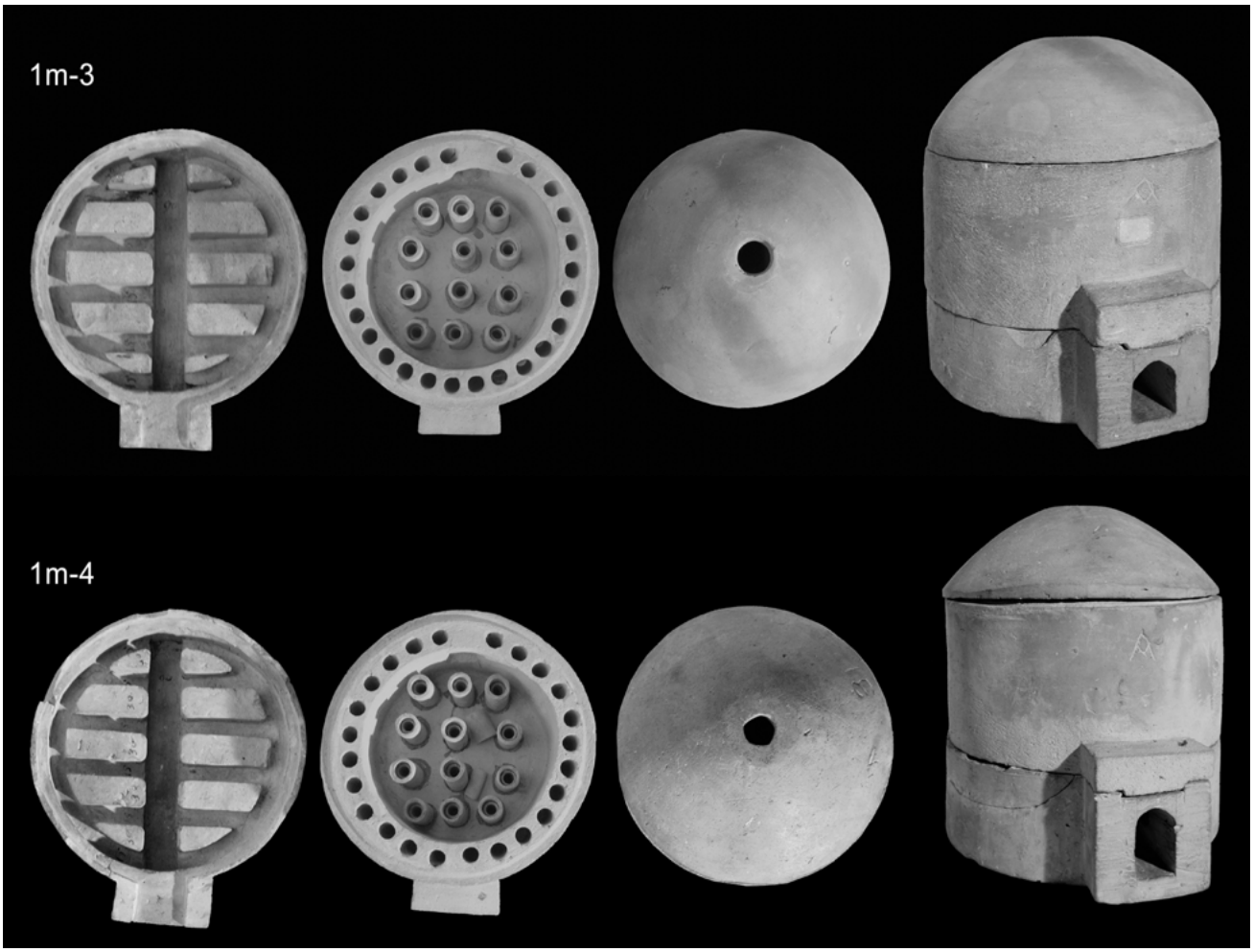

Fig. 1. Two clay models of original sigillata-kilns at Rheinzabern by Johann Michael Kaufmann, made about 1856, today in the "Historisches Museum der Pfalz", Speyer (Germany).

Both drawings and kiln-models made by Kaufmann correspond in every significant detail to the sigillata-kiln-type with tubes above the floor and tubes connected to the circular flue (so called 'four à tubulures'), which appears to be the common sigillata kiln-type in the Gaulish and Germanic provinces of the Roman Empire: in the combustion chamber a main flue with lateral flues leading at right angles towards the outer wall, terminating in the circular flue; *tubuli* connected to the circular flue; few vent-holes in the floor with tubes of different diameter put into each other, standing above the vent-holes[9].

It seems most likely, that Kaufmann saw those 'double'-tubes standing on the perforated floor and the clay-coated *tubuli* above the circular flue as actual archaeological record during the excavation of sigillata-kilns in Rheinzabern, and that he therefore reproduced these elements in the kiln-models. On the other hand the special character of these tubes seems so unusual compared to 'normal' Roman pottery-kilns, that it is inconceivable that Kaufmann simply 'invented' these elements. However, it seems certain that Kaufmann found no 'tournettes' lying on the *tubuli*. Such 'tournettes', a kind of clay plate with a hole in the middle, were placed between the *tubuli* and served as a support for the horizontally placed tiles. As 'tournettes' do not show up in the models, they may not even have been known to Kaufmann[10]. This suggests that Kaufmann may have encountered in his excavations at most only the bottom row of the tube-columns.

The access through the kiln-wall must be treated differently: here it is not possible to decide if it really derives from archaeological evidence. It also could be the result of a clever guess at how to load a kiln with vessels.

The height of the firing chamber along with the dome-like top of the kiln are doubtless purely speculative reconstructions. Because of the ground level in Rheinzabern, no Roman kiln is preserved to this height.

[9] For the principle of „fours à tubulures" see for example N. Cuomo di Caprio, Ceramica in archaeologia 2. Antiche tecniche di lavorazione e moderni metodi di indagine (Rome 2007) 335 ff.; Reutti/Schulz 2010, 567ff.; D. Schaad (ed.), La Graufesenque (Millau, Aveyron). Condatomagos. Une Agglomération de confluent en territoire rutène Iie s.a.C.–IIIe s.p.C. (Pessac 2007) 219 ff.; A. Vernhet, Un four de La Graufesenque (Aveyron): La cuisson des vases sigillées. Gallia 39, 1981, 25 ff.

[10] On the functioning of 'tournettes' in sigillata-kilns see Reutti 1983, 51 note 32.

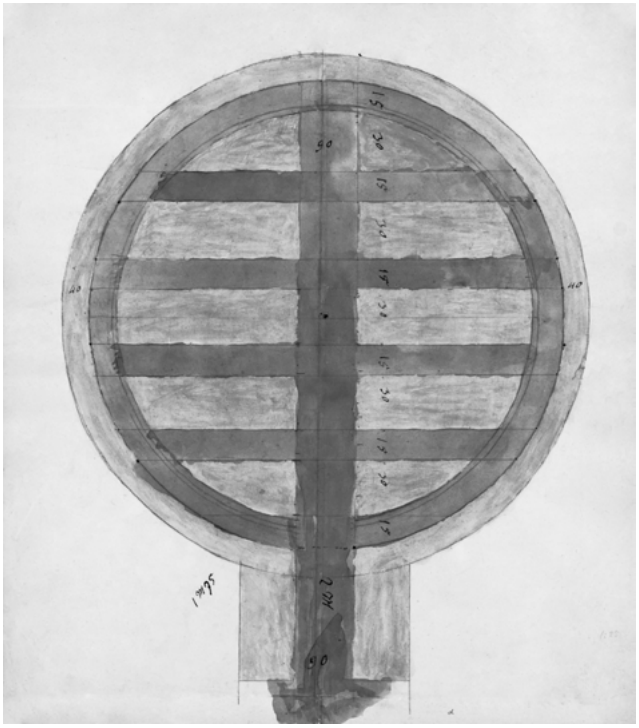

Fig. 2. Design drawing by Kaufmann regarding the building of the kiln-models. Floor plan of combustion chamber.

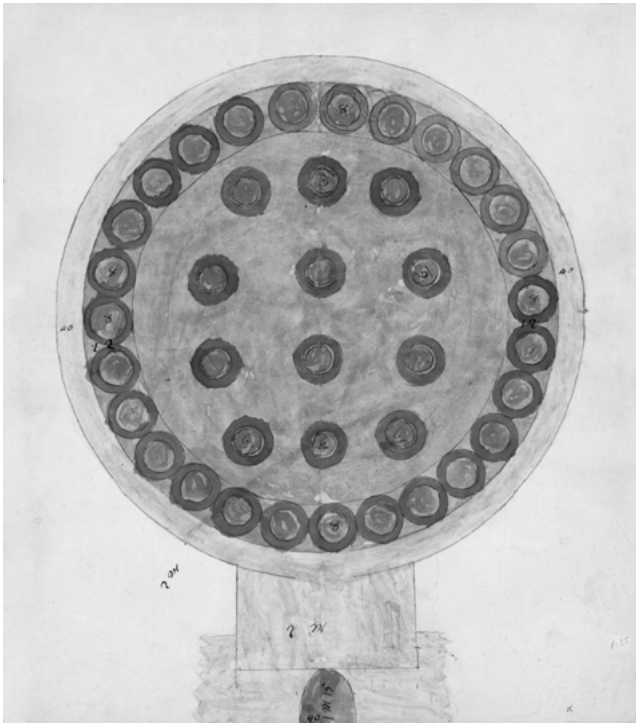

Fig. 3. Design drawing by Kaufmann regarding the building of the kiln-models. Floor plan of firing chamber = mid part.

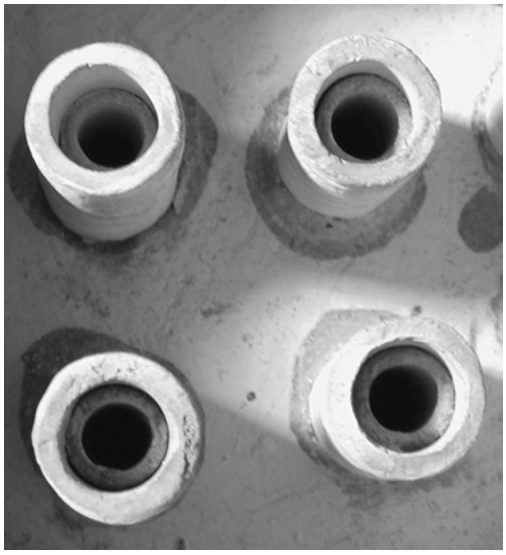

Fig. 4. Kiln-model, detail: 'double' tubes in the interior of the firing chamber.

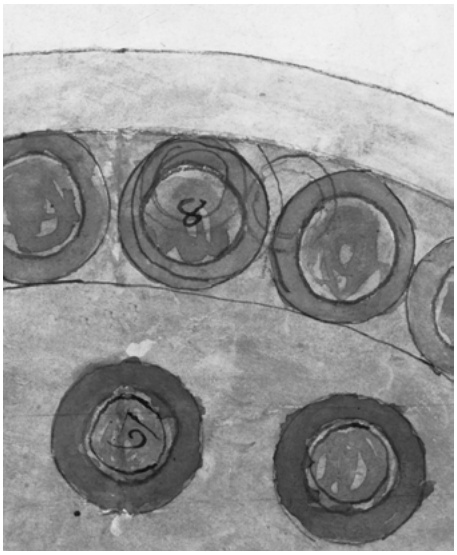

Fig. 5. Design drawing, detail: sketch of tubes of the circular flue at life-size.

So it is assumed that the kiln-models reflect the evidence in the ground of Roman sigillata-kilns. A look at the bottom of the combustion chamber reinforces this impression of an *in situ*-finding. The *tubuli* "stuck" literally in the perforated floor. Also the transition from the lateral flues to the perforated floor is displayed correctly (**fig. 8**). Hence the kiln-models are considered as an important archaeological source relating to the construction type of Roman sigillata-kilns of Rheinzabern.

The sigillata-kiln No. 6 of Rheinzabern (figs. 9–10)

The kiln was situated in one of the long, narrow plots, just about 15 metres away from the Roman main road, located at a place, where previously during the 1st and 2nd century a wooden dwelling-house had been standing. In the vicinity of the kiln several facilities of a Roman potter's workshop were found: a second, poorly preserved sigillata-kiln, several wells and clay-basins, a pit with walls lined with tubes, which had

Fig. 6. Luxeuil-les-Bains (F). Kiln with tubes in the circular flue.

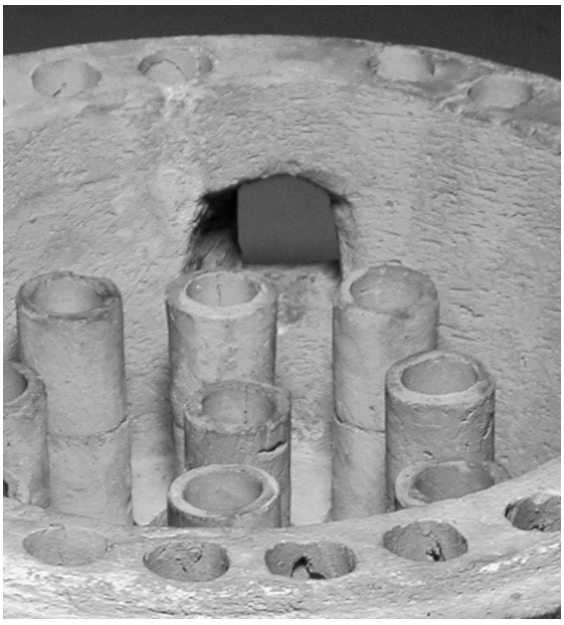

Fig. 7. Kiln-model, detail: opening at the back side of the firing chamber.

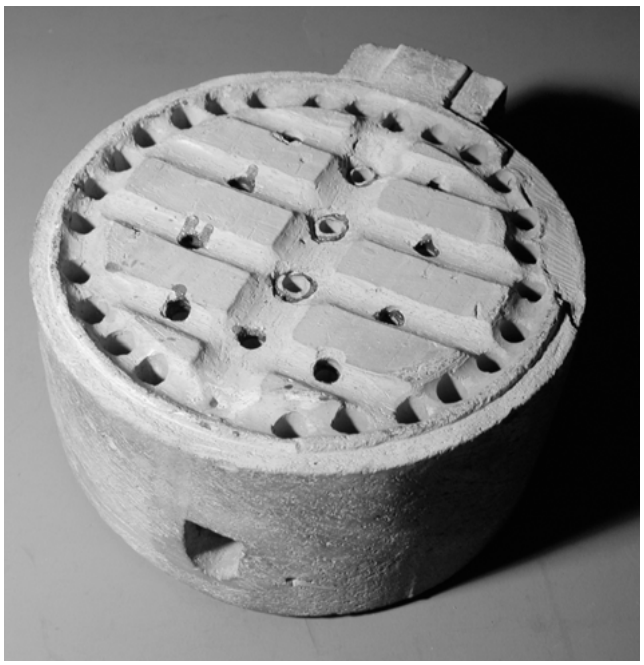

Fig. 8. Kiln-model, floor of the firing chamber: view from below.

probably been used for the preparation of sigillata slip, and also lots of refuse pits. This workshop unit was probably in use in the first half of the 3rd century AD.

Close to the road was found the stoking-pit (3.50 × 6 m) of the sigillata-kiln showing the mouth of the stoking-channel (**fig. 11**). This stoking-channel, consisting of a pointed arch 1.15 m high made from clay bricks, was about 3 m long and almost completely preserved. The stoking-channel continued as the main flue along the total length of the kiln as far as its back wall. The walls of the sigillata-kiln had an inner diameter of 2.70 m and were built from large, initially unbaked bricks made from tempered clay. In the combustion chamber there were four lateral flues, 15 cm wide, set at right angles to the central flue and leading towards the outer kiln-walls. At their outer ends, the lateral flues were connected to a circular flue, surrounding the floor of the kiln. Also the near and far ends of the central flue were connected to the circular flue. Between the lateral flues, the perforated floor was originally supported by 30 cm wide flue walls, which also were made from clay bricks (**fig. 12**).

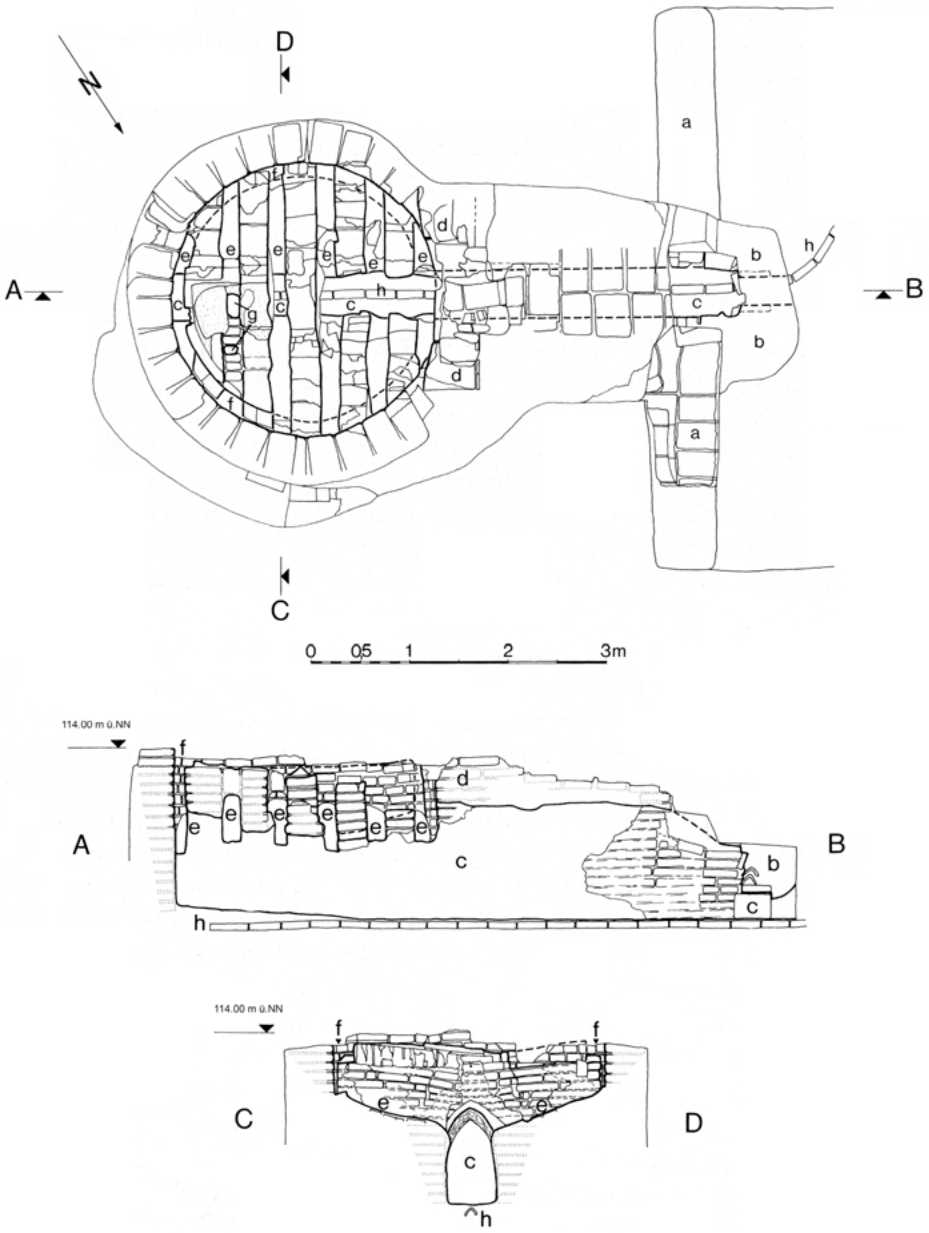

Fig. 9. Rheinzabern, sigillata-kiln no. 6: archaeological evidence; floor plan and sections: **a** wall of the stoking-pit next to the kiln; **b** mouth of stoking-channel; **c** stoking-channel/central flue; **d**: wall between stoking-channel and kiln; **e** lateral flues; **f** circular flue; **g** vent-holes in the perforated floor; **h** conduit made of 'imbrices'.

While the substructure of the kiln was in good condition, only a very small area of the perforated floor of the firing chamber was preserved, showing one vent-hole. A second vent-hole can be assumed nearby, above the central flue (**fig. 9**), so that the rear lateral flue probably was connected to three vent-holes overall. At the edge of the floor, parallel to the circular flue, also some kind of slight upstand made from clay was identifiable. This upstand could be the inner edge of the coat of clay, which presumably covered the vertical *tubuli* standing above the circular flue. Of the superstructure of the kiln no further parts were preserved. Amongst the finds from the surrounding area and the filling of the kiln were found many pieces of firing aids and structural parts from the interior of he kiln such as tubes of different sizes, which are important for the reconstruction of the kiln[11].

The reconstruction of sigillata-kiln no. 6 of Rheinzabern and its relation to the Kaufmann-models

The analytic examination of the forgotten kiln-models by J. M. Kaufmann has caused us to reconsider the previously proposed reconstruction of the sigillata-kiln no. 6 of Rheinzabern[12]. In addition, the kiln-models have led to further thoughts on the process of loading a sigillata-kiln:

[11] see ibid. 46 ff.
[12] Reutti/Schulz 2010, 586 Abb. 23.

Fig. 10. Rheinzabern, sigillata-kiln no. 6: excavation-photograph, general view.

Fig. 11. Rheinzabern, sigillata-kiln no. 6: excavation-photograph, view of the substructure (remains of the floor in the left foreground).

Fig. 12. Rheinzabern, sigillata-kiln no. 6: excavation-photograph, central flue, flue-walls and lateral flues.

As a consequence, the floor area of the sigillata-kiln should be reduced, compared with the previously assumed measures, to an inner diameter of the firing chamber of now only 2.20m (**figs. 13–14**).

Based on the assumption of a 1:1 relationship between inner diameter and height of the firing chamber, the over all height of sigillata-kiln no. 6 of Rheinzabern must be reduced too. It follows that the sigillata-kiln, in correspondence to the very plausible system of tube-columns and horizontally placed shelves suggested by A. Vernhet, probably comprised only five 'stacking- levels'.

For the reconstruction of the perforated floor we assume 14 or 16 vent-holes.

Due to the coat of clay, which, judging from the kiln-models, covered the *tubuli* of the circular flue, we do not assume that parts of 'tournettes' protruded out of the clay-coat, as a support for the horizontally placed tiles (**fig. 14**). Hence there could be no tiles in the outer zone of the firing chamber to enlarge the system of shelves. So for the process of charging the kiln with shelves this means that we would have to assume a certain empty space in the outer zone against the kiln-wall (**fig. 15**). In combination with the assumption of five 'stacking levels' this would mean a significantly lesser capacity regarding the loading of the firing chamber. A solution might have been the presence of somewhat longer tubes, placed vertically around the floor without connection to any vent-hole and thus supporting the horizontal tiles (maybe a little bit smaller than the tiles used in the centre of the firing chamber). A similar solution would apply to the shelves above. Our schematic drawings show potential solutions for the arrangement of the tiles.

To the process of loading a sigillata-kiln with vessels

We imagine the loading of a sigillata-kiln, that features tube columns and horizontally placed shelves as mentioned above, as follows: Through an opening in the outer wall, it could have been possible to get into the interior of the firing chamber and to put in the vessels. At this point, there were either no tubuli at all, or they had to be taken away and replaced after the process of loading the kiln. Theoretically it is also possible that the operators descended a ladder into the firing chamber.

Since we assume that it was not necessary to reduce the tube-columns and the 'tournettes' before loading the kiln, the space to set a ladder should have been limited. As it was therefore possible to load and unload the kiln even with the tube-columns almost entirely in place, we believe that the system was left in the firing chamber, unless parts of spacers had to be replaced. The shelves in the core area of the firing chamber, e.g. the three or four inner tiles in the middle row or the six tiles in the transverse direction to these, could have also stayed in all the floors. These tiles could be loaded with pots from the edge of the kiln interior and the empty spaces between the tube-columns. For the upper floors with a height of tiles of about 1.80 m above the ground, one could have used a small ladder or a stool. Likewise, the loading of each top floor by the previous removal of the roof of the kiln is conceivable. After the outer tile rows were placed between the tube-columns, one might have loaded the shelves. At the end, even the empty spaces in the outer zone of the firing chamber could have been provided with shelves, with the aid of the blind *tubuli*, which had no connection to the vent-holes of the perforated floor (**figs. 14–15**). The working direction would be in each case from the farthest point from the opening towards the opening of the wall. Here too, the blind tubes

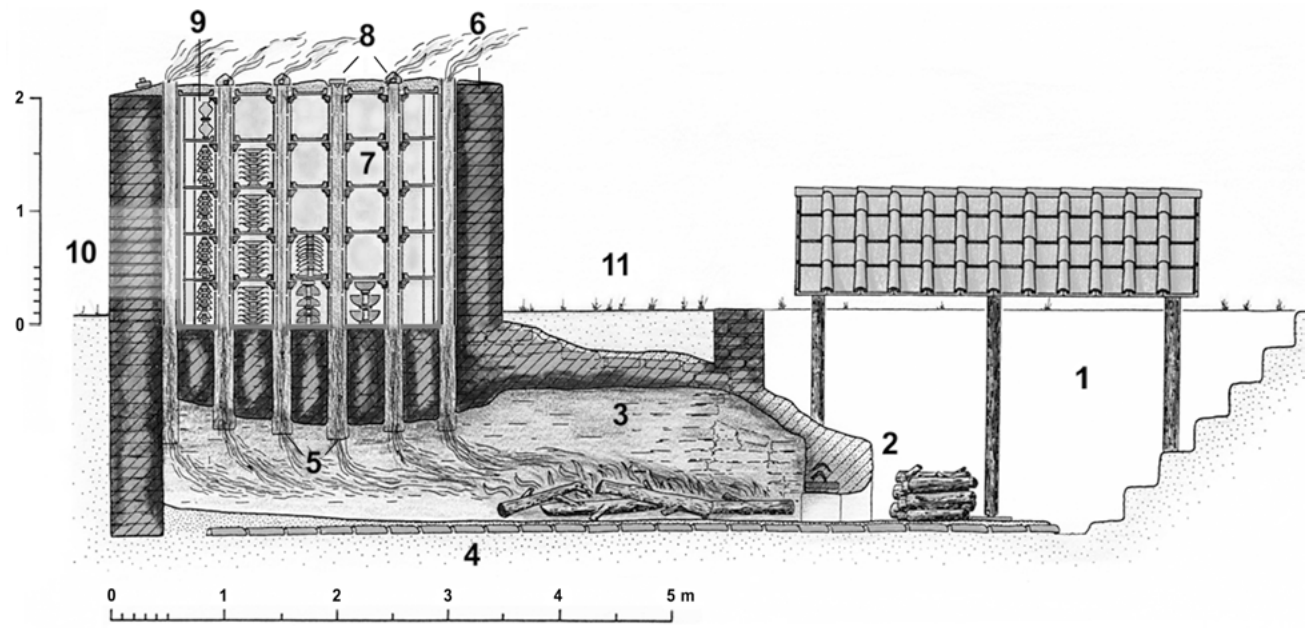

Fig. 13. Rheinzabern, sigillata-kiln no. 6, longitudinal section. New, modified reconstruction (2014). – **1** roofed stoking-pit; **2** mouth of the stoking-channel for feeding the kiln; **3** stoking-channel and main flue; **4** line made from semicircular flues; **5** lateral flues and flue walls; **6** (outer) kiln-wall; **7** firing chamber; **8** vertical line of tubuli for conducting and shielding of the heating gases; **9** piled terra sigillata-vessels; **10** possible access through the kiln wall; **11** ancient surface.

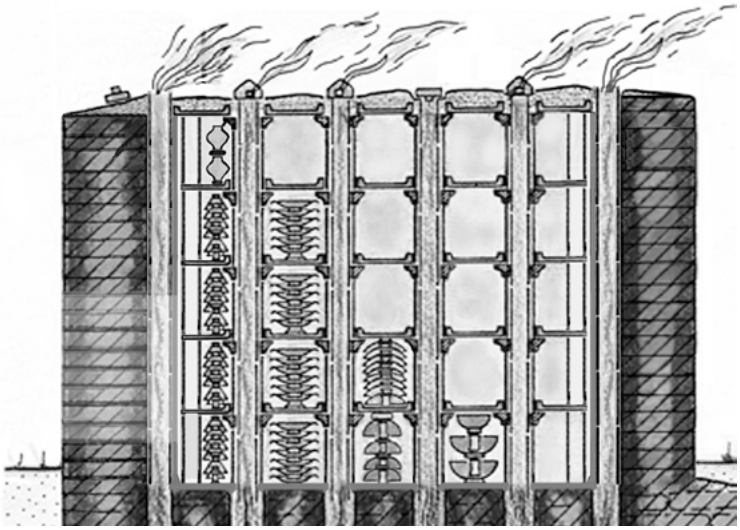

Fig. 14. Rheinzabern, sigillata-kiln no. 6, longitudinal section. Reconstruction (2014). Detail: firing chamber.

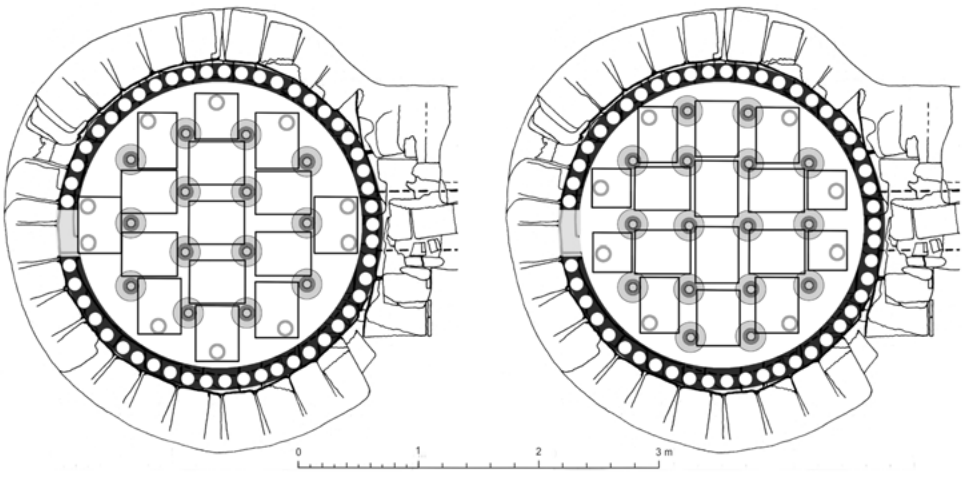

Fig. 15. Rheinzabern, sigillata-kiln no. 6. Reconstruction of the tiles serving as shelves for the vessels. Left: 14 vent-holes assumed. Right: 16 vent-holes.

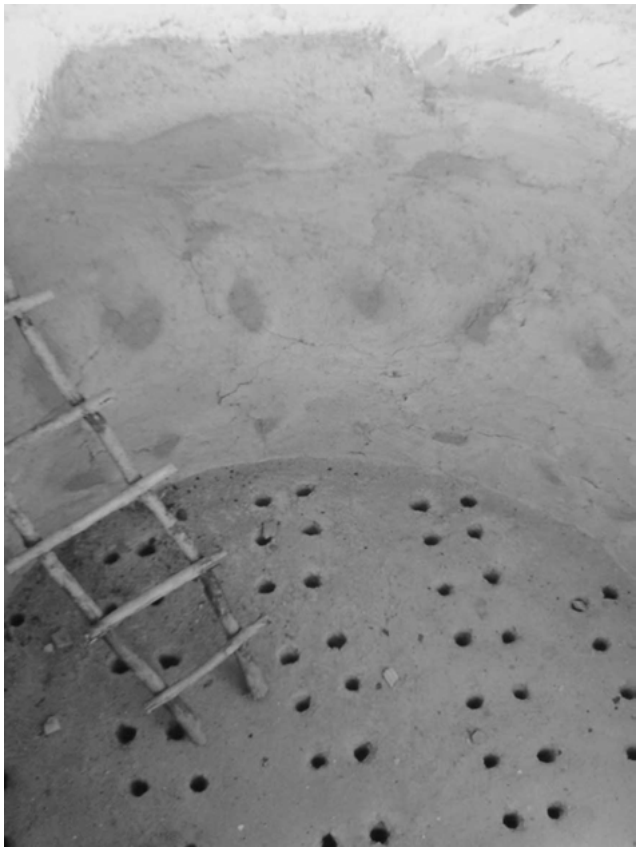

Fig. 16. A wooden ladder inside of a modern pottery kiln at Menderes valley (Western Turkey).

can go up to the roof area to be used by all 5 floors, if a small ladder or a stool, leaning against the outside wall, was used to put the vessels onto the shelves (**fig. 16**).

After loading the kiln the wall opening had to be closed, and any openings that had been made in the roof. It was important to ensure that the tiles used to close the wall opening could be easily removed after the kiln firing, back to the outside without the danger of falling into the interior of the kiln.

Is it now possible to deduce from the construction of such a model, how many vessels were actually fired in the kiln? We believe that this is currently not possible for several reasons. For example it is difficult to determine what impact the demand from dealers and customers had on the numerical ratio of vessel types within a single kiln charge. Although the listings that are known from firing lists, especially of La Graufesenque, initially appear fascinating, they contain little reliable information on how many different vessel types were fired within a kiln charge. Based on the calculations of firing lists from Chémery-Faulquemont, B. Hoerner and M. Scholz already showed that the calculations based on the high numbers mentioned in the firing lists do not necessarily have to designate a single kiln charge, but rather may relate to the scale of production of several potters for a given period of time[13]. The firing lists "Kat 1–2" from Chémery-Faulquemont, which allegedly list over 48 000 vessels, significantly exceed the quantities known from firing lists from La Graufesenque (usually under 30 000)[14]. B. Hoerner and M. Scholz doubt that the workshops of Chémery-Faulquemont possessed greater sigillata kilns than those in La Graufesenque[15]. If we connect this statement now with the research conducted by D. Schaad regarding the excavation record of the "grand four" of La Graufesenque, that results in a much smaller size and capacity of the kiln[16], it is even less likely that the firing lists, that list tens of thousands of vessels, can actually be related to a single kiln charge.The firing lists from La Graufesenque mention Latin and Gallic vessel names with their quantities. However, an identification of the Latin terms with actual vessel types is extremely difficult[17]. Even where the firing lists indicate certain vessel sizes, they refer mostly to the diameter, but rarely to the height, on which depends on how many vessels fit on a stack[18]. Even if R. Marichal's reconstruction of the loading process in La Graufesenque and the resulting quantities of vessel stacks could be possible, one may doubt whether this would be applicable to other manufactories[19]. Therefore, we refrain from speculation about the numbers that could be fired in a kiln of Rheinzabern type.

Conclusion

The kiln-models by Kaufmann, fallen into oblivion, are of remarkable importance regarding actual, partially open questions relating to the superstructure and the interior construction of sigillata-kilns. The quality of the information was surely enhanced by the early date of the excavation of the original kilns and Kaufmann's distinctive power of observation. These kiln-models not only confirm constructive details, which could hitherto be deduced only by combination of archaeological record from several sites, such as the usage of 'double' tubes in the firing chamber; but they also contain potential clues to hitherto unknown elements of the kiln-construction like the passage through the kiln-wall. This was followed by considerations of the internal structure of the kiln related to its total height. In addition, consideration was given to how the combustion chamber can be exploited best by the use of shelves and how the loading process could have taken place.

Credits

Figs. 1; 4; 7–8: Historisches Museum der Pfalz, Speyer / Photo: J. Winkelmann; **sigs. 2–3; 5:** Historisches Museum der Pfalz, Speyer; **fig. 6:** Association des Amis de Saint Colomban, Luxeuil-les-Bains (F); **figs. 9–12:** Generaldirektion Kulturelles Erbe Rheinland-Pfalz, Direktion Landesarchäologie, Außenstelle Speyer; **figs. 13–15:** F. Reutti; **fig. 16:** S. Zabehlicky-Scheffenegger.

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[13] see Hoerner/Scholz 2000, 44 f.

[14] see Marichal 1988, 150 ff. (n. 23).

[15] see Hoerner/Scholz 2000, 44.

[16] see D. Schaad, Le „grand four" de La Graufesenque et un four à sigillées de Montans: étude comparative. Aquitania 23, 2007, 171 ff.

[17] Marichal 1988, 83 ff.

[18] see ibid. 81f.; Galsterer 1990, 291.

[19] see Marichal 1988, 103 ff.

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