Sicht „strategisch hervorragende Lage“ der Burg auf dem Altenberg ihre frühe – und endgültige – Auflassung nicht verhindert hat. Insgesamt zeichnet sich ab, dass die – mutmaßlich allodiale – Grundherrschaft Munzach-Frenkendorf-Füllinsdorf, auf deren Territorium der Altenberg liegt, im 12. Jahrhundert weiter bestand und mit der Errichtung der Neu-Schauenburg ein neues Zentrum erhielt.

In den Kapiteln 7 und 8 werden die Ergebnisse zusammengefasst. Die namenlose Burg auf dem Altenberg war eine kleine, jedoch repräsentativ ausgestaltete Anlage mit peripheren Verteidigungseinrichtungen. Sie zeigt alle Bauelemente, die eine Adelsburg dieser frühen Entwicklungsphase ausmachen (Befestigungen, Wohn- und Wirtschaftsbauten aus Stein oder Holz, repräsentative Bauformen, qualitätvolles Fundgut). Es handelt sich insgesamt um eine typische Kleinburg dieser frühen Zeit, wie sie zwar weniger in den schriftlichen, dafür aber in den archäologischen Quellen immer deutlicher fassbar wird. Dabei war das Baukonzept noch uneinheitlich.

Der ungewöhnliche Fundreichtum, das hochwertige Fundmaterial und die enge zeitliche Eingrenzung (um 1000 bis ausgehendes 11. Jahrhundert), die vor allem anhand der keramischen Feintypologie erfolgt, machen diesen weitgehend unverfälscht erhaltenen Fundplatz zu einem einzigartigen Referenzkomplex für die (adelige) Sachkultur des 11. Jahrhunderts. Der Fundplatz auf dem Altenberg ist damit eine wichtige Quelle für die Erforschung des frühen Burgenbaus mit Signalwirkung weit über die unmittelbare Regionalgeschichte hinaus.

Insgesamt ist es durch diese Forschungsgrabung gelungen, die Bau- und Siedlungsgeschichte einer Kleinburg des 11. Jahrhunderts umfassend nachzuzeichnen und in vorbildlich interdisziplinärer Weise zu publizieren. Somit bildet der Altenberg einen Modellfall für zukünftige Forschungen zur Entstehung der Adelsburg.

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Albrecht Jockenhövel (ed.), Mittelalterliche Eisengewinnung im Märkischen Sauerland. Archäometallurgische Untersuchungen zu den Anfängen der Hochofentechnologie in Europa. Münstersche Beiträge zur Ur- und Frühgeschichtlichen Archäologie (MBA) volume 7. With contributions by Thorsten Abdinghoff, Zahra Hezarkhani, Albrecht Jockenhövel, Ingo Keesmann, Hans-Ludwig Knau, Andreas Kronz, Michael Overbeck, Günter Rosenbohm, Manfred Sönnecken und Christoph Willms. Verlag Marie Leidorf, Rahden / Westf. 2013. € 79.80. ISSN 1861-3942, ISBN 978-3-89646-285-5. 432 pages, 346 illustrations including many colour photos, 10 tables. German text, with summary in English.

Volume 7 of the MBA series, edited by Albrecht Jockenhövel, former head of the Institute of Pre- and Protohistory of the Westphalian Wilhelms-University Münster, is the third massive book in this series concerning the earliest archaeological remains of blast furnace iron production in Europe. This is a comprehensive and scientifically valuable book, contributing considerably to the archaeological research into the history of early iron industry. The critical change from bloomery iron production to iron production from indirect reduction using blast furnaces can be regarded as the starting point for wide-reaching developments comparable to other technological or scientific discoveries in other eras, such as those which triggered the shift from Bronze to Iron Age. This technological change has been the focus of archaeometallurgical research over the last few decades. The book under review, written by archaeologists, archaeometallurgists, mineralogists, historians and botanists, summarises the results of six years of interdisciplinary research (1994–1998) within the scope of the project "Eisen- und Stahlerzeugung im Märkischen Sauerland. Eine Produktionskette von der Rennfeuerverhüttung bis zum Beginn des Osemundfrischens (ca. 800–1600 n. Chr.)" ("Iron and Steel Production in the Märkisches Sauerland. A Process of Production from the Bloomery Furnace to the Early Osemundfinery [c. 800–1600]").

Presenting the outline and implementation of the project (pp. 1–5), Jockenhövel argues that the Märkisches Sauerland, currently with 1 500 archaeologically investigated iron slag sites, most of which date to the Late Medieval and early modern periods, was the most important iron production district before the initiation of blast furnaces using coke as fuel. Iron slag heaps result from two main periods: from bloomery iron production (*Rennfeuerverhüttung in Rennöfen*) in the 8th–13th centuries A. D., and crude iron from blast furnace production with fineries (*Roheisenverhüttung in Floßöfen mit Frischherden, Massenhütten*), 13th–18th centuries. Jockenhövel also lists publications on archaeology, historical iron research, landscape prospection and archaeometallurgy connected to the project (pp. 5–8).

In his paper on physical-geographical conditions of early iron production and iron working in the Märkisches Sauerland (pp. 9–19), G. Rosenbohm gives a detailed survey of the relief, climate and hydrography of the Sauerland as part of the Rheinisches Schiefergebirge in southern Westphalia. Ch. Willms focuses on "Smelting site no. 11 at Kierspe-Fernhagen (Märkischer Kreis)" (pp. 21–56). Geophysical prospection exposed the remains of four furnace-like objects with characteristic anomalies: a water canal 1.5 m in width; a slag heap and a charcoal kiln, presumably from the 17th–18th centuries; and a smith's hearth. Ceramic typology indicates that finery activity was carried out in the 13th–14th centuries. Willms also discusses the typology of iron slags and furnace fragments. In another chapter, Willms presents "Smelting site no. 72 at Kierspe-Wienhagen (Märkischer Kreis)" (pp. 67–89), where a slag heap of c. 15 x 15 m was found. Geophysical prospection indicated the location of a furnace made of clay and stone; a post-framed building may have formed a roof above the furnace. An area of 4 x 3 m is interpreted as an ore roasting and breaking surface. At this site, slags from the bloomery period and fragments of iron tools were also found.

M. Overbeck describes the finds from wet and dry sieving for smelting site no. 11 (pp. 57–66) and site no. 72 (pp. 91–101). The strongly magnetic slags ("Zunder") from smithing on the latter site had higher iron content than the slag pieces from the other smelting sites of this region.

Smelting site no. 105 at Kerspetalsperre (Märkischer Kreis) (M. Overbeck, pp. 103–183) was discovered on the basis of surface finds (ore, slags, furnace fragments, charcoal, slags with high iron content etc.), and geophysical prospection showed the positions of two furnaces that were subsequently excavated. The furnaces were built of stone and clay with an outer diameter of 1.2 m and inner diameter of 0.8 m. The parts of the furnace and the workshops are described in detail, including the tapping hole, drainage, outline of the bellows and drive shaft ("Antriebswelle"), hurdle work ("Flechtwerk"), charging area ("Beschickungsfläche"), ore store, charcoal store and slag heap. A posthole with charcoal was radiocarbon dated to between A. D. 1205 and 1300. The horseshoe shaped finery hearth ("Frischherd") is 1.2–1.3 m wide and around 2.3 m long. A 35 m long section of the upper water canal for the water wheel was also discovered during the excavation. A lane with cart wheel tracks completes the description of this iron smelting site. The author very clearly reconstructed the layout of the industrial site (figs 43–45). The finds comprise charcoal, ore, furnace fragments, slags and iron artefacts.

Th. Abdinghoff presents "Smelting site no. 90 at the Upper Wipper Valley (Oberbergischer Kreis)", close to Marienheide (pp. 185–249). A bloomery furnace (internal diameter 0.45 m; ^{14}C date A. D. 1015–1160) with a charcoal store and a blast furnace came to light as a result of geophysical measurement and excavation. The blast furnace with an internal diameter of 1.25 to 1.5 m was found between three slag heaps. The building material for the furnace was mostly clay with stone inside. Next to this furnace used for the production of pig iron ("Roheisen"), all of the structures necessary for an operating workshop were documented (figs 38–39): a tap hole ("Abstich"), a drainage system made of stone and a timber canal, an ore store and a charcoal store, as well as post holes and pot sherds from the 15th century and a hollow way ("Hohlweg"). Finds also include bog iron ore, charcoal from oak, birch, beech, hornbeam, glutinous alder, willow, rowan, spindle tree, linden and bushes such as hazel. Limestone was used as a fluxing agent. Slags with strong iron content were found near the bloomery. A piece of pig iron found at the site weighs 1.5 kg. All the resources for iron making in the Wipper Valley were found close to the site: Raw materials were extracted from nearby mine pits ("Pingenfeld") and gallery or drift mining ("Stollenbergbau"), and water and wood were available. Five other (13th–16th century) blast furnaces ("Floßöfen" or "Hochöfen") and a forging mill ("Reckhammer") were situated near this site (fig. 21).

I. Keesmann and A. Kronz present the results of archaeometallurgical investigations (chemical, RFA and WDS) of iron slags from smelting sites nos 11, 72, 90 and 105 (pp. 251–263). Sites 11 and 72 yielded the majority of the crystalline slags (fayalite slags), while most of the glassy slags are from sites 90 and 105. Chemical analysis of hundreds of iron slags (I. Keesmann, Z. Hezarkhani and A. Kronz, pp. 265–278) showed that two types can be distinguished: type 1 may have resulted from the processing, while the glassy slags of type 2 are possibly connected with cast iron or pig iron technology ("Flusseisentechnik").

In his overview of bloomery furnaces in the Märkisches Sauerland (pp. 279–294), M. Sönnecken distinguishes eleven types, with more than 2 000 bloomeries ("Rennherd") and 1 631 slag heaps. The finds suggest that hematite with 60 % iron was one of the available resources and that at the end of the Late Middle Ages (^{14}C dating: 1460 ± 225 years), a change in the type of wood used for metallurgy occurred. Currently, the earliest known furnaces can be dated to the Saxon immigration to the Sauerland, i. e. around the 7th–8th or 8th–9th centuries; remains of earlier (Pre-Roman Iron Age or Roman Period) furnaces are not known.

Slags with a glassy structure are the remains of the indirect method of iron smelting, according to H. L. Knau (pp. 295–308), which was introduced briefly after A. D. 1200. Written documents mention this type of furnace ("Hütte") variously as "huttin", "hammerhutte" etc. Blast furnaces ("Floßöfen") were used in the Alpine region (as well as in historical Upper Hungary, cf. G. Heckenast, A magyarországi vaskohászat története a feudalizmus korában [= History of the Iron Metallurgy in Hungary in the Period of Feudalism, from the Middle of the 13th Century to the End of the 18th Century]. Hungarian Academy of Sciences [Akadémia Kiadó], Budapest [1991]). Valuable details from this part of the book are the contemporary quotations on smelting, mining and work at the finery. Knau also discusses the "Osemund" steel quality that differs from the Swedish Osemund steel (pp. 309–318) due to dissimilar finery methods. Both fineries used pig iron ("Roheisen"), which was smelted from iron ores containing small amounts of phosphorus. Confirming some written documents from the 15th century and later, labour continued to be conducted both by hand and with mechanical forging side by side in the mills ("Hammerwerke") for a long time.

Next, A. Jockenhövel and M. Overbeck give an overview of the change from bloomery to blast furnace, discussing technological innovations during the development of new furnace types and smelting processes in Central Europe (pp. 319–360). The first major technological revolution of the iron industry in Central Europe was the introduction of water power c. A. D. 1200. The water wheel was used for the operation of bellows, making it possible to enlarge the size and the capacity of the furnaces. The "Stuckofen" (a term originating from the Alpine area) produced iron blooms from a direct process. This type of furnace often existed next to blast furnaces ("Floßöfen" or

"Hochöfen") in the same places after the spread of the indirect process. The authors discuss the definitions of the terms "Floßofen", "Hochofen" and "Massenhütte", describe the ideal type of medieval blast furnace and present the earliest blast furnaces from excavations in Sweden, England, France, Switzerland and Germany (and Italy from written documents). Then they compare the topography, site structures, furnace types, fineries, age determinations and technical aspects of the pig iron production. They also discuss the increase in quantity of production, the socioeconomic framework, the civil and military use of crude iron and possible European innovation areas.

A separate chapter addresses written and pictorial sources for early blast furnace technology (Th. Abdinghoff and A. Jockenhövel, pp. 361–387), such as the "Trattato d'archittetura" by the engineer Antonio Averlino (1460–1464); "De machinis" by Mariano di Jacopo, an illustrated book about mechanical engineering, dating from 1449; or Georgius Agricola's 1557 "De remetallica libri XII". Pictures of blast furnaces can be found on early maps and in Flemish and Dutch landscape paintings (e. g. Joachim Patinir [1530/40]; Herri met de Bles [around 1500/10–1555/60]; Lucas and Marten van Valckenborch [1535–1597 and 1534–1612]; and in Jan Brueghel Senior's "Hochofen im Walde" ["Blast furnace in the forest", around 1600]). This collection of artistic pictures facilitates the understanding and scientific reconstruction of the activities related to early metallurgical furnaces.

The Märkisches Sauerland was one of the most important iron production areas in Germany, as A. Jockenhövel and M. Overbeck state in their summary (pp. 389–395). Little evidence of Late Merovingian and Early Carolingian iron production remained, while more than 1 500 iron smelting sites are known from the 11th–13th centuries, which functioned under rule of the Salian Franks and the Swabian Hohenstaufen dynasty. However, there are no written documents on this intensive bloomery iron industry. Moreover, in the Märkisches Sauerland, around 100 deserted "Massenhütten" sites (slag heaps and remains of blast furnaces with finery hearths) are known. The two excavated sites of the 13th–14th and 15th centuries deepen our knowledge of the layout of the production sites; the resources that were available, such as types of ore and wood used for fuel; the destiny of the forests in various periods; the types of furnaces; the by-products and the iron itself. Whether or not cast iron technology is of indigenous origin remains unanswered.

This masterful presentation shows that the successful interdisciplinary research of the University Münster and its partners is worthy to be followed as an example for research on other European production areas where written documents from Late Medieval or early modern times indicate similar iron furnaces, fineries and forging mills, such as in historical Hungary (cf. Heckenast op. cit. pp. 39; 65; 298 on Jósvafő in the Bükk mountains, near Rudabánya, where a 1399 text mentions "*… molendinum vulgo hamor dictum …*", and on Vihnye near Selmecbánya, where a 1526 text mentions "*… officine vulgariter hamor et hutta vocate …*"). The comprehensive bibliography is helpful for further orientation on this topic. This volume is essential reading for researchers of the early European iron industry.

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