

Holger Schaaff, **Antike Tuffbergwerke am Laacher See - Vulkan**. Mit einem Beitrag von Lutz Grunwald. Monographien des Römisch-Germanischen Zentralmuseums, volume 107. Vulkanpark-Forschungen. Untersuchungen zur Landschafts- und Kulturgeschichte, volume 11. Publisher of the Römisch-Germanisches Zentralmuseum, Mayence 2015. 243 pages, 193 illustrations, 5 additional plates.

This detailed, well-documented, and accessible study deserves to be read by all archaeologists, stone specialists, and in fact everyone with a large interest in provincial Roman archaeology, engineering, and architecture north of the Alps.

As a study laying stress on a regional subject with a broad impact on Northwestern provincial Roman Archaeology the ›Forschungsbereich Vulkanologie, Archäologie und Technikgeschichte (Außenstelle Mayence)‹ of the ›Römisch-Germanisches Zentralmuseum Mainz‹ once again proves that regional research topics can be of great relevance for research elsewhere or for studies with a broader scope.

The first reports on ancient tuff exploitations date back to the middle of the nineteenth century, soon followed by their publications. A lot of discoveries are strongly connected to Jakob Meurin, who owned a big quarry in the Krufft Valley. It took more or less one century before new intense research was carried out in the region, with Josef Röder. Since then, the number of sites in Krufft, Kretz, Nickenich, and Plaidt has steadily increased, with their highest concentration in the ›Trasswerke Meurin‹. The ›Bergwerke Meurin 1 to 6‹ offered a good opportunity for modern and detailed excavation, starting with Meurin 1 in 1997, succeeded by an intense collaboration between the federal state Rhineland-Palatinate, the administrative district Mayen-Koblenz, the municipality Kretz, the ›Trasswerke Meurin‹ and the ›Generaldirektion Kulturelles Erbe Rheinland-Pfalz‹. The roofed-over site Meurin 2, known as ›Römerbergwerk Meurin‹ since the year 2000, has even become one of the best accessible archaeological sites for visitors north of the Alps, having won twice the ›Europa Nostra Award‹, in 2003 and 2010.

It is surprising to learn that the Romans from the very first moment they put foot on the left river banks of the Rhine, in the period of Augustus, began exploiting the tuffs, and that this process is still continuing. Apparently they had an excellent knowledge of the geological conditions of the area, which is also proven by the early use of, for instance, Norroy limestone from the Lorraine region. The proximity of both the Rhine and the port of Andernach made the tuff exploitation a success story. Volcanic tuff was transported down to the Rhine delta and was used in the Roman settlements as far as Zeeland (e.g. in the Nehalennia sanctuary of Colijnsplaat, Netherlands). The big advantage of volcanic tuff is that, once brought to the surface, it loses weight, but stays solid. From this point of view, it has something in common with our modern cinder blocks.

The first chapter, dealing with the history of research, covers the different stages of the discoveries, beginning with Karcher's documents on the Kruft Valley in 1855. Much attention is given to unpublished material, including sketches of underground networks, structures, and cross sections. Usually unpublished photographic documents, dating from the beginning of the twentieth century, highlight the different activities of the mining companies as well as the conditions in which a lot of »Altmänner« (former mining corridors) were found, and describe the problems of interpreting this kind of documentation. As most of these exploitation areas have disappeared, a lot of information in this chapter, like the discovery of Roman opencast mining, engravings, altars, and inscriptions in the quarry of Idylle near Kruft (1912–1927) remain the only place where one can find a good overview of the antique mining activities. With Röder's central personality, a first phase of thorough and systematic research started in the nineteen-fifties, resulting in many publications. But first in 1997 well-structured, modern, and multidisciplinary research began.

The next chapter deals with the geological characteristics of volcanic tuffs and the geometrical features of the exploitation areas. The volcanic ash layers and their consolidated product, the volcanic tuffs, originated about thirty thousand years ago, from pyroclastic flows of the Laacher See Volcano that were deposited in the Kruft and Brohl Valleys. The author uses the descriptive term »Trass« according to Röder, to designate specific consolidated volcanic rocks, more precisely volcanic tuffs. However, the name of »Trass« is used in the construction industry to designate grinded volcanic tuff, a powder showing good hydraulic properties when mixed with lime or cement (and water). The best outcrops of volcanic tuffs are still the former quarry walls of the Meurin Trassworks near Kretz and Nickenich.

The best geological sections hereto published also concern these areas. The author refers to an »ideal« lithological log already published by Röder in 1957, and to the so-called »Trass-section« by Josef Frechen (1976) showing the following lithological subdivision (from top to bottom): Bims – Römertuff – Tauch – lower Tuff or Laacher Bims with ash-rocks-ash – rocks – ash – rocks. The »basic« threefold subdivision into »consolidated Römertuff«, »unconsolidated Tauch« and »consolidated lower Tuff« can be observed in other sections of the actual quarry of Meurin and in several boreholes carried out on the property of the Meurin Trassworks. However, good outcrops are no longer visible or accessible, because of modern excavation activities that have destroyed the former quarry walls. Already during Röder's time, quarrying activity was rather restricted, resulting in the lack of new and good additional geological sections. The reader who is not familiar with the Eifel volcanic deposits might miss a brief macroscopic description (colour, texture, grain size, etc.) of the different volcanic rock types mentioned above, and some hint to how to distinguish them.

For the geologically more experienced reader, a more detailed lithostratigraphical section, relating the local succession of volcanic strata to the standard regional stratigraphical scale, would have been most useful as well. Furthermore, since Römer Tuff (main target of the antique quarry activity) was a very important building stone during Roman and post-Roman times (encompassing a major part of Western Europe). A short discussion of the main mineralogical and physical characteristics of this particular building stone would also have been helpful.

The author continues with a very detailed description of the lithological successions at different spots in neighbouring quarries and in different boreholes, demonstrating the variation in thickness of the individual geological layers, also using historical documentation such as black-and-white photographs. Although Röder had already complained about the loss of witnesses of antique quarrying techniques due to modern excavation, he managed to draw an »ideal« cross section (block diagram) of the tuff deposits, their exploitation methods and geometrical features in the Brohl Valley, based on his own observations over the years and on several interviews with quarry workmen. The chapter ends with a detailed description of the antique excavation areas within the Kruft and Brohl Valleys. Particular »veins« and mushroom-like consolidated parts within the tuff are geological phenomena that still deserve some more explanation.

A detailed report of the fifty-nine mining complexes constitutes the next and major chapter of the publication (pp. 29–131; appended detailed maps also refer to this chapter). The chronology of a lot of these complexes remains problematic, as shown by the exhaustive study by Lutz Grunwald. A lot of fillings seem to contain shards from the eleventh up to the fourteenth century. More than fifty complexes are located in the Krufter Bachtal (Kruft, Kretz, Nickenich, Plaidt, and others), whilst only five complexes are located in the Brohltal and the Tönnissteiner Tal. For each complex, the reader gets, besides a brief evaluation of the extraction site, information on the chronology, the quarry dimensions, possibly the extracted volumes, as well as the extraction techniques used and, wherever possible, good photographs and plans.

Of course, the most recent excavations offer more insights than the old ones. Nevertheless, a site like »Fundstelle 18, Grube Idylle« (Kruft and Kretz), although dating from 1912–1925, provides us with so much information that one is amazed about the stories a single complex can tell, and about its historical relevance. The latter extraction site, already mentioned by Schaaffhausen (1885), became the study object of Hans Lehner at the beginning of the twentieth century. It is the only site where open air quarrying is more or less well documented. The study of the material of the fillings shows that it dates from Trajan's period. Epigraphic documents prove the presence of the Roman army at several spots, as well as altars for Minerva, Hercules, and especially Hercules Saxanus. Furthermore, it is the only site where figurative engravings are attested – in this case by a Roman

quarry-worker, probably a soldier. Later on, the quarry of Idylle was exhaustively described and published by Röder in 1957.

Modern and more detailed twenty-first century research offers the best conditions for digging deeper into the subject. The most important site described here is Meurin. Site 31, known as Meurin 2, is the best-known example, and has almost become a type locality for studying and presenting tuff exploitation during Roman times. This publication also highlights all the efforts Röder took at the spot in 1956. The entrance of the complex was only rediscovered in 1996 by the RGZM, and it became the signal for starting a new and more extensive research. Site Meurin 2 also represents the largest known quarrying complex. It contains at least forty-four different chambers and offers a lot of opportunities for studying the chronology of the different corridors, besides the other relevant scientific and technical aspects.

The chapter about mining and opencast mining leads into the question of the methods of exploitation. In 1957, Röder already pays a lot of attention to these particular aspects. His detailed research on a broader area like that of Meurin 2 (2300 square meters) offers a good idea of the way mining was done. The Romans applied the so-called »Pfeiler-Kammer-Bau« (room and pillar mining technique or retreat mining) with »einzelne Kammer« (individual room) and »Stützpfiler« (supporting pillars) as their standard excavation method. The dimensions of the pillars and rooms depended on the thickness of the volcanic tuffs and of the stone quality. Schaaff treats the chronology of the mining complexes and the way of studying these (again, for a great deal based on the Meurin 2 site) in a very clear and detailed way. The same can be said about his description of the exploitation technology. Some tuff blocks found had dimensions up to three by nearly two meters. Steps and shafts served for transport and ventilation. The exact way of lighting, although a few lamps were found, remains somewhat unclear. This is in sharp contrast with our knowledge about the tools, of which dozens were found during the years of excavation. In this chapter, Schaaff finally treats the scanty traces (at the sites of Idylle, Koblenz, Zerwas) of opencast mining.

In 1878–79, Eugen de Witt discovered an underground workshop in Kretz, a unique discovery up to now. One must imagine that this kind of workshop was probably mobile, serving to dressing the larger blocks into smaller ones or into sarcophagi, in order to facilitate their transport. The work was finished on the surface in daylight. Excavations in the Kruft site »Im Kendel« (1988–1994) brought to light the existence of several so-called »Streifenhäuser« or strip houses, probably the sole witness of worker's houses connected to mining centres.

Freudenburg (1862) already mentions inscriptions indicating the existence of sanctuaries. In the Brohl Valley, some forty-four inscriptions are known, mostly from altars; thirty-one of them are military ones, most of them devoted to Hercules or Hercules Saxonus. Seven legions and four cohorts and alae are mentioned. Most of them date from the Claudian-Neronic up to the Flavian-Tra-

ianic period. In the »Domkaul«, niches sculptured directly in the tuff and inscriptions of the sixth and tenth centuries as well as of modern times, together with an inscription mentioning Quintus Acutius Nerva (dating the complex between 101–104 A.D.) have been found. All together, more than ten sanctuaries are proven: they show a more or less regular dispersion, possibly indicating that each mining area had its own small sanctuary. As already stated, the »Grube Idylle« in Krufter Bach (Kretz) is another important complex.

In evaluating the duration of quarrying, Schaaff states that for the quarry of the site Idylle epigraphic material is of the greatest importance. The Sixth legion began tuff exploitation soon after 100 A.D. in order to build the Colonia Ulpia Traiana (Xanten). Probably the Twenty-second legion as well as the First legion were involved in this process, and it is quite possible that they also quarried for their own home base, Bonn. They were replaced by the Thirtieth legion around 130 A.D., but soon after that, exploitation stopped. In Meurin 1, the ceramics prove that the exploitation took place in Roman as well as in medieval times. Another well-documented area is, of course, Meurin 2: here, exploitation started around 300, at about the same time as the building of the Castellum at Divitia (Köln-Deutz), in which probably the Twenty-second legion was involved.

For an outsider, or for those involved in provincial Roman archaeology, the last two chapters (put aside the study of the ceramics) are the most enlightening ones. When trying to calculate the extent of exploitation, the intense medieval and post-medieval utilization features real barriers. If we consider the Kruft Valley area, the excavations at Meurin 2 are most helpful in elaborating a method for calculating the exploitation extent. Schaaff concludes that in an area of 158 hectares at least 1.400.000 tons of tuff were exploited, for which, in average, at least sixty-five to one hundred quarrymen (excluding engineers, transporters, blacksmiths, etc.) were needed in the mining zones on a more or less daily base. The exploitation in the Brohl Valley covers an area of only 8,9 hectares and was less important than, for instance, the millstone quarrying at the Bellerberg-Vulcano near Mayen.

For a comparison of the different mining areas and the chronology of their quarrying activities, the mineralogical research (by Jutta Geisweid), together with the ceramological one (by Lutz Grunwald), and epigraphic studies are of crucial importance. In fact, in combination with the results from different research projects located along the Lower Rhine, for example in larger sites like Cologne and Xanten, and those of the research projects in the mining areas, one obtains a rich and vivid image of the chronologies and of whom was involved. For instance, the »Ubirmonument« in Cologne (according to dendrochronological data erected in 4–5 A.D.) was mainly built from volcanic tuff blocks originating from the Kruft Valley, and, to a far smaller degree, from the Brohl Valley, as proved by Geisweid's results.

The fact that both mining areas started quite early, is an indication of a huge demand from the beginning. It

also means that, from the onset, engineers, architects, and specialized craftsmen had come from Rome and were supported by native craftsmen who already had some expertise from the quern-industry, which had existed much earlier. The Praetorium of Cologne was built during the first decennia (Phase A), using volcanic tuff, together with trachyte, basalt and greywacke (lithic-arenitic sandstone). But starting in the period of Nero, volcanic tuff was almost exclusively used during Phase C.

Different military units worked in the mining areas, exploiting volcanic tuffs for several military camps. Probably, the *Classis Germanica* was also involved in the building of the City walls of Cologne (88/89 A.D.) and in the quarrying of volcanic tuffs for this end in the Kruft Valley. The interconnection between the official activities in which the army was involved and quarrying is also to be assumed for the building of the walls of the *Colonia Ulpia Traiana* near Xanten in 101–104 A.D. At about that time, mining activities in the Brohl Valley came to an end, but in the Kruft Valley mining activities still continued.

Most certainly, from the first century onward, private persons were also engaged in quarrying, as shown by Elena Kostner. In private houses in Cologne and Xanten, volcanic tuff was used as a building material. Moreover, as the ceramics show, the site of Meurin 2 was certainly in use around 300 A.D., the period in which several military camps like Köln-Deutz and Andernach were built. During the fourth century, the picture became a bit blurry, but the production of sarcophagi for private purposes was still flourishing till the middle of the fifth century. During the reign of Valentinianus I, volcanic tuff was needed for building military camps. This seems to be the last period during Roman times when volcanic tuff was in huge demand.

The study of Holger Schaaff is very detailed and profound, both from an archaeological and an architectural point of view, but there is more in it. By involving specialists like Lutz Grunwald (Ceramics – RGZM-Mayence) and Jutta Geisweid (account of petrographical and geochemical analysis, study of zeolitization – Johannes-Gutenberg-University of Mayence), the chronology of the exploitation as well as the exact origin of the tuffs, that were used as architectural elements in the Limes frontier zone and in more remote regions like the *civitas Tungrorum*, have now become clearer. The same can be said for the epigraphic material. The author has indeed consulted a broad range of local unpublished and oral sources, a phenomenon that is almost tangible throughout the book. Especially because of the fact that a lot of ancient mines have completely disappeared up to modern times, we can only admire such efforts.

The book is really fresh looking and an easy to read volume, with only a few minor drawbacks: the general location map (p. 1 fig. 1) is too sketchy and makes it rather difficult to locate the different mining sites and to infer the relation with the overall region, certainly, if you want to dig a bit deeper into the subject. A larger map using colour symbols and an inset locating the study

area in a wider-scale view would certainly benefit to the reader. Moreover, the reader would have appreciated the presence of more geological, stratigraphical, and mineralogical data on the different volcanic products and more especially on the Römer Tuff and its enveloping volcanic deposits. On the other hand, the detailed description of the different mining areas, the use of hundreds of illustrations, maps, and drawings, as well as the detailed maps of the different mining units deserve our admiration. This publication has an enduring value for everyone who wants to go further into the subject of Roman volcanic tuff mining, and in fact, for everyone who is studying the Rhine frontier zone.

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