

12 Forgotten pathways. The potential of LiDAR data to record old roads and tracks in medieval cultural landscapes

12.1 Introduction

Anyone who followed the newspapers and other media in the last years might have gained the impression that new archaeological discoveries of old roads were being made all the time.¹ This is deceptive, as excavations of medieval tracks and pathways are quite rare. However, even roads remaining unexcavated can be detected using digital data.

Light detection and ranging (LiDAR) data has been increasingly used for archaeological inquiry since the beginning of the 2000s. This is particularly the case for detecting archaeological monuments and cultural landscape elements in forests that are otherwise difficult to record. Often, such monuments are located in heavily overgrown and inaccessible areas, or they extend over very long distances. Despite these difficulties, they can be documented and evaluated precisely and efficiently with the help of digital elevation data. Old tracks, which mostly originated and have been preserved in mountainous and forested regions, can be explored in a new way using these data.

This paper intends to discuss the potential and limitations of this method using the example of various pathways from the Harz Mountains in Saxony-Anhalt (see Figure 12.1) – especially the central Harz around Elbingerode. Here, different settlements interconnected by a dense network of paths still visible today were established in the early Middle Ages. On the one hand, various visualisation techniques and analytical methods can be used to determine the exact course of these routes and to record their morphology and contextualisation within the cultural landscape. On the other hand, the exact dating of the individual path segments represents one of the difficulties that can only be overcome by interdisciplinary discourse.

1 E.g. lrakn.de/service-und-verwaltung/Pressemitteilungen/befestigter+fruehkeltischer+weg+in+kiesgrube+entdeckt; ksta.de/koeln/koelner-dom-warum-sich-oestlich-des-doms-eine-alte-strasse-verbirgt-299042; nationalgeographic.de/geschichte-und-kultur/2022/04/fortschrittliche-jungsteinzeit-die-bisher-aeltesten-radspuren-der-welt-stammen-aus-deutschland; berliner-zeitung.de/mensch-metropole/aelteste-strasse-berlins-saegemassaker-am-knuieppeldamm-li.211713; ndr.de/nachrichten/schleswig-holstein/Danewerk-Wagenspuren-am-historischen-Verkehrskreuz-des-Nordens,danewerk196.html (all accessed: 01.04.2023).

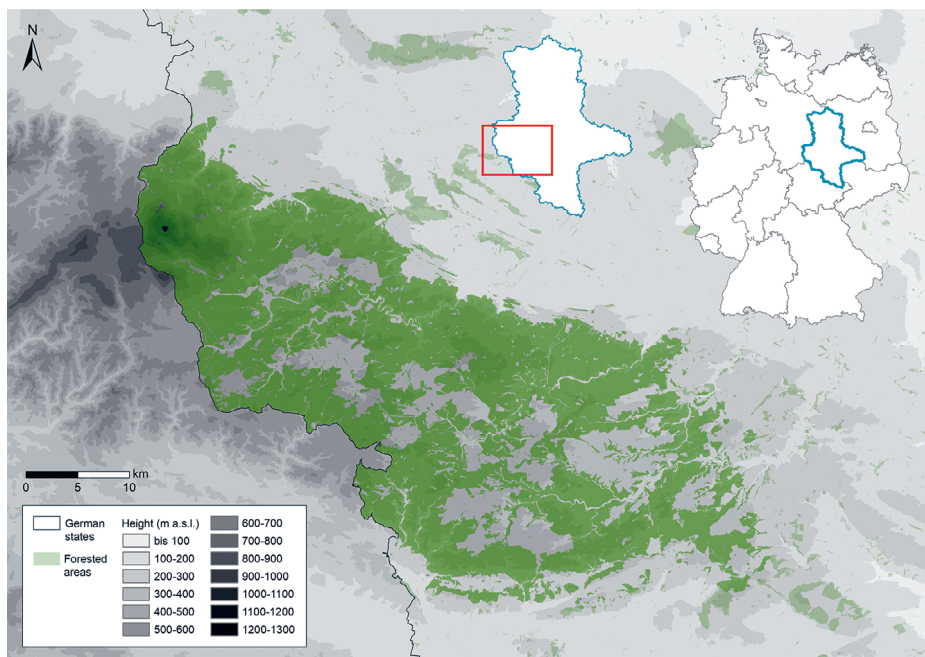


Figure 12.1: The working area of the heavily forested eastern Harz in Saxony-Anhalt in central Germany. Source: graphics: author; base map: SRTM version 3.0 global 1 arc second data, by courtesy of the U.S. Geological Survey (USGS) and the National Aeronautics and Space Administration (NASA), public domain; country/state borders: extracted from Database of Global Administrative Areas (GADM) version 1.0, CC BY-NC-SA 3.0 US; forested areas: LDA.

12.2 LiDAR technology

Medieval hollow ways are mostly preserved as shallow depressions under the vegetation. Thus, they not only often elude the attention of the passing observer, but are also challenging to explore scientifically. The technique of LiDAR – also known as airborne laser scanning (ALS) –, established in archaeology in recent years, offers new, spectacular possibilities for investigating these ephemeral features. LiDAR makes it possible to look through the treetops onto the micro relief of the forest floor. In this way, archaeological monuments preserved aboveground can be recorded and evaluated comparatively cost-effectively, especially if they are covered by vegetation. This method is non-invasive, i.e. it does not interfere with the ground and thus does not damage the ancient monuments.

The required digital elevation data may be generated by scanning the surface of the terrain in parallel flight strips using pulsed laser beams, which are continuously sent out, e.g. from an aircraft or unmanned aerial vehicle (UAV). In so doing, a first

echo (from the uppermost vegetation) and a last echo (from the ground) are reflected, enabling us to determine the exact three-dimensional coordinates of points in space. This is done using the respective travel time of the laser beam and the position of the aircraft – on the basis of global positioning system (GPS) and inertial navigation system (INS). The measurements then allow us to generate digital topographical models of the landscape. In addition to the digital surface model (DSM) emerging from the first echoes, which includes vegetation and buildings, the last echoes allow us to generate a digital terrain model (DTM; see Figure 12.2).² The latter reflects the pure terrain surface and, depending on the resolution, shows even the most minor human interventions, for example, in the form of removal or accumulation of soil. This allows creating visualisations of the morphology of archaeological structures, like ancient pathways,³ thus allowing for further analyses.

Different visualisation techniques impact on what we may see using the DTM. If we use classical hill-shading, for example, which is easy to interpret for the human eye, the outcome depends on the direction from which the (artificial) light comes. Other visualisation methods include, for example, the slope gradient, the local relief model, or the sky-view factor. The visibility of the structures also depends on the nature of the current vegetation. In deciduous forests or grasslands, archaeological monuments are easier to detect than in coniferous forests because, in the latter case, fewer laser beams reach the ground.

The data used in this paper⁴ was made available to the State Office for Heritage Management and Archaeology Saxony-Anhalt (LDA) by the State Office for Surveying and Geoinformation Saxony-Anhalt (LVermGeo). The latter agency delivers data as *.xyz files (text files with coordinates in three dimensions), allowing us to calculate a DTM with a grid resolution of 1 m by 1 m, thus representing even the smallest differences in elevation. The accuracy is ± 15 cm in flat and undeveloped terrain and approximately ± 30 cm in terrain with high relief and dense vegetation.⁵

As described above, the LiDAR method is particularly advantageous for detecting features in densely wooded areas – such as the eastern Harz – compared to aerial archaeology, for example, which quickly reaches its limits in forests. LiDAR can also be an important addition to the classic field survey, which is useful only to a limited extent in dense vegetation, in impassable terrain, and in very large survey areas.

² The basic principle of discrete echo scanners can be broken down into a few sentences. Notably, full waveform scanners are increasingly being used today, which – in addition to first and last echoes – also record numerous intermediate echoes as a continuous signal and thus offer more additional information for a detailed result. For further information on the technical procedure, cf., e.g. *Bofinger et al.*, Hightech (2007); *Doneus*, Landschaft (2013), 213.

³ Various visualisation methods are used, such as hill shading or slope modelling.

⁴ The article is based in some parts on my dissertation, submitted to the Martin-Luther-University Halle-Wittenberg in 2020 and published as *Swieder*, Archiv Wald (2022).

⁵ *Wießner*, Aktualisierung (2014), 36.

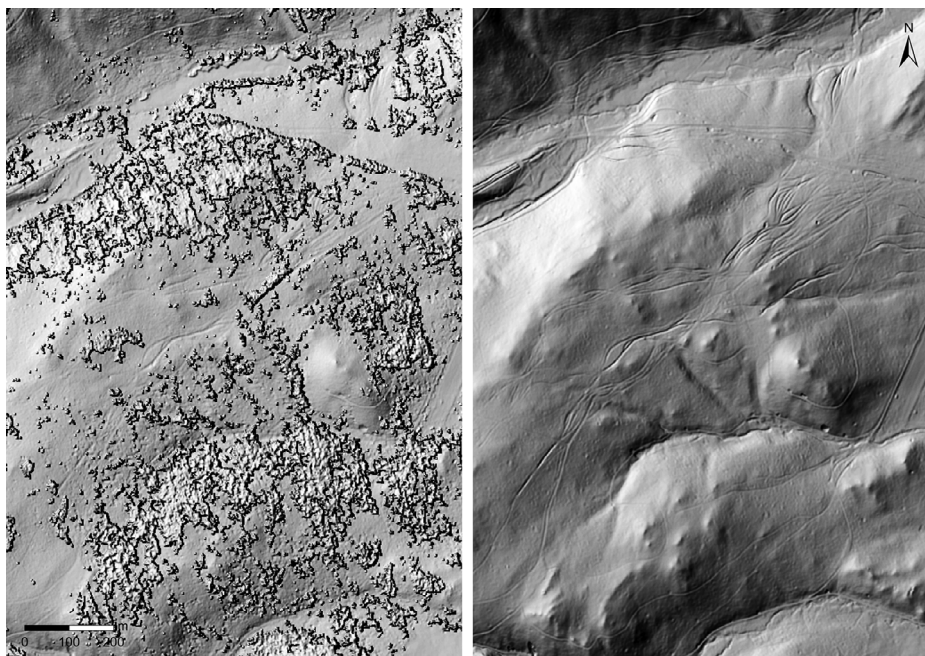


Figure 12.2: Pathway traces at the northern Harz margin near Blankenburg in the DSM (with vegetation; left side) and in the DTM (without vegetation; right side). In the latter, the individual trail lines are clearly visible. Source: visualisation, and graphics: author; DOM2 and DGM2: Datenlizenz Deutschland – Namensnennung – Version 2.0, © GeoBasis-DE / LVermGeo LSA.

When combined, these methods complement each other perfectly. In my project, I analysed the LiDAR data in a manual, non-automatic way, to study a small region by considering, e.g. relevant map sources, excavation results, surface finds, and historical sources. In addition to using new methods, the search for material evidence in the field is of the greatest importance. A walk through the relevant area usually allows for observations no sophisticated method is able to reveal. All this information was then combined in a geographic information system (GIS).

12.3 Old paths in the DTM

Traces of these old pathways have been preserved to a greater or lesser extent, especially under forests, but also occasionally in open areas. In the Harz Mountains and elsewhere, old paths are mostly comprised of hollow ways, usually formed on slopes. Intensive use of steep ascents and descents in the mountains led to the formation of shallow and sometimes several-metres-deep hollow ways – these were accelerated by natural erosion processes.

Fan-shaped groups⁶ of sunken paths tend to form particularly on slopes. This can be explained by the fact that although the ascent and descent on steep slopes were difficult, they were also usually the shortest in terms of distance. Therefore, the hollow ways typically originate in areas of high relief and lose themselves in the plain. The old pathways occasionally also survived on the plateaus and, in individual cases, also as embankments. These embankments were built where swampy or boggy terrain made any passing difficult. As a rule, not many raised tracks are found running side by side, as is the case with the hollow ways, because all traffic was carried along a single track. This made it possible to cross the unfavourable areas safely. As in other (middle) mountain ranges, the watersheds and ridges in the Harz were thus often used as transport routes. By contrast, the swampy valleys or lowlands were usually only crossed when inevitable and at favourable places.⁷ They tended not to be used over longer distances; indeed, those routes along rivers and streams leading into the Harz Mountains are now recognisable in the DTM as being mostly post-medieval.

The most pronounced old paths do not lead to short-lived deserted medieval settlements but to permanently settled sites still extant today. When a significant number of hollow ways and clearly pronounced paths are preserved in the field, this often seem to correspond to the long-term use of a communication corridor. Central German research carried out by Dietrich Denecke and Bernd W. Bahn in particular⁸ was able to establish typical forms of trackway groupings in the terrain. By using DTMs, these forms can now be verified, described, and contextualised more precisely.

“Groupings” of paths developed because the unpaved natural roads had gradually deepened further and further into the subsoil given their long and intensive use and/or ongoing erosion processes. Once a path was no longer passable, an alternative route was chosen in the immediate vicinity. As a result, the routing of paths changed slightly time and again, and, occasionally, several tracks developed next to each other.⁹ In the eastern Harz, typical hollow way groupings in the form of fans exist alongside forms reminiscent of an hourglass or, in contrast, a spindle. The large groups often cover areas of several hundred metres in diameter. In rare cases, we also have paths in the shape of a spiderweb (see Figure 12.3).¹⁰ The DTM reaches its limits in this respect when used as sole method, since other structures exist that re-

6 The terms “fan” and “bundle” of ways are used synonymously here. It should be noted, however, that some authors reject the term bundle since a bundle is a three-dimensional shape whereas a fan only extends in width. They therefore prefer the term fan; e.g. *Bahn*, *Altwegeforschung* (2011), 203 note 13.

7 *Prell*, *Altwegeforschung* (1983), 52; cf. also *Posluschny*, *Aspekte* (2012), 117.

8 E.g. *Denecke*, *Untersuchungen* (1969); *Denecke*, *Altwegeerelike* (2002); *Bahn*, *Gedanken* (1998); *Bahn*, *Altwegeforschung* (2011).

9 For the Harz Mountains, for example, described by Martin *Prell*; cf. *Prell*, *Altwegeforschung* (1983), 52.

10 Cf. *Swieder*, *Wege* (2019).

semble hollow ways even despite having a completely different origin. Such similar structures include, for example, naturally formed gullies, artificial ditches, or mining trenches – features that can therefore only be verified using interdisciplinary approaches.¹¹

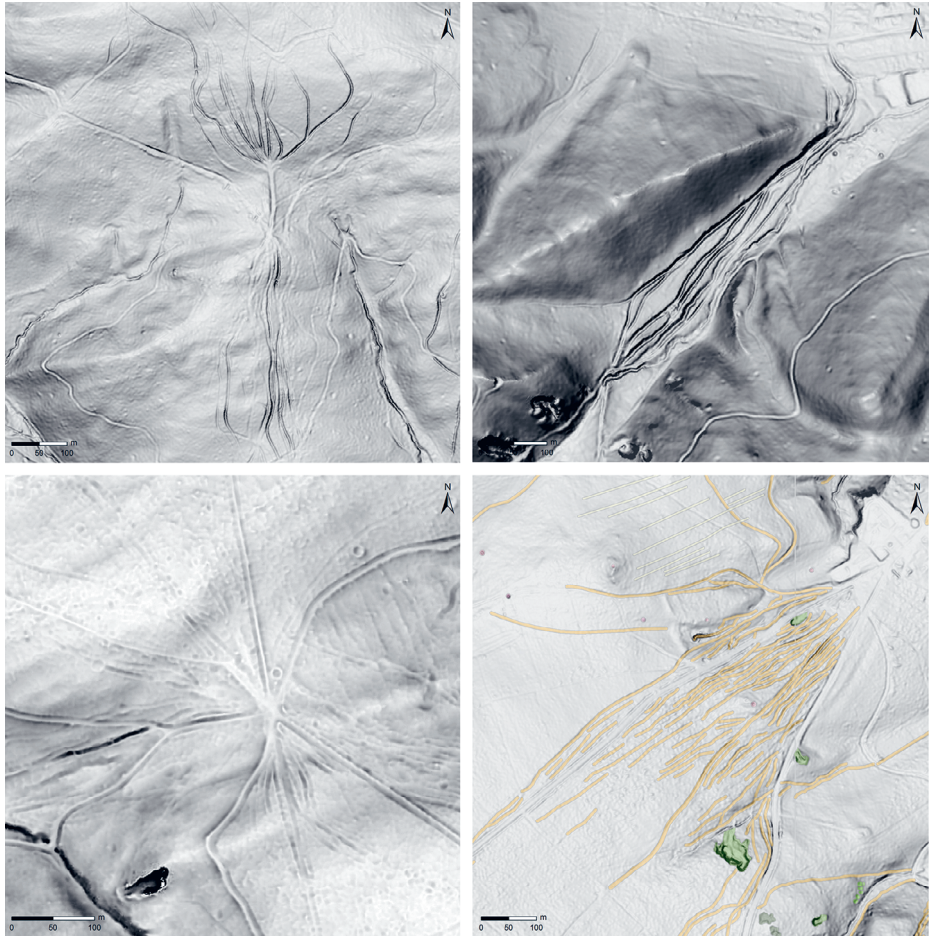


Figure 12.3: Different methods of grouping old pathways in the DTM. Source: redrawing, visualisation, and graphics: author; DGM1: Datenlizenz Deutschland – Namensnennung – Version 2.0, © GeoBasis-DE / LVermGeo LSA.

¹¹ On the distinction of “real” hollow ways from similar surface forms, see also *Bahn, Gedanken* (1998), 6; *Fischer, Beurteilung* (1987).

The DTM provides insight into the complex network of hollow ways covering the eastern Harz. In addition to showing the courses of different trails that connect point A with point B and vice versa, the digital terrain data also allows us to make specific statements about the deepening of the hollow ways into the terrain. With the help of “profile graphs” digital cross-sections can be created at different points of a path which allow for the examination of its shape and the degree of preservation. In addition, longitudinal profiles along the path can be used to show the extent of the route’s rise or fall along its course. Other analytical methods, like generating a viewshed or visual axes, allow us, for example, to examine the relationship of specific paths to other structures such as castles or deserted villages.¹² Parallel to the recording and evaluation of the real path relics in the DTM, optimal connections between different points can also be reconstructed with the help of digital elevation data using least-cost path (LCP) analyses.¹³

Determining the age of old pathways is rather challenging. Some individual paths can be dated more precisely due to their function as an access route to a specific castle or deserted site, or as a transport route with a connection to a securely dated quarry or mining area. For many questions, however, it is important that the chronology of the documented features is as precise as possible, especially since not all parts of the old path that can be found in the field were in use at the same time.¹⁴ Only few paths have been excavated so far, and surface finds within such paths – for instance horseshoes or horseshoe nails – may only serve as *terminus ante quem*, meaning that the track must have existed at that time already. Many paths had different phases of use, however. Problems arise when older horizons have been overprinted or degraded by more recent uses,¹⁵ which often renders it impossible to make any reliable and specific deductions related to the dating. The superimposition of several paths in their respective stratigraphic sequence – as far as can be discerned – at least allows a relative dating: the “higher” paths in this case are older and are intersected by younger, “lower” hollow ways. The morphology of a path may also provide hints to its approximate age, at least under specific circumstances, although any such estimates should be made with caution. Various authors have already noted that the degree of deepening of a hollow way alone does not allow any specific conclusions about its age.¹⁶

12 Concerning viewshed analysis with regard to the connection of castles and old paths, see also Höfle/Wagener, *Burgen* (2012), 137–144. For viewshed analyses and ancient ways, see also Fütterer, *Wege* (2016), 529–535.

13 Cf., e.g., Posluschny, *Aspekte* (2012), 115, and in general, e.g. Herzog, *Potential* (2013); Anderson, *Pathway Analysis* (2012); Verhagen et al., *Pathways* (2019).

14 Spier, *Wegeforschung* (1962), 126.

15 Cf. also Burmeister, *Waren* (2018), 120.

16 Cf., e.g., Denecke, *Untersuchungen* (1969), 85–86. In this context, it has also been repeatedly pointed out that it is just as difficult to make reliable statements about the frequency of traffic (and thus its significance) merely on the basis of the depth of a path (e.g. Rippel, *Methoden* [1958], 71; De-

12.4 Case studies from the central Harz Mountains

The analysis of the digital terrain data reveals the Harz Mountains as a complex cultural landscape featuring archaeological monuments from various epochs – including numerous early medieval sites. Under the Ottonians, the Harz became a core landscape of the East Frankish Empire. With its rich ore deposits as well as extensive forests (and thus timber reserves), it was heavily exploited for mining and smelting.¹⁷ During this period, various royal palaces (Pfalzen) or hunting lodges (Jagdhöfe)¹⁸ and numerous settlements were established in this region. Among these, a number of deserted early medieval settlements and a royal palace have been detected on the Elbingerode plateau. They include:¹⁹

- Egininkisrod, which corresponds to today's Eggeröder Brunnen,
- Erdfelde, with church ruins in the west,
- a deserted settlement, with church ruins in the Peersgrund valley,
- the presumed deserted village of Ripertingisrod,
- Hordeshusen in the east, between Rübeland and Hüttenrode,
- Albrechtsfelde, in the far southeast,
- the site of Volkmarsheller, in the northeast,
- and the Bodfeld royal palace, in the northwest.

These sites are located in areas with large iron ore deposits and with rivers/streams or their springs in the immediate vicinity. Bloomery and/or larger quantities of iron slag are documented throughout the region,²⁰ as well as many hundreds of old hollow ways that interconnect the deserted settlements (see Figure 12.4). Since the remains of iron smelting were discovered on several sites on the Elbingerode plateau, it is very likely that some sunken paths became particularly deep due to heavily loaded wagons transporting iron ore travelling along them.²¹ While it was assumed that old transport routes were located in the valleys before using LiDAR data,²² we know today that this

necke, Untersuchungen [1969], 85) – although frequency, duration of use, etc. did of course have an influence on the characteristics and morphology of the paths; cf. *Fütterer*, *Wege* (2016), 47.

¹⁷ *Alper*, *Königslandschaft* (2014), 78; also *Brachmann*, *Harz* (1992).

¹⁸ In the eastern Harz itself, Bodfeld, Siptenfelde, and Hasselfelde are known; cf. *Alper*, *Königslandschaft* (2014), 78. See also *Freund*, *Jagdpfalzen* (2019).

¹⁹ *Prell*, *Wege* (1971); also *Alper*, *Königslandschaft* (2014), 83–84.

²⁰ *Schneider*, *Erforschung* (1982), 377.

²¹ Recent investigations also showed that iron ore from the Elbingerode area was smelted on a large scale in the northern Harz foreland; see *Klatt*, *Roteisensteinverhüttung* (2016), which required transport routes.

²² Especially in schematic representations, paths were sometimes postulated in the stream valleys; cf., e.g., *Schürger*, *Wüstung* (2005), 153, Fig. 10. They certainly show the rough direction of ascent into the mountains, but the concrete courses of the paths can rather be traced on the heights – e.g. in the case of the paths from Heimbürg to the Harz Mountains, reconstructed by *Schürger* for the ninth century.

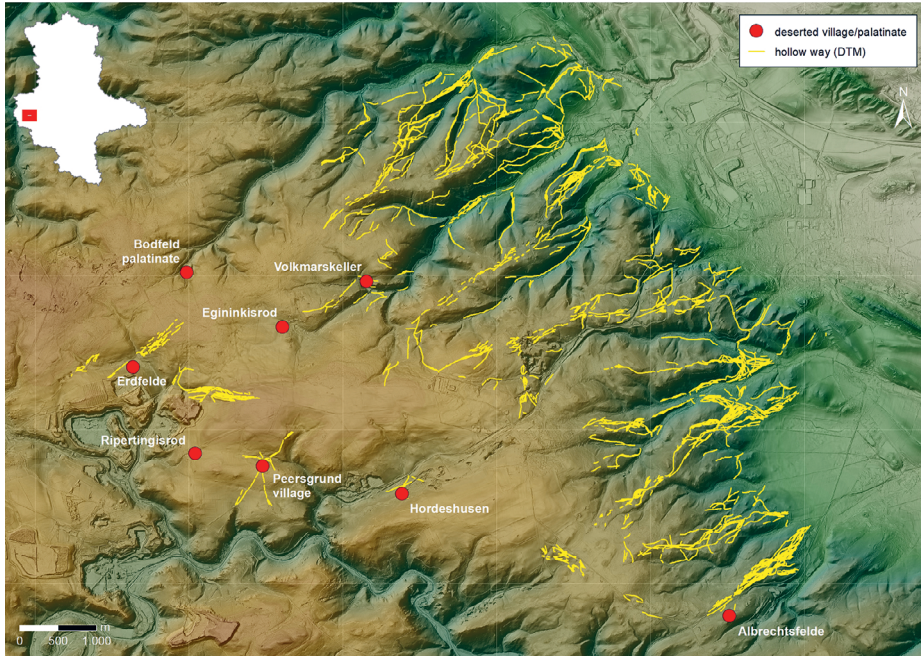


Figure 12.4: The hollow ways and medieval deserted villages on the Elbingerode plateau. Source: redrawing, visualisation, and graphics: author; DGM1: Datenlizenz Deutschland – Namensnennung – Version 2.0, © GeoBasis-DE / LVermGeo LSA.

was probably wrong given that medieval trackways typically used to run along hill-tops. In terms of the Elbingerode plateau – which is covered today with extensive meadows – its hollow ways have in many cases remained undamaged by ploughing and are therefore well-preserved (see Figure 12.5).²³

12.4.1 Egininkisrod

The deserted village of “Egininkisrod”, which lies in the area of today’s Eggeröder Brunnen, was first mentioned in a donation of 5 December 956 from King Otto I (936–973). Addressed to the Quedlinburg Monastery, it relates the village as belonging to the church of St. Michael, today’s Michaelstein Monastery near Blankenburg.²⁴ In 1152, “Euincrode” was mentioned by Pope Eugen III (1145–1153) in a letter of protection

²³ Similar situations can be found e.g. in England where this is very often the case; see, e.g. *Hindle, Roads* (1998), 36–37, Figs. 18–21; 48, Fig. 36; 49, Fig. 38.

²⁴ DD O I, No. 186. Ed. *Sickel*, 268–269.



Figure 12.5: On the Elbingerode plateau with its extensive meadow areas, the preserved bundles of sunken pathways are partly also clearly visible in the aerial view. Source: O. Braasch, 16.12.1992, LB-No. 1311, slide No. 1374–33.

as being an independently managed farm (*Grangie*) belonging to the Michaelstein Monastery.²⁵

Between 1966 and 1975, and in 1986, the Eggeröder Brunnen area was surveyed and prospected with a field campaign augmented by small trial trenches. A semi-circular rampart was uncovered, together with the remains of walls, several racing furnaces, and a slag heap. The shallow rampart and ditch system can be clearly seen in the DTM and on the aerial photographs. Findings on the site also include several *tuyères* for bellows and dozens of kilograms of slag,²⁶ which may still be found on the surface of the Eggeröder Brunnen site today.

In addition to the slag, numerous pottery fragments came to the surface. They date both the beginning of the settlement and the smelting activity at the site, around the ninth and tenth century. Grey ware and stoneware were found in the area of the Egininkisrod site, while glazed pottery is conspicuously absent. This points to an end of settlement in the fourteenth century, which probably corresponds to the end of an initial mining phase.²⁷ It is, however, possible that the decline is also related to the general shift of production to the larger river valleys in the Harz during the fourteenth century, at the latest. Waterpower was needed to drive the bellows in the ironworks, which were increasingly being built at that time,²⁸ especially as, in the early Middle Ages, iron production was already industry-like in this settlement.²⁹

A connection was quickly established between the Egininkisrod ironworks settlement and the mining pits on the neighbouring Mittelberg.³⁰ Martin Prell describes the ore transport routes leading from there or from the Volkmarskeller to Eggeröder Brunnen,³¹ which fan out much more frequently in the DTM than is evident in the field. According to the present state of knowledge, only the local red ironstone was used for smelting, which was first extracted from deposits exposed aboveground using open-cast mining.³² Numerous mining remains of different periods up to the nineteenth century have survived at the Mittelberg and the neighbouring Volkmars-

25 CDQ, No. 13. Ed. von Erath, 88–89 (chapter “Diplomata Aliaque Documenta”); see also Laufköter, Lage (1919), 11.

26 LDA site archive, parish file (OA) Heimbürg ID 1063, site 8; Schneider, Funde (1976), 254–255; Schneider, Erforschung (1982), 377–378; Behrens, Eisenverhüttungsplatz (1988), 10–12, Figs. 4 and 5; Behrens, Notausgrabungen (1992), 149–150, Figs. 2 and 3; Behrens, Spuren (2013), 44–45.

27 LDA site archive, OA Heimbürg ID 1063, site 8; Schneider, Funde (1976), 254–255; Schneider, Erforschung (1982), 377–378; Behrens, Eisenverhüttungsplatz (1988), 10–12, Figs. 4 and 5; Behrens, Notausgrabungen (1992), 149–150, Figs. 2 and 3; Behrens, Spuren (2013), 44–46.

28 Gringmuth-Dallmer, Besiedlung (1992), 151; Kleßen, Eisenhöfen (1985), 10–12; cf. also Alper, Königslandschaft (2014), 87; Alper, Harz Mountains (2008), 479–481.

29 Unger, Rübeld (1994), 89.

30 The area was also investigated a few years ago by Roman Mischker (LDA) and its particularity was highlighted; see Mischker, Bergbaureviere (2003); Mischker, Montanarchäologie (2006), 367.

31 Prell, Wege (1971), 14–15.

32 Gringmuth-Dallmer, Besiedlung (1992), 150.

keller. Some quarry-like structures may also testify to former limestone extractions. From 1293, at the latest, Cistercians from the nearby Michaelstein Monastery also played a crucial role in medieval mining. In this year, they received permission from the Counts of Blankenburg and Regenstein to prospect for and to mine ore in the Kallenthäl valley, between Eggeröder Brunnen and Elbingerode.³³

12.4.2 Erdfelde

The first systematic excavations in the eastern Harz Mountains were undertaken at the end of the nineteenth century. One excavation took place at the church of the deserted village Erdfelde between 1885 and 1886. In 1898, a first and quite detailed survey plan was prepared³⁴ showing that, with dimensions of around 18 m by 12 m, the Erdfelde church is one of the larger church ruins in the eastern Harz region. Some seemingly apsidal structures are still visible today. Although the church reportedly still existed in the sixteenth century, the village itself was already deserted at the beginning of the fifteenth century.³⁵

The village was first mentioned in a document of 26 June 1343,³⁶ whereas local finds date the beginning of the settlement to the early Middle Ages. Later excavations from 1967 onwards revealed iron slag, pottery sherds (reddish-brown “Kugeltopfware”, blue-grey sherds, but also partly-glazed ware) and fragments of flat and hollow glass,³⁷ while older reports from the 1920s attest to the presumably massive removal of iron slag from the site. Due to its high iron content, the slag was apparently used for further smelting. The cultural layer in the deserted village area is said to have been 2 to 3 m thick.³⁸ To the west of the church ruins, a rectangular structure can still be seen in the ground, known locally as “the smithy”.³⁹

The old sunken pathways leading directly past the deserted site attracted the attention of researchers at an early stage.⁴⁰ From the northeast to the southwest, several sunken tracks form a tangent to the settlement area, whereas they were cut off by the recent limestone quarry in the southwest. About 500 m to the east of the deserted site, a huge group of sunken paths begins, with some twenty paths running

³³ Laufköter, Lage (1919), 12; Losse, Braunesumpf (2010), 38–39.

³⁴ LDA site archive, OA Elbingerode ID 1060, 29–30; 53 site 3.

³⁵ See *Delius*, Bruchstücke (1813), 66; adopted, among others, by *Unger*, Rübeland (1994), 94–95; *Marquardt*, Geschichte (1998), 25.

³⁶ *Bode*, Geschichte (1871), 381. See also Niedersächsisches Landesarchiv, Wolfenbüttel, NLA WO 60 Urk Nr. 34; arcinsys.niedersachsen.de/arcinsys/detailAction.action?detailid=b8143 (accessed: 03.05.2023).

³⁷ LDA site archive, OA Elbingerode ID 1060, 31; 40–40; 43; 46; 51, site 3; 170–171, site 30; 172–173, site 31.

³⁸ LDA site archive, OA Elbingerode ID 1060, 117, site 3.

³⁹ LDA site archive, OA Elbingerode ID 1060, 31, site 3. On this structure, see also *Behrens*, Erdfelde (2016), 85–86.

⁴⁰ LDA site archive, OA Elbingerode ID 1060, 52; 60; 114, site 3.

side by side. This bundle is located in the corridor of the “Alte Elbingeröder Straße”. Many among these old routes can be dated to the Middle Ages, as they are directly connected to the deserted village of Erdfelde.

12.4.3 Peersgrund

The deserted village was located after observing the old paths crossing in the Peersgrund valley, when the remains of the church and what appears to be house sites were discovered.⁴¹ Its particularly favourable position for traffic is still evident today. Since the paths lead more or less directly to the medieval church (see Figure 12.6), they must date to the same period, even though this does not exclude later uses. The paths cross the plateau in different directions, as may be recognised in the DTM and in aerial photographs, given that they are not covered by wood. The favourable position of the settlement area is enhanced by the headwaters of a small stream (flowing into the near Bode River), which was reportedly dammed at two points of the deserted site.⁴²

Among the village remains still visible today are the relics of an aisleless church (Saalkirche), whose walls of quarry stones were preserved to a height of approximately 0.9 m. The church consisted of a simple aisle with an apse in the east. In front of the apse – in which a stone foundation of the altar is recognisable – wall stumps were attached from both sides. The entrance is visible on the north side of the aisle, its floor was filled with clay screed (apparently from a younger phase). The walls, whose foundations were uncovered between 1965 and 1967 (with further excavation completed in 1987), measured 1 m in thickness.⁴³ It is possible that the church was only built in the twelfth or thirteenth century, on top of an older cultural layer. According to surface finds, however, the village itself existed at least as early as in the tenth or eleventh century.⁴⁴ Since 1964, archaeological finds have included iron slag, iron fragments, so-called monk’s and nun’s roof tiles, roof slate, and numerous grey ceramics from the twelfth to fourteenth centuries, but also partly brown ceramics. In addition, glass flux (such as fragments of a glassmaker’s pipe) may indicate on-site

⁴¹ LDA site archive, OA Rübeland ID 1072, 134; 136, site 9. This site could be identical with the remains of a chapel in the “Nebelholz” near Rübeland already described at the end of the eighteenth century; cf. *Stübner*, *Denkwürdigkeiten 2* (1790), 416–417.

⁴² LDA site archive, OA Rübeland ID 1072, 71–72, site 9.

⁴³ LDA site archive, OA Hüttenrode ID 1065, 19–20, site 5; LDA site archive, OA Rübeland ID 1072, 94–95; 137–139; 144–147, site 9; LDA site archive, OA Elbingerode ID 1060, 116 (incorrectly assigned to site 1).

⁴⁴ *Schneider*, *Bergbauforschung* (1980), 21; *Schneider*, *Wüstungsforschung* (1988), 239.

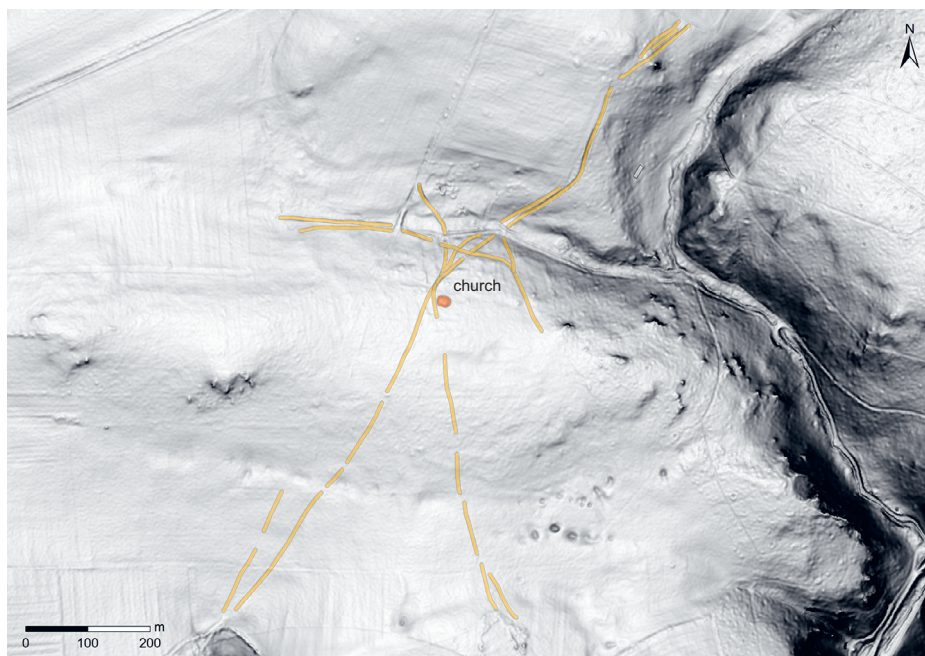


Figure 12.6: Several sunken tracks run directly to the small church ruins of the deserted village in the Peersgrund valley. Source: redrawing, visualisation, and graphics: author; DGM1: Datenlizenz Deutschland – Namensnennung – Version 2.0, © GeoBasis-DE / LVermGeo LSA.

glass production.⁴⁵ A child's skeleton and other human bones were also excavated during archaeological follow-up investigations in 1987,⁴⁶ finds that roughly date the settlement somewhere between the tenth and thirteenth/fourteenth centuries.⁴⁷

12.4.4 Ripertinigröden

This former village site is also called Ripzingerode and was probably located at the "Rippenröder Brunnen" site.⁴⁸ The outworks at Hüttenrode were on the site of an old sheep farm, which formerly belonged to the "Volkmarsche Anstalten" and to the Michaelstein Monastery. It is said that, at a trackway (Trift) near the Rippenrode parish

⁴⁵ LDA site archive, OA Hüttenrode ID 1065, 7; 19–20, site 5; 8, site 6; LDA site archive, OA Rübeland ID 1072, 71; 94; 110–111; 113–117; 133–134; 140; 143, site 9; LDA site archive, OA Elbingerode ID 1060, 50.

⁴⁶ LDA site archive, OA Rübeland ID 1072, 143–147, site 9.

⁴⁷ LDA site archive, OA Rübeland ID 1072, 143, site 9. See also, e.g. *Schneider*, *Wüstungsforschung* (1988), 239.

⁴⁸ *Stübner*, *Denkwürdigkeiten 1* (1788), 366; *Stübner*, *Denkwürdigkeiten 2* (1790), 416.

forest, traces of the sheep farm's buildings – which were only demolished in 1712 – and an associated garden could still be seen at the end of the eighteenth century.⁴⁹ On the basis of this description and given the finds of medieval pottery, Prell assumes that Rippenrode was located at the site of the outworks at Kaltenthal.⁵⁰ Another possible location is at the Rippenbach stream, a few hundred meters to the northeast. Since it belonged to St. Michael's parish, it probably did not have its own church,⁵¹ implying that it cannot be identical to the deserted village in Peersgrund. Ripertingisrod was first mentioned together with Egininkisrod in the year 956,⁵² later mentions are dated to the years 1046, 1258, 1344/65, 1432 and 1583.⁵³

12.4.5 Hordeshusen

The abandoned village of Hordeshusen was described by Johann Christian Stübner as lying between Hüttenrode and the Kreuztal. At the end of the eighteenth century, the place was reportedly referred to as “the village site and chapel”⁵⁴ – its first mention goes back to 1199.⁵⁵ Finds of early medieval red-brown pottery (eleventh/twelfth century) – and, more recently, grey ware – allow for fairly accurate dating of the site. Other finds include masses of iron slag and the remains of a smelting furnace, suggesting – again, like the other abandoned villages on the Elbingerode plateau – a context of medieval iron smelting,⁵⁶ especially given the numerous small and large iron ore mining pits in the area. However, since the larger ones are probably more recent and thus were not created in the Middle Ages, the area of the deserted site must have been strongly altered or disturbed by later mining as well as modern road and railway constructions.⁵⁷

Hollow ways most probably lead from the plateau in the north through the valley towards the deserted site and the presumed location of the church (see Figure 12.7). Today, it is difficult to make out any remains of the church in the terrain, but the schematic ground plan of its earthen embankments was documented by Johannes Schneider in 1982.⁵⁸ The obvious spatial relationship of the paths to the deserted settlement area again points towards a date in the Middle Ages.

49 Stübner, *Denkwürdigkeiten* 1 (1788), 366–367.

50 LDA site archive, OA Hüttenrode ID 1065, 25–28 Fl. 1001; [4] A15092.

51 LDA site archive, OA Hüttenrode ID 1065, [4] A15092.

52 DD O I, No. 186. Ed. Sickel, 268–269.

53 Steinacker, *Bau- und Kunstdenkmäler* (1922), 185.

54 Stübner, *Denkwürdigkeiten* 1 (1788), 366; Stübner, *Denkwürdigkeiten* 2 (1790), 416.

55 Steinacker, *Bau- und Kunstdenkmäler* (1922), 150.

56 LDA site archive, OA Hüttenrode ID 1065, 9; 12; 16, site 7; [8] A15094.

57 LDA site archive, OA Hüttenrode ID 1065, 12, site 7.

58 Schneider, *Erforschung* (1982), 375, Fig. 6; described in Schneider, *Wüstungsforschung* (1988), 240.



Figure 12.7: Hollow ways in the open land also run towards the deserted village of Hordeshusen. Source: R. Kunze, Halle (Saale).

12.4.6 Albrechtsfelde

Albrechtsfelde was also known under the name “Armes Feld” and is very likely identical with today’s Almsfeld.⁵⁹ Several traces of hollow ways passing directly southeast of a heavily overgrown church are known as the “Wasserwege” (water paths). Numerous other tracks lie a little further north of the deserted village, which were all together coming from the direction of the “Wienröder Steige” (see Figure 12.8). The hollow ways were already observed, described and sketched by Prell in 1970/71.⁶⁰

In the middle of the adjacent meadow area lies a spring which, along with others, feeds the Silberbach stream. Surface finds made during surveys in 1970/71 include fragments of grey and older pottery from the site. A brick, roof tiles, and mortar came directly from the ruined church.⁶¹ The church⁶² is mentioned in a deed of sale from the sixteenth century, but it had already been abandoned at that time (“dar die Kirche

⁵⁹ Regarding the discussion about the exact location of this place see also *Steinacker*, Bau- und Kunstdenkmäler (1922), 213.

⁶⁰ LDA site archive, OA Wienrode ID 1087, 5–8, site 1.

⁶¹ *Ibid.*

⁶² A sketch of the remains of the church was first published by *Schneider*, *Erforschung* (1982), 375, Fig. 6.

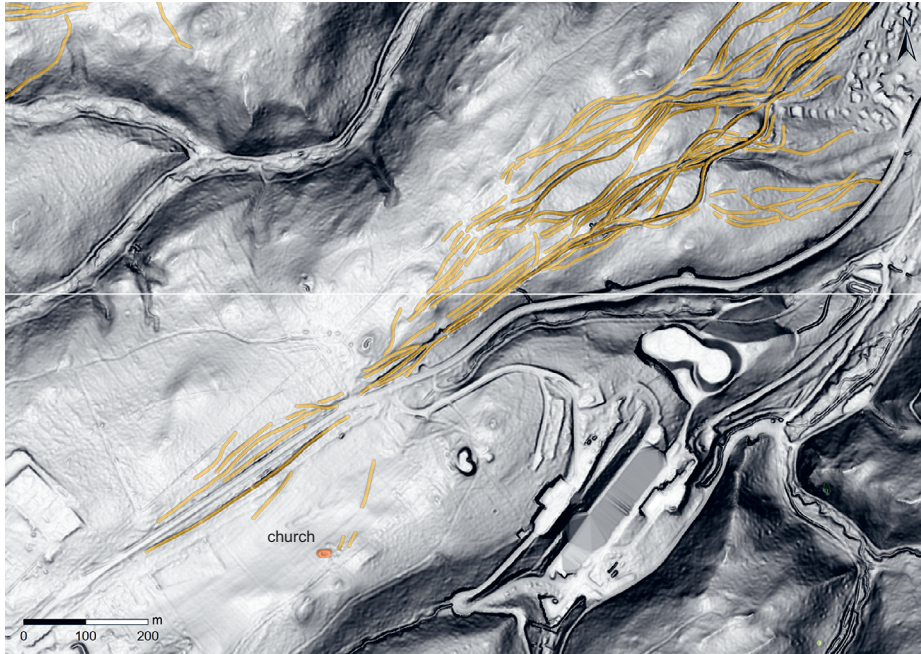


Figure 12.8: Numerous trackways coming up from the northern edge of the Harz Mountains lead directly to the church ruins of Albrechtsfelde. Source: redrawing, visualisation, and graphics: author; DGM1: Datenlizenz Deutschland – Namensnennung – Version 2.0, © GeoBasis-DE / LVermGeo LSA.

gestanden”).⁶³ Albrechtsfelde itself is mentioned for the first time on 8 September 1225 (*locus molendini et duc silve, Albrechtesvelde silva, Wigenrot duo mansi et dimidius, silva cum prato*).⁶⁴ According to Otto Schönermark, 1209 was the year of its first mention,⁶⁵ and he refers to the property register of Count Siegfried II of Blankenburg (c. 1156–1246) dated between 1209 and 1227.⁶⁶

⁶³ The exact date of the contract cannot be determined with certainty, as only copies are available in the site archive (LDA site archive, OA Wienrode ID 1087, 6; 14–16; 22–23, site 1). On this, see also *Stadelmann*, Wendefurth (1961), 5 (however, the year 1557 is presumably an incorrect date). It has not yet been possible to verify whether the text is contained in the “Erbzinsregister des Amtes Blankenburg” (Niedersächsisches Landesarchiv, Wolfenbüttel, NLA WO 111 Alt Nr. 340; arcinsys.niedersachsen.de/arcinsys/detailAction.action?detailid=v5603193 [accessed: 03.05.2023]).

⁶⁴ UB Hochstift Halberstadt I, No. 574. Ed. *Schmidt*, 510–510.

⁶⁵ *Schönermark*, Wüstungen (1897), 7.

⁶⁶ *Bode/Leibrock*, Güterverzeichnis (1869), 78–79; see also *Bode*, Nachrichten (1869), 93.

12.4.7 Bodfeld

At the end of the nineteenth century, particular efforts were made to locate preserved historical palaces. As early as 1870, Johannes Heinrich Müller (1828–1886) had excavations undertaken on the Papenberg hill between Elbingerode and Königshütte – which he considered the location of the Bodfeld royal palace – where he uncovered the remains of St. Andrew’s Church.⁶⁷ The church was first mentioned in 1258 in a letter of indulgence of bishop Volrad of Halberstadt (1254–1295).⁶⁸ This site today is known as the village of Bodfeld or Lütgen-Bodfeld. Traces of early medieval iron mining and smelting were also detected in its vicinity.⁶⁹

In 1885/86, Heinrich August Brinckmann (1845–1910) came across foundation remains in the forest site known as “Schlosskopf” or “Jagdhaus” (hunting lodge) south of Heimburg, which he excavated alongside the old wall courses.⁷⁰ Most scholars agree that this is the site of the Bodfeld royal palace,⁷¹ where the tenth-century kings Otto I to III signed several diplomas⁷² and where the emperor Henry III (1046–1056) died in 1056.⁷³ Particularly noticeable at this site are a hollow way which comes up from the east out of the Trecktal valley onto the plateau, as well as a very impressive and heavily deepened hollow way to the west, coming up from the same valley.

12.4.8 Volkmarkskeller

The area around the deserted settlement of Egininkisrod also offers a multi-layered terrain with various types of features in direct spatial connection.⁷⁴ In the immediate vicinity of the settlement of the ninth/tenth to fourteenth centuries, which is now known as Eggeröder Brunnen, traces of red ironstone mining were found on the Mit-

⁶⁷ Müller, Bericht (1872), 357–359.

⁶⁸ See Leuckfeld, *Antiquitates* (1709), 221; Delius, *Bruchstücke* (1813), 13.

⁶⁹ See, e.g. Schneider/Wittenberg, Bodfeld (1974), 35–36 (here the site on the Papenberg is described, but is still misinterpreted as the location of the royal palace).

⁷⁰ Brinckmann, *Ausgrabungen* (1897), 3. Critical comments on Brinckmann’s excavations, e.g., already in Grosse, *Kloster Wendhausen* (1940), 73.

⁷¹ For decades of deliberations and discussions on the location of the Bodfeld royal palace, cf., e.g. Köhler, *Stand* (2003); Wille, *Örtlichkeit* (2010). Especially at the beginning of the twentieth century, this site was also called “Jagdhof Erdfelde” and was regarded as belonging together with the village of Erdfelde described above; cf. Höfer, *Ertfelde* (1914), 161. In 2023, our excavation of the Schlosskopf-site was started using the latest scientific methods to close the research gaps, see Alper et al., *Pfalzen* (forthcoming).

⁷² DD O I, Nos. 60; 63; 156. Ed. Sickel, 141–145; 237–238; DD O II, Nos. 60; 117; 201; 202; 225; 226. Ed. Sickel, 70; 131; 227–230; 253–255; DD O III, Nos. 75; 103; 104; 106; 107; 168. Ed. Sickel, 482–483; 514–519; 579–580.

⁷³ Ann. Lamperti, a. 1056. Ed. Oswald, 69.

⁷⁴ Swieder, *Burgen* (2020), 189–193.

telberg. An old dam on a small tributary of the Goldbach stream was seemingly connected either with the settlement itself or the extensive smelting activities documented at the site. Several old pathways run from the large iron ore pits on the Mittelberg towards the deserted village of Egininkisrod in the southwest – either towards the former Cistercian monastery of Michaelstein or its predecessor at Volkmaraskeller in the northeast.⁷⁵

At the Volkmaraskeller-site is a cave that shows numerous traces of artificial extensions. Furthermore, remains of human graves, the foundations of different buildings, and several early medieval finds (like a Romanic capital) are documented both on the top of the hill and in the Klostergrund valley at the Goldbach stream below.⁷⁶

12.4.9 Trackways near the sites

A perfectly preserved trackway with wheel ruts⁷⁷ – which in this form very probably dates to a more recent period – is located on the Salzberg hill about 1 km west-southwest of Michaelstein Monastery near Blankenburg. There are several sunken paths on the route leading from the monastery up to the Elbingerode plateau towards the deserted villages of Egininkisrod, Erdfelde, and in the Peersgrund valley.⁷⁸ In Bleeksholz, they meet the old Elbingerode road, also preserved as a hollow way. It leads from Heimburg over the Langenberg hill and continues southwest towards the plateau. Wheel ruts with a gauge of 1.38 m have been preserved in the clay-slate subsoil. They have been driven up to 35 cm deep into the bedrock.⁷⁹ In the 1970s, when Prell documented and published the hollow way, together with the tracks, he apparently did not record the exact position of the site. He only described it in general terms as being located on the Salzberg. Fortunately, its precise location was recently rediscovered and assigned (see Figure 12.9).⁸⁰

⁷⁵ On Volkmaraskeller see, e.g., *Behrens/Behrens*, Alt Michaelstein (2021).

⁷⁶ *Steinacker*, Bau- und Kunstdenkmäler (1922), 196; 198–206.

⁷⁷ Ruts can only be documented during field inspections and cannot be recognised in the DTM. Wagon tracks can usually only form and be preserved if the routes have been used for such a long time that the wheels have left their traces in the rock, and if the corresponding geological subsoil is present. Such traces of use may, of course, also be found in the western Harz Mountains, where they have only recently been documented in detail; cf. *Malek/Linke*, Ansätze (2021), 242–244, Figs. 13–15.

⁷⁸ See also *Prell*, Wege (1971).

⁷⁹ *Prell*, Befund (1978), 268, Pl. 42b.

⁸⁰ Neither Prell's publication (*Prell*, Befund [1978]) nor his notes and reports, which have found their way into the LDA's archives, noted where exactly the tracks were located on the Salzberg, gave their coordinates, or included a sketch of the location. Since there are more than twenty hollow ways or sections on the Salzberg, it was initially unclear where to locate the tracks. I owe the "rediscovery" of the path I was looking for to Ulrich Swieder, Blankenburg, who, after walking along several sunken paths, was able to identify it on the basis of the prominent rocks on the side and locate the tracks already found by Prell.

While it is not possible to determine the period from which these hollow ways originate without further investigation, it is worth mentioning that the “Salzberg” or “Solberch” (Salt Hill) was mentioned as early as 1237, together with an adjacent forest, as being the property of the nearby Cistercian monastery of Michaelstein.⁸¹



Figure 12.9: At the Salzberg, a particularly well defined and stepped hollow way could be documented in the field. Source: U. Swieder, Blankenburg.

Apparently, tracks very similar to the Salzberg have also been found about 1 km further northwest, at the Langenberg. Here, at the end of the 1990s, several pathways were investigated in the field and profile sections were made for three of them in order to draw conclusions about the track gauges and axle heights of the transport wagons used. A track width of 1.5 m and a stepped profile – as documented at the Salzberg – were found.⁸² One of the box-shaped hollow ways, in particular, had an obvious horizontal step on each side, which had presumably been created intentionally to widen the track.

⁸¹ Origines Guelficae IV, No. 69. Ed. Scheidt, 168–169: *montem quendam, cum silua adiacente, Solberch dictum, monasterio lapidis sancti Michaelis vicinum.*

⁸² Projektgruppe, *Hohlwegesystem* (2000), 98–99, Fig. 60. These larger track gauges point to an early modern or post use and overprinting of the paths.

In the Harz Mountains, very few sites of medieval mobility have been excavated so far. Paved trackways were very rarely found there before modern times, since unpaved natural paths were used from prehistory well into the early current period. However, some paved entrances to settlements have already been recorded for the Middle Ages.⁸³ Examples of medieval road paving were mainly discovered at the northern edge of the Harz Mountains (see Figure 12.10) in the course of archaeological investigations during the construction of the motorway A36 (formerly known as the B6n). Gravelled paths, for example, were documented in the deserted settlement of Hinzingerode and in the likewise deserted settlement at the Hellbach stream near Heimbürg. The latter was an important iron smelting site in use from the ninth century onwards.⁸⁴ Within the deserted settlement of Marsleben near Quedlinburg, the remains of a gravel path were uncovered. Furthermore, traces of the “Langenstein Way” were excavated at one of the former gates. The documented segment of this road had a pavement made of sand quarry stones and gravel.⁸⁵ Slags were also used for medieval road paving: for instance, about 390 kg of slag were recovered from the gravel of the road at the deserted site at the Hellbach, dating from around the ninth/tenth to thirteenth centuries.⁸⁶

12.5 Summary

Research on (early) medieval hollow ways on the Elbingerode plateau in the Middle Harz region was – especially in its beginnings – mainly the work of Prell.⁸⁷ He systematically followed the traces of pathways discernible in the terrain and initially discovered crossroads which, in conjunction with stream and river crossings, often indicate deserted village sites. Closer investigations of these former settlements (such as Erdfelde, Egininkisrod, Hordeshusen, or Albrechtsfelde) subsequently unearthed ceramic finds or slag remains confirming their dating to the (early) Middle Ages. These finds may be used indirectly to date the trackways leading directly to the deserted villages or church ruins. Today, the exact documentation of these old ways, if they have been

⁸³ Schürger, *Straßennetz* (2006), 191.

⁸⁴ The path documented at the smelter settlement on the Hellbach runs roughly in a north-south direction; cf. Schürger, *Wüstung* (2005), 153, Fig. 10. To the south it leads into the Harz Mountains, to the iron ore deposits on the Elbingerode plateau. To the north it seems to run towards the medieval Derenburg royal palace; see, e.g. Alper, *Königslandschaft* (2014); Schwarz, *Methoden* (2014), 57.

⁸⁵ Schürger, *Straßennetz* (2006), 190–191, Fig. 3; Schürger, *Wüstung* (2005).

⁸⁶ Schürger, *Eisenverhüttung* (2005), 161.

⁸⁷ For the description of Prell's work, see Schneider, *Bergbauforschung* (1980), 20. While Prell focused on concrete remains in the field, earlier research concentrated primarily on the embedding of the Elbingerode plateau in a network of royal and/or long-distance routes and their general course; e.g. Grosse, *Straßen* (1942), 4–10.



Figure 12.10.a: A paved way in the northern Harz foreland near Benzingerode is one of the exceptional archaeological features. Source: A. Hörentrup (LDA).



Figure 12.10.b: A few kilometres away, near Börnecke, an unpaved way, but with wheel tracks and footprints, could be documented. Source: K. Ulrich (LDA).

preserved as sunken roads or road embankments, is possible by using digital terrain data. In this way, attributes like their exact course, their cross-sectional profiles, or their ascent in the terrain can be determined and examined non-destructively and they may be located precisely in spatial terms. Thus, the evaluation of the data obtained by means of LiDAR or ALS contributes significantly to the understanding of (early) medieval mobility in the Harz Mountains.⁸⁸

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⁸⁸ My sincere thanks for the English translation go to Louis D. Nebelsick (LDA); and to Laury Sarti and Helene von Trott zu Solz for their editorial work. Furthermore, I would like to thank Ulrich and Carmen Swieder, Blankenburg, and René Kunze, Halle (Saale), for their support during numerous field surveys.

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