Reconstruction of the oppidum on the Dünsberg (Germany)

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Abstract

This dissertation is concerned with modelling the Dünsberg (Kreis Gießen, Germany), which was once occupied by an oppidum. The primary concerns were to shed light on the probable use of the Strahlenswälle, questions of intra site visibility and impressions of the settlement structure. Introductory to this a short overview of the discussions about oppida in general, and the available data about the Dünsberg is presented. This leads to the various stages of constructing of the model and the considerations which had to be taken in the process. The conclusions are supported by short animations and stills generated from the model, and the reader is supplied with a interactive model of the site on the accompanying CD.
Chapter 1

Oppida

1.1 Antique use of the term

The word *oppidum* was used by Caesar in *De Bello Gallico*, in which he reports about his warfare against the Gauls. The sites referred to as *oppida* are described as fortified settlements, which represent the central place for a tribe. Some tribes had several of these places. Caesar describes Bibracte in more detail and mentions senate meetings and an election (Collis, 1997). According to this, it is assumed that the word *oppidum* in Caesar’s usage is intended to mean “town”, especially as some of these places are also mentioned as *urbs*. On the other hand, he is using the word *oppidum* for merely defensive sites in Britain, which had no central place function. Collis (1984) thinks that this is due to translation from Gallic informants, who called these sites *dunon*, which was translated *oppidum*, even though the meaning did not quite match.

1.2 Archaeological definition

In France the term *oppidum* is used for every fortified Iron Age settlement; while in the Czech Republic, Slovakia, and Germany the term *oppidum* is more a technical term for large (over 20-30 ha) fortified Late Iron Age settlements, thus excluding hillforts, which are smaller than 20-30 ha, and settlements like the Heuneburg, which is comparatively small and of Early Iron Age date. The use of the term *oppidum* is variable in Britain, as some authors rely on the Czech, Slovakian and German scheme, while others rely on Caesar’s second hand description of British *oppida*, and thus include merely defensive sites with little or no habitation as well as small sites into their definition (Avery, 1976; Collis, 1984).

1.3 Further characteristics

The chief characteristics of *oppida* have just been mentioned, but there are more details to be added to the picture especially concerning regional variances. But a word of caution is necessary, because only few of the *oppida* have been excavated to any larger extent. Most of the assumptions are based on a few well excavated sites (like Bibracte, Manching, Staré Hradisko and Hrazany). Often enough only the ramparts have been investigated, because of the enormous size of the *oppida*, which makes settlement archaeology difficult, especially if a representative insight in the settlement history and the internal organization of the site are the aim (Wells, 1984, 1987).

1.3.1 Emergence of *oppida*

It is assumed that the first *oppida* appeared in the Czech Republic, Slovakia, and southern Germany. Some of the *oppida* date into La Tène C2. In La Tène D1 more sites in central Europe emerge, for example in southern and middle Germany, Switzerland, Luxemburg, and France. Finally, around 50 BC and later, more sites in France and the first ones in Britain appear (Collis, 1984).

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1 I will follow the terminology of Reinecke (1902), when mentioning relative chronology. A lookup table for his terminology will be presented in Appendix A.
1.3.2 Distribution and siting

True oppida occur in France, middle and southern Germany, Switzerland, the Czech Republic, Slovakia, and Hungary (Wells, 1984). In adjoining areas we find similar developments, which do not exactly match the definition of oppida, but share some of their features. Also true oppida show regional variances in size, occupation, fortification etc. (Collis, 1995).

The oppida themselves are usually situated in easily defensible positions, like hilltops (e.g. Bibracte, Dunsberg) and peninsulae formed by river loops (e.g. Berne-Engehalbinsel, Altenburg-Rheinau). Often these sites were chosen for defence purposes, and not for their accessibility or their proximity to trade routes. In many cases this meant that the sites had no former “history”, i.e. they did not naturally evolve out of smaller settlements, but were consciously created (Collis, 1997). Their development was usually rapid. When an oppidum was founded the population of the surrounding area concentrated in it. Often this concentration lasted only for a few generations, then the sites were abandoned for more accessible places, or survived as little villages. Nevertheless some of the Gaulish oppida evolved into Roman towns (e.g. Bibracte or Paris) (Collis, 1995).

1.3.3 Size

Woolf (1993) states that usually a minimum size of 20-25 ha is asserted for oppida. Collis (1984) sets his threshold at 30 ha, to separate oppida from hillforts. He maps 59 of these sites in Europe.

The differences in size can be enormous. Most sites are small, but the largest have 300 ha and more, for example Altenburg-Rheinau 315 ha, Manching 380 ha, Kelheim 600 ha, Heidengraben 1662 ha (Kuckenburg, 1993). Size is one of the criteria for oppida which is often neglected by authors—in particular when the site shows other criteria which are commonly associated with oppida. This is especially true for France (especially northern France has a large amount of smaller “oppida-like” settlements) and Britain (Woolf, 1993).

1.3.4 Fortification

Fortification is one of the main characteristics for an oppidum, but as mentioned by Woolf (1993), probably not a very good one. The fact that fortification seemed to be a central feature of oppida goes back to Caesar and his description of these sites in De Bello Gallico.

The ramparts show regional variation, and usually four different construction techniques are mentioned: Preist-Altkönig, Hollingbury, murus gallicus and Kelheim (Collis, 1975). In addition to these there is the Ehrang construction (like the murus gallicus but without nails (Audouze and Büchenschütz, 1992)) which is usually incorporated into the group of muri gallici. These are only principle construction schemata, which in reality appear with different kinds of variation. Almost every oppidum has a special type of rampart construction—if not several (Leicht, 2000). Nevertheless there are differences in the distribution of the main fortification types (see Audouze and Büchenschütz, 1992: fig. 50), (Woolf, 1993). In France muri gallici prevail, while in the more eastern regions (Germany, Slovakia and the Czech Republic) various layouts of the timber-framed wall are preferred (van Endert, 1987).

Gates are another important feature of the fortification, they differ roughly in their use through time. The main types according to Collis (1975) are: the simple gap, the overlapping entrance, the inturned entrance and the Zangentor4, and hornworks. Of these gate types all but the hornworks appear at the Dunsberg.

The last thing left to mention about the fortification is the complexity of enclosures. Collis (1975) mentions that outside Britain most of the complex enclosures with more than two ramparts are confined to the Mittelgebirge5, to which belongs the Dünsberg.

Footnotes:
3This may also be grounded in the different nomenclature. See section 1.2
4Zangentore are according to Collis (1975) definition over 20 m long, but Dehn (1962) and van Endert (1987) define them as follows: ‘rampart ends were turned back at right-angles into the interior to edge the entrance ways’, the length of the entrance way is not mentioned.
5Outside these regions only the Magdalensberg and Závist provide complicated fortifications.
Dünsberg.

Coming back to the problem of defenses as a necessary attribute for oppida—some authors like Hill (1995) think it would be better to judge sites by the action that took place in them and not on the fact whether or not they had fortifications. He is taking up arguments offered by Woolf (1993), who stated that the fortified nucleated settlements were not really different in use, size etc. from their unfortified neighbours. On the other hand he acknowledges the communal efforts to establish these huge fortifications, and assumes that these were just reactions to a thread or a crisis. As a confirmation for this thesis the development of Manching could be cited, or other oppida where the buildings were not confined to the area inside the walls, but where the settlement continued outside as well. On the other hand we know of deliberate foundations (see 1.3.2).

Collis (1995) also mentions sites, which lie outside the boundaries of the “oppida civilization”, for example the Zemplín type settlements in Slovakia and Hungary, which are concentrated habitation sites around a small fortification. They have otherwise all the characteristics of oppida: trade, industry, nucleation etc. In France on the other hand we have small fortified and unfortified settlements, which show the traits of oppida only at a smaller scale. He even adds fortified sites in Spain and Portugal to the picture, which are the size of Gaulish oppida, but were already in existence before the Roman conquest in the 2nd cent. BC. He continues to describe the British “oppida” and mentions their unusual siting in the valleys and the lowland, as well as their small settlements in the often huge embanked area, where the fortification seems to have been a prestige object. Their role in trade and crafts is unknown.

All these peripheral sites share some aspects of the oppida but not others. It is certainly difficult to decide in which way to broaden (or not to broaden) the term oppida, or to come up with more meaningful definitions, although this is not the aim of this work.

1.3.5 Duration of use

In the east oppida usually stayed in use for about a century or longer (Wells, 1984), but Collis (1993) mentions that some places in France had a use of less than a generation. They were then abandoned for some other settlement. He uses an example where four sites (Corent, Gondole, Gergovie, and Augustonemetum) followed each other in a rapid succession and other regions witnessed similar developments. Nevertheless some French sites had more continuity as they lived on as Roman towns (see 1.3.2).

1.3.6 Are oppida urban?

One of the most controversial points related to oppida is the question whether they really were urban settlements, as Caesar described them to be. This question is hard to answer, because only a few sites have undergone modern large-scale excavation, and the surrounding area of these places is even less investigated, so that their role as central places stays obscure. The best excavated and most cited oppidum is Manching, which is in many respects not a typical site. The same accounts for Bibracte, which developed into a Roman town, and in turn effaced the underlying Pre-Roman remains. So the focus for the following questions has to rely on less well excavated sites, which obviously leaves a lot of questions unanswered.

1.3.6.1 Trade

It is not entirely clear how important trade was for the development of oppida. Remains of imported goods such as amphorae have been found in settlements, but long distance trade with the Mediterranean existed long before the oppida came into being.

Most of the traded goods stayed near the border to the Mediterranean cultures, so that in central and southern Gaul large amounts of wine amphorae were found, while their quantity decreases in the inner regions of France (Collis, 1995). Antique sources mention the trade of iron objects between the Romans and the the residents of Noricum. More information about this trade comes from graffiti in Magdalensberg. Further we are
told about the exchange of slaves for wine by antique authors, while trade goods like Campanian fine wares, or silver bowls appear at the oppida themselves (Collis, 1997). The question is whether this trade really played such an important role as is often suggested—even the whole existence of oppida is ascribed to it (Wells, 1987). I think that the trade with the Mediterranean was not so important.

Besides the long distance trade, which was according to classical authors organized by Italians7, there is also local trade and trade between oppida (Collis, 1997). Raw materials for production in the oppida could come from considerable distances. For example, the graphite clay for the potteries in Manching was transported over 200 km from Passau. On the other hand the trade of raw iron seems to have ceased, and now the finished goods were traded. Goods manufactured at the oppida were distributed to the surrounding areas, like the painted wares from Stradonice which can be found in the whole of Bohemia. Finished graphite ware cooking pots were also widely distributed (Collis, 1997). How this trade was organized is unclear.

1.3.6.2 Industry

There is plenty of evidence for manufacturing in the oppida. Iron working took place in all of them, and also ‘bronze casting, glass manufacture, pottery making, coin minting, textile production, bone and antler carving, and jewelry manufacture’ (Wells, 1984). Collis (1997) even goes so far as to mention mass production of for example brooches and belthooks, which now had stereotypical patterns. On the other hand a lot of specialized tools were produced: for agriculture, crafts, personal adornment, household equipment, wagons, horse gear, and warfare (Collis, 1984). Závist contained 85 different blacksmithy products, while in Hrazany about 65 different objects were produced (Drdá and Rybová, 1995). Pottery production also became more “industrialized”. For example almost 75 percent of the pottery in Manching was manufactured on the potters wheel (Collis, 1997).

1.3.6.3 Cult

Cult related finds in oppida are very rare or not easily identified. In Manching some round buildings with a rectangular ditch enclosing them are taken for temples, one of these buildings has hoards associated with it. A cult-tree (a gilded branch with leaves, together with a gilded sheath) was found, as well as remains of a horse statue made from iron. The horse statue was discovered close to a hoard of weapons, and the fact that the horse was destroyed and its remains scattered is taken as further evidence for a battle at the end of the 2nd century BC in which some of the sanctuaries were looted and destroyed (Sievers, 1993, 1999). During the excavations at Manching huge amounts of weapons and human bones were found. Some of the weapons were too bent to be the remains of a fight, and the bones were mainly skulls and longbones. The skulls might represent trophies, which were taken from defeated opponents, while the longbones were cut from decomposing bodies, freed from the flesh and finally the joints were removed. Both kinds of bone were kept for some time, before they were discarded. That skulls were kept as trophies is reported by classical authors. The longbones could belong to some kind of ancestry cult (Sievers, 1999). There are a few cases of cult related sites found inside oppida, for example there are a few rectangular enclosures (Viereckschanz)8 in the oppidum of Závist, but most of the sites are outside the settlements (Wells, 1990).

On the other hand it is remarkable that a few of the oppida lost their importance as occupational sites, but continued in use as gallo-roman temple (e.g. the Martberg)9. This indicates that some of the sites must have had some religious function.

7This is also supported by findings from the Magdalensberg (Collis, 1975).

8The question whether Viereckschanz are really cult related sites is vividly discussed. K. Schwarz had based on his excavation in Holzhäusen (1957-1963) argued that Viereckschanz are cult related, this had been the standard interpretation for some time, until recently. Webster (1995) already doubted the cultic significance of these sites, and in a new publication (Günther Wieland (ed.), Keltische Viereckschanzens—einem Rätsel auf der Spur, Stuttgart: Theiss Verlag 1999.) they are rather interpreted as places for living, production, storage and shelter. Unfortunately I could not get hold of this publication, my information is based on http://www.theiss.de/AId/2000/1/buch1.htm.

9Information provided by C. Nickel in private correspondence.
already in Celtic times which continued to be of importance.

1.3.6.4 Coinage

Gold coins were known from earlier Celtic contexts, but they were rather a means for storing wealth than for payment. The situation changed in the late second century BC when low value silver and potin coins were appearing (Collis, 1995). Almost every oppidum seems to have minted coins (even though there are coins, which were not produced in oppida, but came from open settlements (Wells, 1990)), but they usually did not leave the area immediately surrounding the oppida. The coins minted in Stradonice, for example, are normally not found outside of a radius of 30 km around the oppidum, and thus we can assume that trade was not managed on a monetary basis (Collis, 1997). The origins of the coins can often be traced, because many of them bear legends naming the local rulers (Wells, 1990).

1.3.6.5 Central places for the area

One of the criteria Woolf (1993) mentions to be essential for his concept of “urbanism” is that there has to be a functional differentiation between sites. This would mean that the oppida, if they have any function as a central place at all, would need smaller sites, which they dominate. For one thing not enough research has gone into this, but what has been observed so far is that there are no secondary settlements near oppida. What is rather the case, is that minor settlements were abandoned in favour of the oppidum, as soon as it was established. If there are larger open settlements they seem to have had the same role as the defended oppida and were not subordinate to them, that is if trade can be used as an indicator for economic dependency. Products from the oppida were either evenly distributed in their hinterland, or they did not leave the immediate area surrounding the oppida at all.

Collis (1995) is also aware of the fact that the oppida did not form any kind of economic, trading and defensive network. He bases his assumption on the fact that some sites in the German Mittelgebirge (among them the Dünsberg) were still inhabited in Augustan times even though in France and Southern Germany the oppida had already been abandoned for a generation or more.

1.3.7 Population

1.3.7.1 Population size

There have been different attempts to judge the size of the population. A major drawback is that usually no cemeteries belonging to the oppida can be detected. Thus the estimates are highly variable, according to the methods used to make them. Numbers mentioned range from 3000-5000 inhabitants per oppidum (Wells, 1990). For Bohemian oppida several thousand persons are estimated (Závist: 3400, Staré Hradisko: 5000), while the population for Manching, based on the quantity of meat represented by animal bones, was estimated at 1700 (Wells, 1984). Other authors propose population sizes of 1000-2000 persons per oppidum. The more moderate estimates seem in this case the more likely guesses (Wells, 1984: 171).

1.3.7.2 Zoning

Some of the oppida show signs of a deliberate layout with a rectangular grid pattern, where houses and streets follow the major axes (Wells, 1984). These patterns are attested for Staré Hradisko and Manching. The latter site even provides evidence for a major change in orientation to this grid pattern. This in turn gives us proof of the internal organization at work inside the oppida (Sievers, 1999). Both afore mentioned sites have traces of fences, which divide the area into units. These units are interpreted as farmsteads which are joined together to bigger settlement blocks. Wells (1984) assumes that 95 percent of the population in the oppida were farmers, and that they may have worked as craftsmen and merchants during the winter. Still it is obvious that there must have been a small number of professional craftsmen as well, especially regarding the high specialization

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10For example painted pottery from Stradonice in Bohemia, see 1.3.6.1.
11We saw this in relation to the coins.
in tools found inside the oppida, and regarding the diversity of tasks carried out. Drda and Rybová (1995) mention smithies, mints, jewellery, and other metallurgical workshops, which are specialized, tannery, coopers, casketry, joinery, wheelwright’s work and lathe turning. Further crafts can be assumed of which no evidence survived (e.g. basket-making, dye-making).

Drda and Rybová (1995) state that there are only a few places which were obviously used as sites of workshops, but it can be observed that certain productions took place in the same areas in different oppida. These workshop places can be found either: ‘in the vicinity of gates, in the homesteads and, in special cases, extra muros.’ And further: ‘The presumption that these craftsmen worked in the enclosed areas of farmsteads, in smaller homesteads or in dwellings bordering the main trackways (roads) in the oppidum is valid.’

Wells (1987) proposes that there are two types of sites—sites with a distinction between residential areas, workshops and areas of political activity (Bibracte and Manching are named as examples), and sites (like Staré Hradisko) where farmsteads are grouped together as units, but no differentiation of agriculture, craft, and the public sector is evident—every farmstead incorporates all of these criteria.

Woolf (1993) refuses to see any evidence of zoning in oppida at all. In this model a town needs distinct quarters for residence, crafts and agriculture, as well as zoning by social class. This differentiation is not evident in oppida, especially as a division by only a few hundred meters between differently used areas is not enough for him.

Evidence for zoning has been found in Manching where an area predominantly used for crafts was discovered. Nevertheless the excavators seem inclined to believe that the area was used exclusively for crafts, because the moist soil was not suitable for residential buildings (Sievers et al., 2000: 391).

My opinion on the question of zoning is that Woolf (1993) is thinking in too modern terms, spatial division between living and working areas is a rather recent development, which I would attribute to the dawn of the industrial revolution and the emergence of manufactures. In Roman towns there might have been residential areas for the elite, but this is due to the fact that the Roman elite did not work in agriculture or crafts. So I would rather agree with him that we are here looking at ‘a local variation on urbanism peculiar to Iron Age Europe’.

1.3.7.3 Land utilization in oppida

Oppida do not only consist of occupied regions, they usually include empty areas as well. The use of this land could have been diverse, at Manching it is assumed, that wet areas were used as pastures for cattle (Kuckenburg, 1993), while drier areas might have provided arable land for some of the farmers inside the oppidum (Sievers, 1999). This area could also provide space for the population of the surrounding settlements at times of war (i.e. act as an refuge (Dehn, 1962)). For both of these uses lower ground had to be included into the fortification. It is also attested that sources of water were deliberately incorporated into the oppida (Avery, 1976). One example would be the Grinchesweiher and the Schulborn at the Dünsberg.

1.3.8 Why did oppida emerge?

Most of the researchers think that the emergence of oppida was in some way related to the trade with the Mediterranean (Collis, 1993, 1995; Wells, 1984, 1987). A competition started for the luxury goods imported from the south so that the iron industry was intensified, slaves could be obtained through warfare (which would stimulate the need for defence). Social and political changes came to pass, which in turn lead to settlement nucleation in form of the oppida.

If we would only look at France, we could at least agree that trade was a factor in the process of oppida development, because there the oppida emerged at about the same time when the trade with the south began to flourish, but having a look at the wider picture we see that the trade theory has not much footing indeed. Collis (1984) included maps of imported Mediterranean goods from the Iron Age. They show that most of the imports (mainly wine) reached southern and central France, but at the same time almost no imports reached Slovakia, the Czech Republic or Germany, and these were the first places where oppida emerged. In addition the oppida were built before
the trade with the Mediterranean became important. Even though Collis (1995) realized this discrepancy he offered no other explanation.

Other theories are concerned with threat from outside, like the Dacians or the Germans who were challenging the security of the Celtic settlements, driven by overpopulation after a period of migration.

This might have been of concern for the people living near these tribes, but hardly for the Celtic population living close to the Alps. But something obviously must have happened if suddenly large settlement concentrations appeared. Certainly there was an ‘increased social power’ (Woolf, 1993), which made it possible that fortifications could be build and large settlements evolved in them. Audouze and Büchsenschütz (1992: 242) have a different explanation:

However, we believe that we can distinguish in the characteristics of the oppida the signs and motivations that go beyond the need for defence. By going back to earlier hillforts or installing themselves in similar upland locations the Gauls resumed an older tradition.

They see in the creation of the oppida the wish to hold on to old traditions, but also the ‘wish to delineate an urban space, separated from the countryside’. I am not sure whether I could agree that the oppida were planned as towns, but certainly they were planned, and the vast area they can include seems to indicate that a lot of settlement activity is expected. At the Dünsberg we also have evidence that a formerly fortified site was chosen again to be used as settlement area. The inner fortification is most probably of Late Bronze Age / Early La Tène date. Settlement remains dating to this period have been found inside the fortified area. Then there was a break in the settlement activity, which started again, maybe in the Middle, but certainly in the Late La Tène period.

Surely this does not explain everything, but new and more likely ideas are needed to find the answer to why the oppida emerged.
Chapter 2

Dünsberg

Having examined the general interpretation of oppida, this chapter is taking a look at the available information about the Dünsberg in particular, and of its surrounding area.

2.1 Setting of the Dünsberg

2.1.1 Topography

Northwest of Gießen (Hesse), we find several hill formations, the highest (497.5 m) and largest is the Dünsberg (see figure 2.1). This hill is a widely visible landmark for the region and its top is occupied by the oppidum.

The Dünsberg is one of the outposts of the Rheinisches Schiefergebirge. The ground consists mainly of silicious slate, but in the east of rubble and loam. The hill has several foothills: the Kleiner Dünsberg with 385 m in the north and in the west the Vorderer and Hinterer Eulenkopf (Reeh, 2001: 3). The distance to the river Lahn in the south and east is about 9 km (Schlott, 1999: 8).

2.1.2 Trade routes

The river Lahn might be seen as one of the trade routes for the site. Reeh (2001: 292-298) argues that some old ways are passing the Dünsberg, for example the Weinstraße, leading from Mainz via Gießen further to the north; the Rennweg coming from Koblenz, passing the Lahn north of Gießen and leading further to the west, the Hohe Straße coming from Cologne passing Herborn and continuing to the southwest; and the Koblenzer Straße, which is beginning near Koblenz and ends in Wetzlar. These roads pass the oppidum in some distance, but they would still provide accessible trade routes for it.

2.1.3 Other monuments

2.1.3.1 La Tène graves

To the west of the Dünsberg in the Krodorfer Forst, about 1 km from the lowest fortification, several La Tène D2 graves were found. The graves were discovered, because of 10-15 cm high rectangular or round banks, which are enclosing the cremation graves. These features, called Grabgärten, stand out from the forest ground, and were already partly destroyed by grave robbers. (Schulze-Forster, 1997, 1998). More Grabgärten exist in the Krodorfer Forst, but were not excavated. The phenomenon is well known in the regions surrounding the River Lahn and the River Rhine. The Grabgärten date to the Late La Tène and the Roman Period (Römische Kaiserzeit) (Schulze-Forster, 1997). The cemetery in the Krodorfer Forst contains about a dozen cremations, which fits into the prevailing picture of Late La Tène funerary practice of small dispersed cemeteries (Schulze-Forster, 1998).

2.1.3.2 Burial mounds

Besides these graves, which are contemporary with the late settlement phase on the Dünsberg, we find a concentration of grave mounds in the region. Most of them are south or south west of the Dünsberg (see figure 2.1). Reeh (2001: 45) lists 42
Reconstruction of the Dünsberg grave mounds\(^2\), of which 7 are under 60 cm high while the remaining 35 are over 1 m high. Only one of the grave mounds has undergone modern excavation, unveiling finds from the Late Bronze Age (Reeh, 2001: 45). Reeh (2001: 45) also states that the mounds appear to be close to the roads in the area.

2.1.3.3 Roman sites

Only 6 kilometers to the south (see figure 2.1) is the site of Waldgirmes—a Roman civil administrative site, which was built just 10 years after the destruction of the oppidum on the Dünsberg, and was given up 9 years later\(^3\) (Rittershofer, 2000). Also to the south runs the Limes. At its closest—when enclosing the fertile area of the Wetterau—it is only 18 km away from the Dünsberg (Reeh, 2001: 4).

2.1.4 Springs

A great amount of springs have their source on the Dünsberg. In the west they appear at a height of 360 m, but in the north and east they are closer to the foot of the hill. It is likely that there once were more springs which also bore a greater amount of water than they do nowadays (Reeh, 2001: 14). Three of the springs have been incorporated into the oppidum, they are the Schulborn to the north, the Grinchesweiher to the east and the spring near the Hinteren Eulenkopf in the west (see figure 2.2) (Reeh, 2001: 142).

Further springs have Strahlenwälle pointing towards them, these are the springs east of the Kleiner Dünsberg and north and east of the Schulborn (Reeh, 2001: 142, fig. 42). The streams east and south of the Grinchesweiher and north of the Schulborn are flanked by ramparts, while the spring of the Wilsbach in the south and the springs in the west have no Strahlenwälle associated with them.

The springs had a wooden frame to keep the water clean. Some of these wooden structures were excavated in 1907. One of the biggest is the Schulborn. In the administrative report from 1907 (Verwaltungsbericht, 1908), which mentions its excavation, it is said:

\[\text{daß hier ein großer Wasserbehälter angelegt war, dessen Pflößen samt de\text{r in Falzen einge-lassenen Bodenwand infolge des schlammigen Bodens größtenteils noch erhalten war. Dieser Anlage scheint eine etwas ältere und kleinere, auch anders orientierte, vorausge-}gangen zu sein.\]

Herrmann (2000) mentions that the bigger structure was 13.08-13.50 m by 4.20-4.55 m and that not only the smaller (and supposedly earlier) basin but also several wells were overlayed by it. Even though the chronological sequence (the bigger structure being younger than the smaller one) might be questionable. Only a modern excavation and, if possible, dendrochronological examinations could clarify these questions.

Nevertheless following the excavations a model of the Schulborn was built for the Museum in Wiesbaden (Reeh, 2001: 144).

In 1908 further springs were excavated. All of them contained wooden structures similar to the ones found in the Schulborn, nur waren die Wandverkleidungsböhlen bei den geringen Maßen der Bassins nicht eingelassen, sondern durch gegenseitige Verspannungen in Pfosten gehalten. (Ritterling, 1910: 356)

The Grinchesweiher was examined in 1909, but not completely as the installation proved to be too extensive. Again the report about the excavation is short and not very detailed (Reeh, 2001: 146).

2.1.5 Iron ore

In the west of the Dünsberg iron ores were mined. This certainly happened in the middle ages and during modern times, but the resources might have been important in earlier times as well. Dehn (1986: 260) thinks that there could be a connection between the iron ore deposits and the ramparts, which include the Kleinen Dünsberg together with the Strahlenwälle (R and S) near the Hinteren Eulenkopf.

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\(^2\)12 to 14 burial mounds immediately south of the Dünsberg have been completely destroyed by ploughing in the early 19th century. They are not included in this number.

\(^3\)This was after the defeat of the Roman army in the Teutoburger Forest (i.e. Kalkriese).
Figure 2.1: The Dünsberg and surrounding grave mounds (after Reeh)
Jacobi (1977: 34) also considers early use of these ore deposits. He regards the hoards of iron ingots and the great amount of tools as indications for iron working and iron production in the area, whereby the finished goods might have played an important role in trade.

Slag has been found in the vicinity of the oppidum, especially in the west and the north (Reeh, 2001: 105), but no attempt of dating these finds has been made so far.

2.2 Overview of previous research

2.2.1 Descriptions

The oldest references to the oppidum on the Dünsberg are descriptions of borders dating to the 16th century (Reeh, 2001; Schlott, 1999). Descriptions of the ramparts occurred in the 19th and early 20th century (Reeh, 2001):

1844 Dieffenbach described the two higher banks after a survey, 1878 all three banks are mentioned and roughly measured by Gareis and Zöppritz.

1860 In an article about a millstone found on the Dünsberg Dicke also denotes the kind of ramparts encountered on the hill, and mentions the Schulborn.

1879 The Dünsberg was mentioned by von Cohausen (1879) in his article about defensive walls of the region. 1904 the forester K. Behlen gives the fullest description of the hill. Besides his depiction of the banks and the identification of the Strahlenwälle, he suggests that the oldest walls were on the top of the hill, and the youngest ones on the bottom. He also detects the house platforms, and draws the first plan of the fortifications on the Dünsberg.

1907 Behlen (1907) reports about some weapon and bone finds from the Dünsberg.

2.2.2 Excavations

First excavations by the Landesmuseum Wiesbaden were undertaken in the years 1906-09 and 1912. Ritterling and Brenner conducted these excavations. Trenches through the banks revealed almost everywhere a pointed ditch in front of the bank (Reeh, 2001), but the inner structure of the banks remained unclear (Dehn, 1986; Reeh, 2001). Excavations at the Schulborn encountered two phases of the wooden lining, which also had different orientations. A model of them was constructed by the museum of Wiesbaden. The Grinchesweiher contained wooden structures similar to the ones observed in the Schulborn (Dehn, 1986). Besides these two major water reservoirs other springs and cisterns were excavated, which displayed the same kind of wooden linings (Reeh, 2001). Finally several platforms were examined, revealing their artificial nature, posthole settings and drystone walls (Dehn, 1986; Reeh, 2001). In 1916 a plaster model of the Dünsberg with its ramparts was built in the Landesmuseum Wiesbaden. Unfortunately it was not very accurate on behalf of the banks (Dehn, 1986; Reeh, 2001). Otherwise no publication followed the excavations, and some of the records were lost during the two World Wars. This and the fact that the excavation standards were not very good in these times makes the remaining records almost useless for modern research.

In 1951 a cremation was found 50 m outside the ramparts of the Dünsberg to the east. It dates to La Tène D1, the urn contained (besides the human remains) two broaches, parts of a chain and a ring (Jacobi, 1977; Schlott, 1999). Dehn (1958) assumes that this is not an isolated grave but rather part of a bigger, so far not excavated, cemetery.

In 1965 trenches for cables were cut, the finds made during this period are only partly published (Schlott, 1999).

Preceding the construction of the television and radio tower a rescue excavation on top of the Dünsberg was undertaken in 1974. An abundant amount of Late Bronze Age pottery and a bronze hammer were found, but no structures. Still it is

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5 In case of the middling rampart (banks o-s) the ditch had two points (Reeh, 2001: 79).

6 As mentioned before, in the Late La Tène small dispersed cemeteries are the rule (see section 2.1.3.1).
likely that there was a habitation site of this period on top of the hill (Dehn, 1986; Jacobi, 1977). Only a preliminary report of these excavations was published (Schlott, 1999).

In 1977 once more trenches for cables were installed on the Dünsberg. The trenches passing through the banks did hardly yield any new information. Only the topmost wall (banks w-y) seemed to be constructed of wood and rubble, while the others displayed no noticeable structure at all (Dehn, 1986; Janke, 1981).

Since 1999 further excavations have been carried out under the supervision of Rittershofer. So far two trenches have been opened, cutting through the bottommost wall (bank g, see figure 2.2), covering an area in front of gate 7. Perpendicular to this the second trench cuts through one of the Strahlenwälle (M) (Rittershofer, 1999). Some of the inner structures of the banks could be revealed. Interestingly two phases could be demonstrated for the rampart near gate 7, and the assumption of a battlefield in front of the same gate could be verified (Rittershofer, 2000). In addition to that some occupational remains behind bank g, inside the oppidum, were discovered (Nickel, 2001).

2.2.3 Early Interpretations

Certainly the earliest interpretation for the fortification on the Dünsberg was given in 1613 (Reeh, 2001: 50), where it is said that the Dünsberg is the site of a

Schlosse oder Castells [...], wovon viele nicht unwahrscheinlich mutmachen, daß es die alten Catten zum Schutz gegen die Römer und anderer feindlicher Überfälle angelegt, andere aber noch wahrscheinlicher glauben, daß hier die Römer, nachdem sie die Catten überwunden, eine Burg gehabt, um dadurch dieses tapfere Volck leichter im Zaum zu halten.

Reeh (2001) also mentions an interpretation by Wigand from 1851:

Es wird die Ansicht vertreten, daß sich dort auf dem Kleinen Dünsberg das von Germanicus errichtete castellum in monte Tauno (Tacitus Ann. 1,56) befunden habe. (Reeh, 2001: 50)

2.3 Settlement features

In the following the numbers and letters for the gates, ramparts and Strahlenwälle are according to figure 2.2. A table showing the differing nomenclatures for the gates can be found in appendix B. The three mentioned plans can be seen in appendix C, for easier comparison.

2.3.1 Ramparts

The ramparts consist of tree concentric rings, each of them being composed of the actual bank and a ditch in front of it. They also display a trough on the inside from where material for the construction of the wall has been taken (Dehn, 1958; Reeh, 2001).

Generally it is assumed that the topmost rampart must be the oldest, inspired by the Late Bronze Age material retrieved on the top of the hill, the first phase of construction of the rampart is generally assigned to this period (i.e. around 800 BC) (Herrmann, 2000; Rittershofer, 2001). The middling rampart is assigned to the time of 500BC, while the bottommost rampart dates to the Late La Tène period.

2.3.1.1 Topmost rampart—banks w-y

The banks w-y seem to be the best preserved of the three rings. Their height is still 6-8 m on the outside. On the inside the hill is marked by a huge depression from which material for the wall has been taken (Dehn, 1958). The wall must have consisted of the local stone which was filled in to a wooden frame. Reeh (2001) states that the length

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8Most of the more recent descriptions and articles of the Dünsberg like Dehn (1986), Bender (1999), Schlott (1999) and Herrmann (2000) are actually based on the description by Dehn (1958). Reeh (2001) delivers an independent account, but is not an archaeologist by training.

9I do not see a reason for this as allegedly there are very few finds from this period.
Figure 2.2: Plan of the Dünsberg: A-U Strahlenwälle, a-y ramparts, 1-23 gates (drawing after Reeh, entries by Joyce Wittur)
Reconstruction of the Dünsberg

The construction described could be of the Preist-Altkönig type, at least this was my assumption when creating the model.

Gates 21-23: While Dehn (1958) sees only two original gates (22 and 23) in the topmost circle, Reeh (2001) observed three gates (21-23). Dehn (1958) emphasizes gate 23, which consists of overlapping ramparts forming the entrance. The southern end is higher and more massive than the other one, making the whole entrance appear higher. Reeh (2001) refers to gate 22 as a simple gap but highlights the fact that a ramp had been built to give easier access to the gate. The entrance 21 is shallower and thinner than the other two gates. Instead of a 3 m deep cut through the rampart it is only 1.4 m deep. The gap between the parapets on either side is only 11.2 m, which is 2 m less than for the other entrances. Nevertheless Reeh (2001) is convinced that this entrance is necessary for access to the Schulporn and he mentions traces of a path leading from gate 19 up to gate 21.

2.3.1.2 Middling rampart—banks o-s

The enclosed area is 21 ha, the length of the ramparts 2308 m. An average height of 6.1 m with a volume of 62100 m³ is estimated by Reeh (2001). The banks follow more or less the shape of the hill, including a plateau-like extension in the east. Dehn (1958) thinks that this plateau might not have been included into the middling rampart originally, and that the banks t, u and v could be the remnants of the former layout. After having visited this part myself, I would rather say that this is unlikely. First t, u and v are very shallow ramparts in comparison to o-s, and then bank p would have to bridge over a very steep slope to join up with bank v. In all other places the ramparts approximately follow the isolines.

According to Reeh (2001) banks t, u and v are only 0.6 m high and 175 m long with two gates (19 and 20). Dehn (1958) observed only banks u and v, together with their gate 20.

East of gate 14 bank o makes a sharp bend leading uphill and then downhill again. There is also a small bank sticking out in the direction of the Schulporn. Dehn (1958) initially assumed that this might be the remainder of a rampart leading down to the Schulporn and enclosing it within the fortification. Reeh (2001) on the other hand mentions that after surveying this area he could find neither any traces of banks nor of levelling work undertaken there.

In the excavation reports from 1907 it is mentioned that at one part of the rampart the 4 m wide pointed ditch displayed two points (Verwaltungsbericht, 1908). The banks were again clearly layered, but no further features could be observed (Janke, 1981).

Gates 14-20: While Reeh (2001) sees six gates in the middling rampart Dehn (1958) counts only four of them.

Gate 14 is a simple gap in the defence, a short distance from the Schulporn (Reeh, 2001). Gate 15 appears on Dehn’s plan (Dehn, 1958) as having one end of the rampart turned inwards—like a Zangentor, neither Reeh (2001), nor I have seen this when visiting the site. Instead Reeh proposes that this is yet again a simple, gap-like gate.

Gate 16 is emphasized by Reeh (2001), because he thinks that the right side of the gate is flattened.

10This has already been mentioned in the excavation reports from 1906-12.
11The terrain in this region is also very steep, which would make it rather difficult to enter.
out. I had the impression that the ends of the rampart were turned inwards. This was pronounced on the northern side of the gate, in the south the marks were much shallower.

The left side of gate 17 was built higher than the right (Reeh, 2001). The next gate mentioned by Reeh (2001) is not on the figure 2.2. He assumes that this is rather a modern gap than an original gate. Gate 18 is also not certain, and Reeh (2001) seems rather inclined to call it a gate out of the necessity to have a gate to the west rather than being really convinced by the features in the landscape.

While gates 19 and 20 are not further mentioned by Reeh (2001), Herrmann (2000) describes gate 20 as a gate with overlapping ends.

2.3.1.3 Bottommost rampart—banks a-n

These ramparts enclose an area of about 90 ha (Dehn, 1958), the Kleine Dünsberg in the northwest is incorporated into the walls, which gives them a length of 3628 m. Dehn (1958) suggested that maybe the original plan was to incorporate the Hinteren Eulenkopf into the fortification as well, but concedes that the two banks leading towards it might also be counted to the Strahlenwälle.

As an average the walls are still 3.8 m high from the outside. Their modern volume is 46800 m$^3$ (Reeh, 2001). Two meter deep ditches were found in front of the banks in 1906/7 and 1999 (Rittershofer, 1999; Verwaltungsbericht, 1908), which were about 4.50 m wide (Janke, 1981).

The construction of this bank is known in greatest detail through the excavations in 1999-2001. The construction follows roughly the Kelheim type. The main difference is that no dry-stone walling was used for the front, only few stones have been found so far, which were situated in the lower parts of the walling, otherwise the front seems to have been made up by condensed slate rubble intermixed with loam (Nickel, 2001). The second difference is that we have clear indications of the anchorage for the palisade-like front. Every second upright beam is held by three smaller beams which acted as anchors. The anchors were clearly visible in the field as they were preserved as hollows, which would connect with the palisade beam at an angle of 63 degrees. The front of the wall was slightly leaning inwards (similar to the walls at Kelheim (Leicht, 2000)).

The rubble and earth inside the wall appear layered, the beams on the face of the wall were about 50 cm in diameter, the anchors about 20 cm. At the place of the excavation, two phases were visible. Remnants of the first wall are visible further to the north, its 2 m deep ditch was at a later stage filled up and in its place the new wall was built (Rittershofer, 1999). The latest results show that the course of the second wall in relation to the first has been changed: while in the first phase the ditch was running northwest to southeast, the second wall runs from west to east. Further excavations would be necessary to see the dimensions of the change in course (Nickel, 2001). In the second phase the wall does not have a ditch in front of it (Nickel, 2001).

Gates 1-13: Reeh (2001) recognizes thirteen gates, while Dehn (1958) counts seven, even though he regards gate 9 as a possible location for an eighth one. According to Dehn (1958) gates 1, 2, 5 and 8 are gates with overlapping ends, often with one end being raised and more massive in build (similar to gates 23 and 17), while 7, 10 and possibly 13 are Zangentore. Reeh (2001) describes gate 1 as a gate with overlapping ends, the western side is 1.4 m higher than the other. He also proposes a second entrance, which he calls gate 1a, which is 38 m to the west of gate 1 and of the simple gap type.

Gate 2 is a wide opening. The eastern side of the overlapping ends is 6 m higher than the western side and also considerably more massive (Reeh, 2001). Gates 3 and 4 are simple gaps (Reeh, 2001), both were not recognized by Dehn (1958). Another gate with overlapping ends is gate 5, here the southern side is 3 m higher and more massive than the northern (Reeh, 2001). Gate 6 is once more a simple gap, but gate 7 is a true Zangentor, as already mentioned by Dehn (1958). According to Reeh (2001) the ramparts turn in funnel-like to form the gate structure, this would mean that we have a Type 2 Zangentor after van Endert (1987).

13 In my reconstruction I assumed that a facing of wood (or wattle) would be necessary to give the front the necessary strength, even though no finds which would support this theory were made. Known examples of ramparts with wooden fronts are the Staffelberg, Bern-Engehalbinsel, Limberg and the Kegelriff (Leicht, 2000: 137-138).
Figure 2.3: Plan of the Dünsberg drawn according to the survey-map of the FH-Frankfurt (with slight alterations).
Gate 8 has the form of overlapping ends, with the eastern end raised 1.9 m above the western (Reeh, 2001). One of the most interesting gates is gate 9. The ramparts swing outwards before turning in funnel-like to form the gate. This is also a quite outstanding feature in the rampart on the survey-plan produced by the FH-Frankfurt in 1984 (see figure 2.3). On the other hand the short bank in front of this gate (Strahlenwall Q), as described by Reeh (2001), was not observed in this survey. Gate 10 has a similar outline to gate 9 concerning its outward swinging ends which then form the gate structures. It clearly belongs to the type 2 Zangentoren. Gate 11 is marked as a gate by the FH-Frankfurt, but was not considered by Dehn (1958). Reeh (2001) describes it as a simple gap in the rampart, the same accounts for gate 12.

Gate 13 is described by Reeh (2001) as a simple gap, while Dehn (1958) regards it as a possible candidate for a Zangentor. In this case I would go with Dehn’s interpretation even though the situation is very difficult to judge, because this area is derogated by the modern road leading past it.

2.3.1.4 Strahlenwälle

One of the most prominent features of the site are the banks enclosing the Grinchesweiher. Dehn (1958) is convinced that these banks belong to two phases. The older one consists of walls H and D, which are meant to be L-shaped, the younger banks E and I cross the older banks southeast of the Grinchesweiher. While banks E and D are almost parallel, F and G leave a wide gap. They are 125 m apart when they finally join the main wall. The total area enclosed by these banks and the bottommost wall amounts to 3.5 ha (Reeh, 2001). A further bank (F) stretches for 50 m along the stream, which is fed by the Grinchesweiher and several other springs in its vicinity. Perpendicular to it, coming from the northeast, are two further banks: C and G, which appear to be associated with F but do not join up with it.

The Strahlenwälle A and B lead from the southwest to the northeast. They start at gate 1 and 2 respectively and lead to nearby springs16.

Bank J does not start at a gate, but it leads to and possibly through an area with several springs17. The survey-map of the FH-Frankfurt shows J linked up with bank N, which leads together with banks M, f and e to a completely enclosed area (see figure 2.3). This area is free of platforms (Reeh, 2001), so it was probably not used for living. Strahlenwall K is L-shaped and follows one of the streams near bank J.

Close to gate 7 two Strahlenwälle have their beginning: L and M. L runs from the northwest to the southeast, while M extends to the southwest. In its lower half M is joined to N, which has a course from northwest to the southeast. Further south of N and M Strahlenwall O begins, it is leading from the northeast to the southwest. Strahlenwall P is only on the map of the FH-Frankfurt (see figure 2.3), it is situated south of running from northwest to the southeast. Strahlenwall Q was already mentioned in relation to gate 9. It is very short and blocking the entrance to gate 9 from the east (Reeh, 2001). Extending towards the Hinteren Eulenkopf are the Strahlenwälle R and S, their common source lies near gate 10. They are not only blocking the entrance to gate 11 from the south, but they also enclose springs and seem to embrace the Hinteren Eulenkopf from two sides. This is an area which is rich in iron ores and was largely exploited during the middle ages and in modern times (Reeh, 2001). Strahlenwall T begins close to gate 13 and then follows the line of bank I. On Dehn’s (1958: plate 29) plan the bank swings to the northwest, but on Reeh’s (2001: 54) map the bank appears to follow the shape of the Kleinen Dünsberg to the northwest. The survey of the FH-Frankfurt loses the bank while it is still close to bank I18.

Strahlenwall U is quite short but it seems to point from bank m towards a spring in the north.

Coming from the Schulborn a short Strahlenwall (V) follows the stream to the north, while Strahlenwall W begins near the Schulborn in the west and runs towards Strahlenwall A.

Concerning the use of the Strahlenwälle Schlott (1999) writes:

16The form of the gate is marked quite accurately on the plan by the FH-Frankfurt, but is not shown as a gate.
15This plan is so far unpublished
16The length of Strahlenwall B is 125 m.
2.3.2 Sources of water

Some of the sources of water inside or close to the oppidum were already mentioned. They are the Grinchesweiher, the Schulborn and several springs in the vicinity (see 2.1.4).

Reeh (2001) mentions cisterns, and includes them into some of his plans (see also figure 2.3).

In his second part of the book he just mentions one cistern to the south of the summit. Another supposed cistern is between the highest rampart and the middling rampart in the south. Reeh (2001) also identifies a cistern at the outer edge of bank t, and another one just in front of gate 13. None of these presumable cisterns has been excavated, and we cannot be sure what they really are. Especially in the case of the cistern in front of gate 13 caution should be taken, because this is not the ideal place for a cistern, as it would block the passage. 19

2.3.3 Platforms

Both Reeh (2001) and the FH-Frankfurt map show some of the platforms on the Dünsberg, but both are incomplete20. Together they record about 800 platforms, which are mainly situated between top and bottom rampart21. Concentrations of occupation can be found in the east and south between the middling and the bottommost rampart, almost no platforms are on the Kleinen Dünsberg, in the area between gate 1 and gate 2 and on the top of the hill22. It is also remarkable that many platforms are located outside the ramparts, especially in the west and near the Grinchesweiher (Reeh, 2001). Very little has been published about the excavations of some of the platforms undertaken in 1912. Bremer (1913) mentioned the excavations and that La Tène pottery and metal artefacts were found, but only one of the excavated platforms could be identified, which is in the east of the oppidum (Reeh, 2001). Further information about the excavations comes from Schumacher (1921), who mentions that platforms in the south and west of the

19What springs to mind is the pit in front of the eastern gate in Manching (van Endert, 1987: see).
20A merged picture of both recordings is shown in figure 2.3
21Reeh (2001) gives numbers for his recorded platforms on page 137.
22(Reeh, 2001: 107) mentions a comment by O. Vuge, which points out, that on the top of the hill was a fort in 1759. Further destruction through the modern buildings on top of the hill can be assumed.
Dünsberg have been excavated, revealing posts of square huts, and drystone walls (Reeh, 2001). The platforms were formed by cutting into the hill on one side and using the rubble to extend the terrace on the other. The platforms have a slope of 60 cm to 1 m from one side to the other, thus enabling drainage after rainfall (Reeh, 2001).

During the excavation in 2001 another platform was cut. It had not been visible from the surface, but three postholes, ceramics, fired clay and charcoal made it clear that this must have been a habitation site. Besides a trench for drainage of the platform could be discovered (Nickel, 2001).

### 2.4 Development of the site

The archaeological work and some of the surveys undertaken have been described in the previous sections. Additional finds were made illegally with metal detectors and some of these “collections” could be accessed by researchers.

The oldest find from the Dünsberg is a sherd dating to about 3500 BC (Michelsberger Culture), but a settlement in this time is improbable (Bender, 1999; Dehn, 1986). The same accounts for the Bronze Age, to which a wheel-headed pin dates (Jacobi, 1977). The first real settlement phase accounted for by abundant finds is the Late Bronze Age (Urnfield Culture). At that time the top of the hill must have been occupied, pottery and two copper axes have been found. Generally the construction of the first rampart is assigned to this period, even though there is no excavation data to support this view (Dehn, 1986; Jacobi, 1977), but it can be said that hillforts in this time were no uncommon settlement type (Jacobi, 1977).

The finds dating to the Hallstatt period consist of a few sherds of pottery only, no metal finds have been made so far. It is certainly questionable, whether the site was occupied in this period at all (Dehn, 1986).

The second settlement phase began in La Tène B2. The finds are concentrated on the eastern spur of the hill, which is enclosed by the middling rampart (Jacobi, 1977). Further finds are situated near gate 8 (Schlott, 1999). It is assumed that the second rampart belongs to this phase, making the Dünsberg part of the Early La Tène settlements, which are common sites from the Mittelgebirge to Bohemia, i.e. the first oppida (Jacobi, 1977). It is also thought that mining and iron smelting were important features for the oppida in this time, giving them an economic basis (Jacobi, 1977). While Jacobi (1977) proceeds on the assumption that the Dünsberg was settled continuously from La Tène B2 onwards, Dehn (1986) believes that the hill was occupied anew in La Tène C2.

The bottommost wall was certainly begun in La Tène C2 and from this time on the oppidum flourished. The Grinchesweiher and the Schulborn were incorporated into the fortification (Dehn, 1986), and the settlement area was extended to outside the boundaries of the ramparts (Jacobi, 1977; Reeh, 2001). Finds from this period include imported bronze vessels, tools and weapons. Iron production and processing took place (Jacobi, 1977). Through the tools we know that different crafts were carried out and also agricultural tasks (Jacobi, 1977; Schlott, 1999). Interesting is the great amount of weapons found on the site (Schlott, 1999).

Two questions were and are still discussed. One is the relation of Celtic and Germanic finds on the Dünsberg and the second is the end of its occupation. Different interpretations have been offered:

Schlott (1999) mentions that in 1917 Anthes thought that the Dünsberg was still occupied in Roman times. In 1930 Kutsch (1930) concluded that the Dünsberg was one site in a line of Germanic fortifications against the Romans, finally, with Domitian, the settlement found its end. A thesis which has been dismissed by Dehn (1958), on grounds of missing finds from the site to sup-

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23Besides the surveys undertaken by Reeh, others preceded the excavations in 1999. A geomagnetic prospection helped to determine the most promising areas for the excavation, and data from boreholes has been assembled. In 2001 the FH-Frankfurt undertook a survey exercise in a corridor from the top of the hill down to the excavation site, in which more borehole samples were taken. Some of the platforms sketched by Reeh (2001) were revisited. (Rittershofer personal comment and Nickel (2001))

24Jacobi (1977) assumes that at this time metalworking took place on the Dünsberg.
Dehn (1958) himself held the opinion that there was no proof for continuing occupation on the site during the first century AD. He emphasizes the Celtic finds, but mentions that there is also Germanic pottery present at the site. Jacobi (1977) states that

*die spätkeltische Siedlung ein gewaltsames Ende gefunden hat, das mit dem Feldzug des Drusus nach Germanien in den Jahren 11/10 v. Chr. im Zusammenhang steht.* (Jacobi, 1977: 38)

Taking the Roman finds as an indication he argues that the settlement could have not existed after the campaign of Drusus against the Chatti, especially as only 30 km away Drusus constructed the Roman fort of Rödgen.

Schlott (1999) criticizes Jacobi for not taking into account that some of the weapons date to La Tène D1 and others to D2, but otherwise agrees with his hypothesis.

Other critical voices have been raised. Schlott (1999) mentions Polenz, who claimed that no settlement continuity was needed, and that the Roman finds could date to later times. Mildenberger (1980) comes to the conclusion that the weapons dating to La Tène D1 belong to a conflict between Celts and Germans, and that in D2 another conflict between Germans and Romans took place. Schlott (1999) also mentions the interpretation of Spehr, who thinks that the weapons do not represent the remainders of a battle, but are indeed remnants of ritual actions.

Schlott (1999) himself points out that there are two possible reasons for the concurrence of Celtic and Germanic finds on the Dünsberg. One explanation would be that the Celtic occupation comes to an end at the end of La Tène D1, and later Germanic settlers from the Elbe region arrive. The other possibility would be that no hiatus occurred, but that the Celtic population mixed with Germans from the north. Schlott obviously assumes that no battle took place between Celts and Germans.

Schlott (1999) also gives new information on coins found on the Dünsberg and the neighbouring Heidetränkopfidum. Both sites are the centers for a special coin type. The coin distributions almost exclude each other, and Schlott wonders whether this might be taken as a proof for a Celtic settlement in the Heidetränkopfidum, and a Germanic population on the Dünsberg.

Generally the end of the occupation on the Dünsberg in 10/9 BC has now been acknowledged, especially after the recent excavations on the battlefield in front of gate 7 (Herrmann, 2000; Rittershofer, 1999, 2000). The exact relations between Celtic and Germanic occupation remain unclear.

The here outlined previous research outlined here gave a sufficient grounding for some of the reconstruction, but still further correlates were necessary to built a coherent model, as will be seen in chapter 3.

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26 Forrer 352 is found in the Heidetränkopfidum, while Forrer 351/351a has its greatest density on the Dünsberg.
Chapter 3

Methodology

This chapter will deal with the research questions, their relationship to the model, further resources which were necessary to create the model and the technical details of the reconstruction.

3.1 Aims of the model

The aims of the Dünsberg model lie in research purposes, even though the model might be later used to give visitors of the site a slight idea of what it would have looked like in past times.

The questions which were tried to be answered with the model are the following:

3.1.1 Purpose of the Strahlenwälle

One of the initial research questions concerned the use of the Strahlenwälle. Several possible explanations for them exist:

- The Strahlenwälle are remains of the (unfinished) attempt to enclose more settlement area into the defences.
- They were built to direct the traffic towards the gates.
- They were defensive structures supporting the concentric ramparts a-y.
- They were cult-related (especially as several of them are associated with springs or streams. See chapter 2.).
- Some of these structures were laid out as a corral, or were helping to direct cattle through the gates into the oppidum.

Through walking along these features and seeing them in their assumed original height, I hoped to find out whether they were useful for defensive, traffic guiding or agricultural purposes.

The Strahlenwälle which are enclosing the Grinchesweiher and the Schulborn and thus making them part of the settlement area, can certainly be compared to similar features at other sites. For example the fortification on the Glauberg, displays a triangular annex which encloses a spring (Frey and Herrmann, 1997)

3.1.2 Theorizing the inner features of the oppidum

By placing houses on all the known platforms, I tried to illustrate the occupation of the site. The Dünsberg provides a great amount of platforms, but it is not clear which ones were contemporary, or what kinds of buildings were built on them. The platforms vary largely in size, so it seems possible that they had different uses or contained different numbers of buildings, which might also have varied in size.

Some probable roads, which pass through the gates, have been marked by Reeh. I decided not to include them into the final model, so as not to distract and bias the viewer in his/her perception of the features in the landscape, thus helping to keep an open mind about different ways through and towards the oppidum.

1The site of the Glauberg is of an earlier date, but I still think that this is a valid parallel.

2The 725 platforms on the Dünsberg, stand in no relation to the neighbouring Heidetränkoppidum, which is with 130 ha (Maier, 1980) larger than the Dünsberg, but contains only about 161 Platforms (Maier, 1985).
Areas with different settlement density and the extent of the conglomeration should be assessed. Also interesting are the areas with only very little settlement features, even though their real use can only be determined by excavation, observations about the landscape and visibility can still be made. I tried to include the springs into the model, because they also structure the inside of the oppidum and were important features for daily life.

Most of this is a prerequisite for the visibility studies I wanted to undertake.

### 3.1.3 Visibility

- How would a visitor perceive the oppidum when arriving there and walking through it?
- How visible are certain structures inside the site?
- How much of the surrounding landscape can be seen from inside the site - and how is the vision obstructed by the banks?

It was suggested that I would not only use my reconstructed model to answer these questions, but that I would also design a GIS to find out about the visibility from the site and about the obstruction of the line of sight by the fortifications. Unfortunately this could not be carried out, because the 40 m DEM of the region could not be obtained in time from the Landesvermessungsamt.

With the construction of a GIS analyses, like the visibility of contemporary sites in the region, could have been undertaken. Also investigations in the relation between the Dünsberg, the surrounding burial mounds, and the Late La Tène graves would have been possible (see sections 2.1.3.2 and 2.1.3.1). With the DEM in place more about the look of the oppidum in its surroundings could have been learned.

Otherwise the reconstruction is a useful tool to tackle the first two questions. The perception of the viewer approaching the site could give useful hints about the use of the Strahlenwälle, and about the general impact of the site on an observer. Also the view from inside towards other features, like the settlement areas, the gates, the springs or the Strahlenwälle could give hints about how the site might have been structured and whether intervisibility of the three concentric ramparts and other features was important.

### 3.2 Basis of reconstruction

The reconstruction is highly dependent on assumptions and correlates, as there are very little excavation data to support it (see chapter 2). In the following sections I will elucidate my assumptions and the supporting material for some of the features.

#### 3.2.1 Surface model

The surface model is mainly based on the survey of the FH-Frankfurt in 1988/89 (figure C.3). Several flaws have been discovered while digitizing the plans: In the northwest of the hill, south of the Kleinen Dünsberg a gap appears in the isolines. Apparently at the time of the survey a forest plantation had inhibited the area from being surveyed. Apparently at the time of the survey a forest plantation had inhibited the area from being surveyed. Nevertheless it is impossible to join up the isolines north and south of this gap the way they were recorded. The way in which I transformed the isolines so that I could connect them followed the map by Dehn (1958: plate 29) (figure C.1). The banks have been left out, so as not to bias the model.

Otherwise the platforms were incorporated into the surface model. As sources for the digitizing served the survey by the FH-Frankfurt and the mapping of platforms by Reeh (2001: 137). The FH-Frankfurt map supplied height values for some of the platforms, but it was not entirely clear whether these points were only spotheights or an average for the entire platform. None of the platforms which were sketched by Reeh (2001) had any height value associated with it. For these platforms, as well as for the FH-Frankfurt platforms without height value, I assigned heights according to the surrounding isolines.

Problems were posed by some platforms north of the Hinteren Eulenkopf. As no isolines were remaining in this area, I had to guess the height values. In retrospect I believe that my heights...
were chosen too low, as the surface of the model is curving down too much in this area.

Height values for the springs had been desirable, but were unfortunately not available. This could have aided their modelling considerably.

### 3.2.2 Ramparts

The construction of the ramparts, especially the smaller, more accurate models of the bottommost wall and the *Strahlenwall*, were guided by the excavation findings (Nickel, 2001; Rittershofer, 1999, 2000). The shape of the ditches has been digitized in AutoCAD R14 from the excavation plans. Calculating the volume from the fill in the ditch and the remaining bank, the height and breadth of the original rampart, including a ramp, were estimated. In the case of the bottommost rampart the reconstruction was further supported by the fact that three “anchors” had been found. The highest of these anchoring beams must have connected to the beam at the front of the wall at a height of 4.4 m. I assumed this height to be the minimum height of the rampart at this point.

The reconstruction shows a section of the rampart with its three anchoring beams. According to the excavation findings the beams still had the beginnings of branches attached to them. This was also modelled (see Lowestwall_side.jpg and Lowestwall_SW.jpg). The ditch, which I added in the reconstruction, was not observed during the excavation. The justification for adding the ditch lies in the fact that most of the lower bank is accompanied by a ditch (as proven by the excavations in 1906-8, see chapter 2.) and the model was supposed to show rather a generalization instead of a detailed excavation account. Still the remaining structures were modelled according to the excavation findings, for example the thickness and the spacing of the beams (see Lowestwall_front.jpg).

There are no remains of the palisade on top of the rampart. In this case I followed the reconstructions offered by Motyková et al. (1991: fig. 6, fig. 7) and Drda and Rybová (1992: fig. 12, fig. 17) for Závist, Maier (1985: fig. 23) for the Heidetränkoppidum and van Endert (1987: fig. 20) for Manching. The front of the rampart is faced with wood in my reconstruction. No actual evidence has been found for this, but no evidence for a stone facing was found either. The necessity for a stabilizing blend work is obvious, considering that the rampart consisted of rubble and sand. Only wattle or wood may have been used for this purpose, leaving almost no trace when they were decaying. Parallels for the use of wood as facing for the ramparts are mentioned by Leicht (2000: 137-138).

The situation at the Strahlenwall was much more complicated. The excavation drawings were not very clear so different interpretations were possible. Rittershofer (1999) writes that the rampart was about 5 m wide. Calculating the volume of the infilled ditch and the remaining bank, and using this to estimate the size of the original rampart, I came to the result that a 5 m wide rampart would have been only 60 cm high (see Strahlenwall_low.jpg).

On the excavation plans some dark areas, which might denote the position of beams, can be seen. The length of one of these beams is c. 1.6-1.8 m long, then the feature disappears. Assuming on this basis a width of 1.7 m for the original wall, the resulting height would be 1.9 m, which is much more likely (see Strahlenwall_high.jpg). As before a ramp was attached to the wall.

The inner structures of the rampart were built according to Rittershofer (1999). Only part of the lowest layer is preserved and I had to chose how the construction would look further up. I decided that the wooden framework (again for stability reasons) would be repeated in close layers, so as to avoid the rubble and sand on the inside being washed out. Other constructions are possible, for example a variant similar to the Ehrang-type but with a wooden front, because no stones were found at the site.

During the excavation four round soil marks were found, their diameter was between 10 to 20 cm and they marked a straight line. The dis...
The distance between one post and the next was between 65 and 70 cm. The marks were just a few centimeters deep and then disappeared. It is not clear whether these marks are postholes and whether they stand in any relation with the *Strahlenwall*. I included the findings in the form of a palisade into my smaller, more accurate model of the *Strahlenwall*, but their sense is highly questionable9.

In the model of the entire oppidum I placed a palisade on top of the *Strahlenwälle*, even though there is no archaeological evidence to support this.

The only other rampart for which some reliable data exists is the topmost wall (see top-wall_back.jpg and top-wall_front.jpg on the CD). According to Janke’s (1981) description a construction of the Preist-Altkönig type seems possible10, but once more a wooden facing has to be postulated due to the lack of stones on site.

The height and width of the wall were estimated, by using the sections drawn by Reeh (2001: 57-58), and calculating the volume from the remaining bank only (because no data from the ditch was available). A maximum height of 8.9 m and a width of 6.6 m were estimated, and this time no ramp was added11. The omission of the ramp was according to the reconstruction drawing of Collis (1975: fig. 4), even though it is not clear whether there was really no ramp at the back of the topmost wall.

Once more a palisade was added to the rampart, as well as a ditch, the latter being mentioned by Janke (1981) as being 2 m wide.

There is almost no data available for the middling wall and the banks t, u and v.

For the middling rampart I once more used Reeh’s (2001: 67-68) section drawings. A height of 5.1 m and a width of 3.1 m plus a ramp were estimated. I assumed a similar layout of the structure to the bottommost rampart12. Due to the lack of reliable data no detailed reconstruction was made.

The same accounts for the banks t, u and v, for which no data exists at all. Reeh (2001: 62) mentions them to be now about 65 cm high, from which I approximated a height of about 1 m for the original rampart13 to which a palisade was added.

### 3.2.3 Houses

As laid out in section 2.3.3 there are almost no data available for the platforms and the houses. In this case I had to rely on parallel finds from other oppida. Lorenz (1986: 40-44) offers reconstructions of houses from Budenbach, from which I chose a half-timbered style14 with wattle and daub. Budenbach even provides evidence that the walls were whitewashed, sometimes even coloured.

For the roof I chose shingles, because wood was a readily available material. Another just as probable kind of roofing would have been thatching. The streams around the Dünsberg would have offered abundant amounts of reeds for this.

Two houses were reconstructed in detail (see House.jpg and Houses.jpg on the CD). For this I chose the measurements of two houses described by Schubert (1994: 150). They are both small buildings with six posts. One is 2.79×3.72 m, the other 3.72×4.96 m15 on the ground plan.

For the model of the entire Dünsberg I chose an even smaller house, out of the necessity that this house had to fit even the smallest platform. Based on Schubert’s (1994: 138) construction schema I, I picked a relation of 6:816, which results in a 1.86×2.48 m basis for the house. The height of the house is 1.80 m without the roof, and 2.78 m with a roof.

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9See all images Strahlenwall...i n folder Small_models on the CD.
10The reconstruction drawing by Rybová and Drda (1994: fig.11) for Hradiště by Stradonice, also conforms to Janke’s (1981) description of the inner structures, only the stone facing any maybe the ramp would have to be changed.
11The existence of a ramp would reduce the height of the rampart.
12The lack of easily observable inner features and the layered appearance of the sediments inside the rampart made me think that they could have been of similar design.
13This is a rather arbitrary estimate, as there were no section drawings to guide me.
14The other possibility had been simple walls made of wattle and daub.
15This corresponds to his fig. 4b and fig. 4c.
16Schubert (1994) proposes some common construction principles for the buildings at Manching. The basis is a measure of length based on feet. One foot has a length of 30.9 to 31 cm. Further design elements are based on the Pythagorean theorem (especially the numbers 3, 4 and 5) or on compass patterns. These were used to construct right angles and standardized proportions.
3.3 Reconstruction phases

3.3.1 Software

Several software packages had to be used for this reconstruction: AutoCAD R14 or AutoCAD Map2 were used for digitizing and extruding. ArcView 3.2 was used to create a TIN from the isolines. Chisel was needed to simplify the surface model, 3D Studio Max 2.5 and 3D Studio Max 4.2 helped to create the model and to make the animations, and the finished model was then exported to the Viewpoint media player. Adobe Photoshop 5.5 and Corel Photopaint 9 were used to create textures, bumpmaps and to crop the mapsheets. Conversion of images to other formats (especially to .eps) were done with the GraphicConverter 4.0.

3.3.2 Digitizing

K.-F. Rittershofer from the RGK had provided me with tiff images of the 1:1000 maps of the Dünsberg by the FH-Frankfurt. Even though one of the mapsheets had already been digitized and imported into MapInfo, by one of the employees at the RGK, I decided that it was better to digitize the whole 13 mapsheets in a new AutoCAD file and to include not only the isolines, but also the platforms, streets, springs and ramparts.

First it was necessary to crop the mapsheets using Photoshop, so that no overlap occurred between them. Then I created a grid in AutoCAD, which was set up according to the Gauss-Krueger co-ordinates, into which I inserted my prepared mapsheets. First I digitized most of the available features on the plan: isolines and platforms (which were lifted to their appropriate height) springs and ramparts. The parapets of the topmost and bottommost rampart were recorded as strahlenwälle. Only the middling rampart had no height values assigned to it, so I had to digitize it as a line. Also not all of the strahlenwälle were recorded in the same way: some had exact measurements of the parapet and the foot, others were only recorded through hachures. In the latter case it was necessary, to record them as lines, too. I also digitized the roads, which were taken by Reeh (2001) as being original. They are also included on his plan (see figure C.2). The second step was to incorporate features from the plans published by Reeh (2001). The scanned images from the publication were made available to me by C. Nickel. After scaling figure 113 and figure 160 by Reeh (2001: 137, 200), in which the positions of over 600 platforms are recorded, and trying to match them up with the plan made by the FH-Frankfurt, I found out that they were not identical. The sketch made by Reeh was so distorted that it was impossible to digitize the platforms from it immediately. Trying to rubbersheet the platforms from Reeh’s plan to the FH-Frankfurt’s plan proved to be futile. Some of the round platforms were distorted to lines. The attempt to rubbersheet just a few of the platforms with more orientation points made the result even worse. Finally the platforms were moved by hand to their approximate position on the already digitized plan. It might be argued that some accuracy was lost through this process, which is certainly the case, but regarding the fact that Reeh’s plan had just been a sketch (Reeh, 2001: 137-138), the accuracy of the original drawing is already questionable. Where possible it was attempted to match Reeh’s platforms with the ones recorded by the FH-Frankfurt, to reintroduce some of the accuracy.

The height values assigned to these platforms were given according to their proximity to the neighbouring isolines (see also 3.2.1).

After having digitized the most important features, I tried to import my data into MapInfo, but unfortunately none of the possible methods for importing the files worked, because my AutoCAD file appeared to be corrupt.

3.3.3 Surface model in ArcView

Even though I was unable to import my data into MapInfo it was still possible to import the plat-
forms and isolines into ArcView 3.2. There a TIN\textsuperscript{20} was created from the features.

It seems now that the platforms recorded by the FH-Frankfurt were more often not modelled as flat surfaces than the platforms recorded by Reeh (2001). The reason for this could be that some of the platforms recorded by the FH-Frankfurt used only 3 to 4 lines per platform, while for recording Reeh’s platforms always 5 to 6 lines were necessary.

The TIN was then exported as a VRML 2.0 file, using the 3D Analyst extension to ArcView.

### 3.3.4 VRML and minimizing

The VRML scene could not be readily imported into 3D Studio Max, as the surface had more than 32,767 vertices, which is the maximum supported. So I had to import the file into Chisel, which can clean up and reduce VRML code\textsuperscript{21}. Unfortunately the available documentation for this software is not very elaborate on behalf of the settings, so that I usually accepted the default. First I let the software clean up the VRML code produced by 3D Analyst, and then removed the smallest edges and the smallest triangles. I also tried unsuccessfully to split up the elevation grid into smaller grid tiles, which were meant to correspond with the 13 initial map tiles. Even though the program would not let me do this, my surface was now—through the triangle and edge reduction—small enough to be imported into 3D Studio Max.

### 3.3.5 Reconstruction in 3D Studio Max and AutoCAD

The main aim of the further reconstruction work in 3D Studio Max was to incorporate houses and ramparts into the model. I had also intended to include the springs and water reservoirs into it, but experienced some difficulties\textsuperscript{22}.

#### 3.3.5.1 Ramparts

I realized that the spotheights, with which I had recorded the topmost and bottommost rampart as well as some of the Strahlenwöllle, were of little use for the reconstruction, because they recorded the status quo. I had already calculated how high the different ramparts must have been, and the excavation drawings indicate that the front of the original wall lies about 3 m down the hill from the modern parapet.

I decided to digitize the ramparts again in AutoCAD, this time using polylines, which had a sufficient distance from the modern parapet. First I used three layers to record the ramparts:

- **First rampart** included banks t-\(\text{y}\)
- **Second rampart** contained banks o-s
- **Third rampart** consisted of banks a-n and A-W

These lines were imported into 3D Studio Max 2.5 and merged with the surface. To keep the model flexible and the filesize small the ramparts had to be constructed as simply as possible. I decided to build a palisade which could be used as the front view showing the posts and the wooden facing, and to have a simple rampart on the back. To construct the palisade I extruded the lines in 3D Studio Max. To give them the appropriate height over the ground it was necessary to conform them to the underlying surface. In 3D Studio Max two possibilities exist to conform objects, one is by creating a compound object, but this would result in the palisade and the surface being one object and I could not have mapped different materials to them easily. The second method, which was finally chosen, is to bind the palisade via a space-warp to the surface. In this case the surface and the palisade stayed two separate objects\textsuperscript{23}. For the conform modifier to work, it was necessary to flip the normals of the surface, then the palisades would penetrate the surface by the height assigned to the “standoff distance” field. This meant that now banks a-n and Strahlenwöllle A-W had the same height, the same accounted to banks w-\(\text{y}\) and banks t-\(\text{v}\). To change this it was necessary to return to AutoCAD. In the file “maps and gridPalisades” I transferred banks t-\(\text{v}\) and Strahlenwöllle A-W into

\textsuperscript{20}Triangular Irregular Network

\textsuperscript{21}A free trial version of this program is available from www.trapezium.com.

\textsuperscript{22}This is discussed in more detail in section 3.3.5.3.

\textsuperscript{23}The conform modifier tries to conform the vertices of one object to the surface of another object. The more vertices both of the the objects have the more accurate the fit will be, as the modifier has more points to work with: only the vertices are adjusted the area in between will be flat.
separate layers. Now it was possible to extrude the lines and conform them to the surface with the appropriate height.

To create the ramparts behind the palisades I needed to "attach a thickness" to the lines. First I tried to create loft objects along the lines in 3D Studio Max, but the software would not let me pick the lines as the path for the loft object. I returned to AutoCAD and produced the ramparts in the file "maps_and_gridExtruded." In the beginning I assumed that it would be possible to create the ramparts with a ramp already attached to them, and then to conform them in 3D Studio Max to the surface, but this is not possible. There are two ways to use a conform modifier. One is to let the extruded/lofted object penetrate the surface, and the height assigned to the "standoff distance" field would act as an barrier against which the object is pressed. Thus the ramp would not be visible, because most of the time the vertices denoting it would be pressed against the "standoff distance" barrier. The other way to conform an object to a surface is to select only the bottom vertices of the object, which will then be bound underneath the surface. The top of the object would be where the "standoff distance" tells it to be. This would preserve the form of the ramp, but would distort the middle part of the object by stretching it, while the top of the object would always be on the same height (which is not the same height away from the surface). So neither of the two possibilities suited me, so that I had to build the ramparts like walls, without the ramp.

Nevertheless the reconstruction tried to account for some differences in thickness, for example bank n was designed not as massive as the other banks of the bottommost rampart, because it is only enclosing the spring of the Schulborn, but not shielding it from the population inside the oppidum. Strahlenwälle E and I were constructed more massive than the other banks around the Grinchesweiher. This is consistent with a drawing by Reeh (2001: fig. 75), who depicts the inner wall E to be more massive than the outer one (D).

Unfortunately during the process of extruding in AutoCAD the outer lines of the ramparts were deformed, so that the ramparts were not matching up with the palisades any more. This caused some unpleasant effects in 3D Studio Max, where the palisade is sometimes sunk into the rampart instead of always fronting it.

<table>
<thead>
<tr>
<th>Height of:</th>
<th>palisade</th>
<th>rampart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topmost rampart</td>
<td>9.9 m</td>
<td>8.9 m</td>
</tr>
<tr>
<td>Low rampart</td>
<td>2.5 m</td>
<td>1 m</td>
</tr>
<tr>
<td>Middling rampart</td>
<td>6.6 m</td>
<td>5.1 m</td>
</tr>
<tr>
<td>Bottommost rampart</td>
<td>5.9 m</td>
<td>4.4 m</td>
</tr>
<tr>
<td>Strahlenwälle</td>
<td>3.4 m</td>
<td>1.7 m</td>
</tr>
</tbody>
</table>

Table 3.1: Height of the ramparts and palisades in the model

3.3.5.2 Houses

To keep the model small, the houses were built in a very simple way. They consist of a box, with a wedge as a roof. All the other features were mapped on the surface via materials.

As mentioned in section 3.2.3 the houses were meant to fit even the smallest of the platforms, and I decided to built them in a standard size, to minimize work. The buildings were merely meant to represent occupation of the site, and the schematic representation, which looks unrealistic, helps to express the uncertainty. On the other hand the buildings help to make out the platforms on the surface, so that it is possible for the observer to get an impression of settlement density or settlement dispersion.

After the prototype of the house was finished I copied it and distributed the houses over the hill. In total 724 houses were put on the corresponding platforms. Two platforms could not be populated by houses, because they did not show up on the surface, or were for some reason shown as holes. Several other platforms were not represented as flat surfaces (see section 3.3.3), so I had to sink the houses into them. Unfortunately some houses appear still to be hovering above the surface, where the surface model did not fit the actual platforms I had digitized.

24When importing the lines into 3D Studio Max, the software believed the lines to be a single object, when they were on the same layer.

25To loft an object in 3D Studio Max means the same process as extruding an object in AutoCAD.

26It was also impossible to generate a ditch in this manner.

27We also know almost nothing about the size of the houses on the Dünsberg and whether several of them could be expected on one platform.

28I had used the platforms as an aid for positioning the
3.3.5.3 Springs and Roads

Springs and cistern had been digitized in AutoCAD, using either polylines, for the features recorded by the FH-Frankfurt, or circles to record the cisterns mentioned by Reeh. Unfortunately 3D Studio Max was unable to extrude or otherwise modify those lines, because they were constructed as two different kinds of primitives(?) and imported as one object. Nevertheless it was possible to conform these features to the surface so that they show up as blue lines in the model.

The roads, which were digitized in AutoCAD (see section 3.3.2), were also imported into 3D Studio Max, but I finally decided not to include them into the model, because they might bias the perception and imply roads which might not necessarily have been in use at the time.

3.3.5.4 Animations and stills

One long and several short animations were rendered. The long animation (walkthrough.avi) is a walk over the hill, which gives an overview over the model, and shows how the settlement might have been experienced by an observer. The path for the animation is shown in figure 3.1.

The short animations look along the Strahlenwälle and try to determine how a person approaching the oppidum might have experienced them. Through these animations I wanted to find out whether the Strahlenwälle could have directed traffic towards the gates, or whether they were defensive features. Another small animation shows the view from gate 7 at the area outside the oppidum.

The stills show views from banks o-y towards the Strahlenwälle. Through them I wanted to test how far a person could see, and also how the Strahlenwälle were perceived from the inside of the oppidum. Another group of stills explores the smaller more accurate models of the different ramparts (see section 3.2.2) and the houses. Some of these stills have only a black background, while others are displayed more naturalistically with sky and grass, depending on whether the view of the model allowed the more naturalistic looking background to be arranged easily. The observer will be inclined to notice that there is a difference in perception of these stills, depending on a naturalistic background or a plain black one.

All the animations and stills can be found on the CD.

3.3.6 Viewpoint Media

The model was designed to be accessible to other researchers as well, especially as not all of its features can be covered by stills and animations. VRML was offering an easily accessible form of displaying the model and making it available to other researchers, who would on their part be able to explore and modify the scene.

Unfortunately it was not possible to export the whole model from 3D Studio Max to VRML. The obvious problem was that the conform objects were distorted, and had lost their conformed shape.

Therefore it was necessary to export the model as a 3ds-file, which just records the position of the vertices and not the conform modifiers themselves. Again it was not possible to export the whole of the model at once. Instead parts of it had to be exported as different files, which then had to be assembled correctly in a new max-file. This process introduced further inaccuracies into the model, especially the Strahlenwälle had to be positioned by hand, so that their precision in height and position is possibly not faithful to the original model.

Still it proved to be impossible to export the model without distortions into VRML. Finally the decision was taken to export it to another file format provided by Viewpoint Media, which would export the model perfectly. The exporter creates three files, among them an html-file, which can be opened to view the image.

...
Figure 3.1: The path for the animation file "walkthrough.avi".
3.4 Shortcomings and flaws of the model

It was already mentioned that there are flaws in this model. I want to use this section to remark in detail what could have been done in a better way and what is still missing.

3.4.1 Ramparts and ditches

It would have been desirable to have a more accurate picture of the ramparts. In particular ramps and ditches should have been included into the model. As mentioned before it was not possible to model these features by simple conforming, but I could have included them into the surface model in the same way, as I included the platforms. This means that I should have digitized them in AutoCAD and together with the platforms and the isolines imported them into ArcView, where the TIN could have modelled these features.

Having the ramps and ditches included into the model, it would have been possible to assess how obstructing they really were. For example: in the current model it seems as if it was possible to walk through the gap between *Strahlenwällen* L and M. but indeed there must have been the ramp of *Strahlenwall* L and the ditch of *Strahlenwall* M obstructing this passage.

It is also not clear for all the *Strahlenwälle* which side they were facing, and whether there was a ditch in front of them at all. It is also not proven that all of the *Strahlenwälle* were constructed in the same way. They might have varied in height and appearance considerably.

On the other hand for the ramparts a-y it is attested that they were of different heights and width at different points of the fortification (Reeh, 2001). It is possible that their construction varied in different places as well. At least the data for different heights had been available through the section drawings by Reeh (2001) (see section 3.2.2).

3.4.2 Gates

None of the gates were modelled even though I had collected material from correlates. First it is not really necessary to see the gate as a structure for answering any of the questions I had posed at the beginning of my research work, and second none of the gates has been excavated, so my reconstruction had to be based on mere assumptions regarding the construction of the gates. Still it would be interesting to see the difference a simple gate or a whole gate tower would make to an entrance. Especially gate towers would make the gates much more prominent and outstanding features in the fortification. They must have been widely visible as well, and thus making an impression on visitors of the *oppidum*.

3.4.3 Water

I had planned to model the springs and water reservoirs as outstanding features, so that their impact on the appearance of the inner features of the *oppidum* could be assessed. Unfortunately I was not able to achieve this (see section 3.3.5.3). The lack of these features is especially apparent at the Grinchesweiher, where the absence of the basin leaves the viewer orientationless. Modeling the actual basins and showing all the springs in the model would certainly have made a difference in the perception of the site, and would maybe show the relation between *Strahlenwällen* and water reservoirs more clearly.

3.4.4 Houses

The uniformity of the houses on the hill has a touch of the surreal. It would have been advantageous to have different sizes of houses, and maybe different types of buildings as well, for example barns, stables and *Grubenhäuser*, which show different activities. But for this is would be necessary to have more excavation data first, otherwise the model would seem to be a faithful reconstruction, even though we actually know nothing about the buildings on the hill.

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34 Another possibility would be that there was no ditch in front of *Strahlenwall* M in this part.

35 Leicht (2000: 137-138) mentions several sites where this is the case.

36 At least this is my impression.
3.5 Using the model

To test the model animations and stills were prepared. Still it would be desirable to be able to interact even more with the model. I had the impression that it was not possible to capture the whole site through the means of recorded walk-throughs and panoramas. The animations often seem jaggy\(^{37}\) and it is not possible to direct the view to whichever direction is interesting at the moment.

This situation is changed if the user has access to the original model and to 3D Studio Max, new paths and cameras can be set up to investigate questions and to generate new impressions of the site.

Also the perception changes greatly with the focal length of the camera used to view the scene. Experimenting by changing the focal lense for the same scene can focus or broaden the view on objects and their surroundings.

For experiencing the model even more freely the viewpoint media representation is a step in the right direction. It is possible for researchers to explore the model on a low-cost basis, maybe download it from the internet, and manipulate the views on their browser\(^{38}\). Refinements and changes to the model could open new ways of viewing the site in the landscape, and by adding and hiding some of the ramparts previous stages of construction could be visualized and tested. Also changes in colour could help to experience the model differently. I had the impressions that I could view the features in the model more clearly when freezing most of the objects in 3D Studio Max (they become grey then) and only the ramparts were displayed in green.

I think that the model is very complex and it would take a long time to explore it in its entirety in order to understand the specific layout of its features. Still this would be a worthwhile exercise, because the model gives us insights which cannot be experienced otherwise.

This leads us straight to the conclusion.

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\(^{37}\)Something which could have been solved with higher frame rates.

\(^{38}\)For a theoretical discussion see for example Gillings (1999).
Chapter 4

Conclusion

4.1 Strahlenwälle

The research questions, which were posed in chapter 3 mentioned different explanations for the use of the Strahlenwälle. Through generating and exploring the model it was tried to gain some insight into their use. Naturally this is a visual and subjective experience of the model, and may answer some of the questions better than others, it might also pose new problems which can only be answered by further research, in particular by excavations.

4.1.1 Expansion of settlement area

Schlott (1999) speculated that the Strahlenwälle could be the beginning of the attempt to add further living area to the oppidum. I would argue against that, on grounds of missing parallels. Usually if living area was added towards oppida it took place in a more or less “circular” way (for example Závist or the Heidetränkoppidum, also the three concentric rings of the Dünsberg itself might be taken as an example) and not by building many ray-like extensions extruding from the site. Also the evidence on site is speaking against this thesis. Where we find more or less enclosed areas (for example the area between Strahlenwällen J, L, M, N and banks f and e1, or the area enclosed by banks m, a, W and A) then they provide no evidence of occupation. We also have areas of little or no settlement activity inside the oppida (see section 2.3.3), and the question remains whether these areas, which are already enclosed by the banks would not have been occupied first, before additions were constructed.

We can also witness that building activity did extend outside the fortification of the hill, especially to the west but also in the south and near the Grinchesweier (see figure 2.3). In the west we find no Strahlenwälle associated with the occupation (if we are not taking ramparts R and S as the start for extending the settlement area). In the south the platforms lie either not close enough to the Strahlenwälle to be associated with them, or they lie outside their boundaries, so that they are separated from the oppidum by the Strahlenwälle.

Platforms can be found inside and outside the annex, which encloses the Grinchesweier, but Strahlenwälle C, F and G do not seem to represent an attempt to enclose the outlying settlements.

4.1.2 Visualization

Through the model it was possible to first get a general impression of the features on the hill, and then to choose suitable locations for stills and animations, in order to investigate the points of interest. The Viewpoint media model and the possibility to easily manipulate it made it possible to keep an overview over the whole of the hill while the details were investigated.

While watching the panoramas and the animations, which show the Strahlenwälle from outside the oppidum, I had the impression that some of the Strahlenwälle did seem to guide the observer visually to some of the gates, but were obstructing others. A summary of my impressions can be seen in figure 4.1. The dark areas denote the points from where the access to the gates seems obstructed, while the light grey areas show the positions where the access is guided visually.
Reconstruction of the Dünsberg

from where an observer seems to be guided towards one of the gates. In case of the light grey area between Strahlenwällen D and C the passage through the gap left by the two banks seems to be “inviting”, even though this is not a real gate.

Especially the area around the Grinchesweiher brings further questions. Dehn (1958) proposed that the ramparts around the Grinchesweiher seemed to be built in two phases (see section 2.3.1.4). When viewing the ramparts from the northeast (see Banks_DEC.avi on the CD), this seems very likely, as Strahlenwall D with its lower L-shaped part seems to form a straight line with H, but it is also observable that the longer part of D, which runs parallel to E, seems to form an “entrance”, by curving in into the direction of E and I. Is this maybe part of an original entrance to the area of the Grinchesweiher, which was in use at the time when only the first phase of the ramparts existed? Going to the south (Banks_FDIJ.avi) the picture is very different. It seems like the longer part of bank D, with its curving end, blocked the entrance between the ramparts D and E. And the L-shaped part of D appears to have exactly the same function: blocking off the access to D and E. From this position it does not seem clear any more whether there were really two phases to the banks enclosing the Grinchesweiher.

4.1.3 Schimmelhain

As can be seen in figure 4.1, it seems that access appeared to be restricted when approaching the oppidum from the southeast and the north, but the settlement seemed approachable when coming from the southwest and the northeast. The only entrance which seems openly accessible from the southeast is gate 6, because we find a gap in the line of J in front of it. Studying Reeh’s (2001) map (see figure C.2) it is obvious that exactly in the region of the gap springs are frequent, thus the area might have been naturally closed off, assuming that it was a marshy ground, which on the other hand would restrict access to gate 6.

Nevertheless it is remarkable that some areas look more accessible after a barrier had been crossed, for example once arrived in the Schimmelhain, Strahlenwälle L and M seem to focus the observer on the entrance to gate 7 (see Banks_LM.avi); they (L and M) appear almost like a Zangentor leading up to another Zangentor (gate 7). This focus on gate 7 is one of the interesting features of the Schimmelhain. It is understandable why Reeh (2001: 100) thinks that this area might have been used as a corral. But other uses would be possible: for example the site could have been used as a refugium for the surrounding villages. It is fortified with ramparts, and allows an easy access to the oppidum via gate 7, if there should be further need of evacuation. Noteworthy in this context is the fact that Strahlenwall M would have the ditch (and palisade) on the wrong side of the fortification: it is shielding the area in front of gate 7 from the Schimmelhain and not vice versa.

Another possibility could be something similar to a marketplace, which is connected to the oppidum via gates 6 and 7. Access could not only be gained from gate 7, but also from the gaps between ramparts M and N, or J and N. When choosing either of these entrances to the Schimmelhain the visitor is forced to walk past the ramparts and palisades for some time.

We could also be looking at two phases of additional “fortification”. In figure 4.1 it seems like the access from the southeast was supposed to be restricted. Strahlenwall M would be facing in this direction, but might have been superseded by Strahlenwall J in its use, so that we are not looking at an enclosed area, but on two different lines of fortification.

These are only suggestions, which spring to mind while watching the animations for the Strahlenwälle in this area, the real use of this enclosure can only be verified through excavation.

4.1.4 Defences

Generally I think that the Strahlenwälle were not really suitable for defence purposes, because attackers could easily walk around them. The only exceptions might be banks D, E, H and I, which are securing the Grinchesweiher, and also T, which encloses the area of the Kleinen Dünsberg in a parallel line to I. It is also remarkable how at the same

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2This is an indication for Reeh to take this area for a corral.

3The area enclosed by J, N, M, f and e.

4Bank_T.avi shows this nicely, especially how the Strahlenwälle follows the isolines in this area, while I runs further on the
Figure 4.1: Positions from which accessibility seems guided or restricted.
time the Strahlenwall T guides the view towards gate 13, if the spectator is already close enough to the gate, otherwise the view might be blocked by Strahlenwall U.

4.1.5 Access and Restriction

The characteristic of blocking entrances physically, or only from view, is notable at several other places on the Dünsberg. Gate 1a seems to be blocked by Strahlenwall W especially in association with bank V (see Banks_VWA.avi), while gate 1 lies open to the visitor, its accessibility is even enhanced by the presence of Strahlenwall A.

The small rampart P is blocking the view towards gate 7, when approaching it from the southwest, on the other hand gates 8 and 9 seem to be easily accessible (see Banks_hgP.avi)5.

Approaching from the west, gate 10 is widely visible and Strahlenwall R seems to lead towards it, while the view of gate 11 is blocked by Strahlenwälle R and S. Only when the observer is getting close to the gate by walking around the tip of Strahlenwälle R and S the entrance becomes visible (see view_towards_gate11.avi).

One might wonder, whether it is deliberate that one of the entrances seems to be blocked when two gates lie quite close to each other (e.g. gates 1 and 1a, 8 and 9, 10 and 11). Was maybe one of them dedicated to entering the site and one for exiting it, while visual aids helped to communicate which one was which?

4.1.6 Hinterer Eulenkopf

It is remarkable that both of the Strahlenwälle near the Hintere Eulenkopf are facing to the west6, so that they are not really enclosing the Hintere Eulenkopf but rather shield the area next to gate 11. Could it be that we encounter once more two phases of the same structure? First Strahlenwall S could have been built, and later R followed because it was desirable to enclose the top of the hill, with a steep slope in between them (see also From_a_to_TU.jpg).

5The Strahlenwall Q did not find its way into the model, because it was not included on the map by the FH-Frankfurt, if it would be in place the view of gate 9 might have been obstructed as well.

6That is the direction to which their ditch (and palisade?) is directed.

Hinteren Eulenkopf as well (because of its ores or because of the springs in this area?). Otherwise the two ramparts would make little sense. In the way they were built they form a dead end (see Banks_SR.avi), and would not offer much of an escape towards the oppidum. Also generally the access to the area enclosed by the two banks is restricted, and with that the access to the springs there.

4.1.7 Relation to water and cultic significance

It seems apparent that there is a connection between Strahlenwälle and sources of water. 14 of the Strahlenwälle can be associated with springs or streams, while 9 of them cannot, or the connection seems questionable (see also 2.1.4). But the way in which these features relate to the sources of water is very different. The Grinchesweiher and the Schulborn are incorporated into the settlement. F, K and V restrict the access to streams from different areas (F and K from the northeast and V from the east). Also S and R delimit the springs near the Hinteren Eulekopf. One of the possible explanations would be that the water was in some way assigned to different fields or meadows, and the banks were a means of separation between them. Further boundaries could have been formed by hedges etc. On the other hand it seems a great effort to separate fields by massive ramparts.

The other explanation could be related to cult. The seclusion of sacred areas by means of boundaries is common to Celtic ritual sites (Filip, 1970: 63; Webster, 1995: 458-459). But the way the boundary is set up is very unusual, because normally the sanctuary would be not only enclosed from one side, but kept more secluded, by walling it off on four sides, as for example the “Belgic sanctuaries” (Webster, 1995), the sanctuaries in Manching (Sievers, 1999) or in Libenice (Filip, 1970). Not only are these sites more secluded from the surrounding area, but also the banks are the focus of ritual activity (Webster, 1995). The partly excavated Strahlenwall M has not provided any finds in its ditches, but it is also not associated with water. As we have no other excavation data concerning the banks F, K and V, it is hard to determine whether they could have been of cult related use,
and further research would be necessary.

The Strahlenwälle leading up to springs (A, B, U, J) may also be interpreted as being cult related, by guiding a passage from the gates or from certain ramparts towards the springs. Unfortunately we cannot say whether these springs were the focus of cult related attention. Indeed it is not attested that the Celts used springs as sanctuaries, and Webster (1995: 449-450) points out that springs as sanctuaries in Celtic areas came only into use after the Roman conquest. On the other hand we know that springs were used by the Germans (Stjernquist, 1970), but then we should find sacrificial gifts and other indications of cult in or close to these springs. As already noted in section 2.1.4, several of the springs and also the great basins of the Schulborn and the Grinchesweiher were excavated, but no trace of cult related remains was found, even though the conditions were good enough to preserve organic materials.

Taking together all the facts I think that it can be said that a relation of the Strahlenwälle to cult is rather questionable at the moment, but the picture could be changed by further excavations of these sites.

4.2 Visibility

Having elaborated the perception of the Strahlenwälle from outside the oppidum, it is time to have a look at the features and the visibility from inside the site.

In the folder “Views-Strahlenwalle” on the CD views from the top of different banks inside the oppidum towards the Strahlenwälle have been collected. These images do not only provide views of the Strahlenwälle, but also show how much of the interior of the oppidum was visible from different ramparts.

From the top of the hill the Strahlenwälle are usually quite well visible. The views offer little new insights into the layout of the banks, only two facts should be mentioned.

In the image from q_to_LMNOP.jpg the passage between J and N seems almost like a gate, while in the same image Strahlenwalle L and M also appear as a gate leading up to gate 7.

The view from p_to_Grines.jpg shows again that H and D seem to join up, and could have formed a single defensive line (see also section 4.1.2).

4.2.1 The ramparts t,u, and v

An interesting view is offered by view_from_o_to_w.jpg and From_w_to_tuv.jpg. Both show how the banks t, u and v are acting as a barrier between the flat area in the northeast and the massive fortification on top of the hill. View_from_o_to_w.jpg also shows that both of the entrances (gate 21 and 22) to the topmost wall are visible, but only to a limited degree.

It could be assumed that banks t, u, and v were contemporary with the topmost rampart. In this case the construction might be paralleled by what we can see at the oppidum of Závist (Motykova et al., 1991: fig.1; Drda, 1997: fig. 4), where two banks in front of gate D block off a flat area leading up to the oppidum.

After the construction of the middling rampart, banks t, u and v might have become redundant as obstacles against rapprochement.

4.2.2 Settlement

The stills are also helpful in the investigation of the settlement areas inside and outside the oppidum. Already from plan 2.3 it is apparent that some areas are more densely settled than others (see also 2.3.3).

From the image Houses_in_the_east.jpg it is clear that even though this is the most densely populated area on the plan, the settlement density is not very high. One obvious reason for this is the steepness of the slope, which permits the building of houses only in intervals on platforms. The view may also be biased by the fact that the houses on the platforms are very small and that just one house was placed on each platform, even though some of the platforms had been big enough to supply enough space for several buildings. Still, the picture presented by this image is not what we would expect to be “urban” in a classical, medieval or modern sense.

Other areas of high settlement densities are to the south and to the west of the oppidum.
4.2.2.1 The South

A good overview of the southern part is given in From_x_to_LMNOP.jpg and from_y_to_LMNOP.jpg. The area seems closely populated, but there are marked exceptions: the area north of rampart O and in front of gate 7 as well as the Schimmelhain are completely free of occupation.

The houses between the gap left by Strahlenwölle O and N, are hardly visible from inside the oppidum. At the end of the sequence of Banks_JN.avi the extent of the settlement between banks O and N can be observed. The houses seem to be situated in a very vulnerable position, and only the top ones are visible from the topmost rampart of the hill. The question is also why the area between this settlement cluster and the bottommost rampart are kept free of buildings. Was there some kind of taboo to building there or was the situation not favourable enough for settlement? The latter would be rather strange considering the amount of houses situated further north and south of this empty area.

4.2.2.2 The West

To the west we also have densely populated areas, where the buildings spill over the ramparts into the lower lying ground. The ground is remarkably steep in this region (see walkthrough.avi).

An interesting situation is given at gates 10 and 11, near the Strahlenwölle R and S (see From_y_to_KS.jpg). The entrance area inside the oppidum towards gate 10 is completely free from buildings, while the platforms start to cluster in the direction of gate 11 and on the outside of bank k. Is the area at gate 10 kept free because it is one of the main arrival areas (see section 4.1.5)? Maybe we could also postulate that gate 10 is for general access, and gate 11 is used by the population of the oppidum for minor tasks, and does not bear a great amount of traffic. This might also explain the visually guiding function of the Strahlenwölle, which lead the arriving visitors directly to the right entrance (gate 10) to the oppidum.

4.2.3 The East

The same phenomenon concerning a free entrance area is observable at gate 4, which is leading towards the Grinchesweier (see from_p_to_Grinches.jpg and From_w_to_Grinches.jpg). Here a shallow depression in the landscape is left completely free from occupation, while the houses cluster on the steeper hill behind it. This feature cannot be explained by incoming traffic from outside the oppidum, as there is no real entrance to the Grinchesweier, besides the ones coming from the oppidum. Still gate 4 would be the main access to the Grinchesweier, as the direct way from gate 5 towards the basin is obstructed by Strahlenwall H. Being one of the main sources of water for the settlement it was certainly necessary to keep the entrance area to this basin free.

The view offered by From_w_to_Grinches.jpg shows not only the empty area in front of gate 4, but also that the areas closest to the walls show no settlement features. Also the area between the topmost and the middling rampart appears to lack of buildings.

On image From_w_to_b.jpg it is observable that the houses on the hill are standing in rows, this can also be seen in from_p_to_JK.jpg, but usually the development appears rather “random”. Plan 2.3 shows that there seem to be more platforms, which might be built in lines, but this is not reflected by the stills made from the model.

Whether streets or paths along which the buildings are situated could be deduced from this “patterning” has to remain speculation, even though it is obvious that some tracks or ways, between the houses must have existed.

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7They are placed far away from the oppidum, on a steep slope, which is completely exposed to the southeast. Research in the nature of this settlement would be interesting to determine why the houses were built there.

8For example trade etc. which is related to people coming from outside the oppidum, which need to access the settlement with carts, bring in cattle etc. Activities which will need a lot of space in the entrance area.

9Reeh (2001: 105) has argued in similar lines, i.e. that the two gates had a different purpose.

10The reason for this might be that the ramps, which are not modelled, occupied this area, which was thus not available for settlement. Also easy access to the fortifications via the ramps would have been necessary.
4.2.4 The North

The north is generally sparsely settled. Near gate 1 the occupational area stops abruptly leaving the rather flat area between gate 1 and gate 2 completely empty (see from_w_to_VWA.jpg, From_w_to_AB.jpg and From_o_to_AB.jpg). The question arises, whether this area was truly not settled, or whether the settlement remains were not detected. The surface in this region appears to be less steep than other regions with high settlement density. Did the platforms between gates 1 and 2 escape Reeh’s (2001) attention, because they were not as clearly visible as on the steeper slopes? Or were the traces of platforms destroyed through forestry? Maybe the area in the north was not adequate for settlement or was left open as pasture, refugium etc. Only excavations in this region could shed new light onto these questions.

4.2.5 A visitor’s impression

The ramparts in general are obstructing the view inside the oppidum, this becomes apparent in the animation “walkthrough.avi” but also while viewing some of the stills, for example From_y_to_TU.jpg, where the whole of the occupation between the middling and the bottommost rampart is concealed by the middling rampart.

On the other hand the fortifications are widely visible from outside the oppidum, and give the onlooker an impressive view of the site with its multiple ramparts, which become more massive the further up the hill they are. The multitude of houses and the vastness of the site must have added to the impression of a strong centre.

The Dünsberg is still a landmark in the region (see section 2.1.1) where it is widely visible over kilometers. Imagining it stripped of the forest and with the clearly visible fortifications and houses, which can be seen in the model, the view of it must have been even more imposing to the population and visitors of the area than it is today.

It is still hard to imagine what the site must have looked like in the past with different buildings, busy inhabitants, cattle and other animals, but I think that the model might give some indication of what we could expect from the ramparts and the settlement density.
I want to thank Karl-F. Rittershofer and Claudia Nickel for their support, proof reading, advice and the data they made available to me. Also thanks to the members of staff at the surveying department of the FH-Frankfurt, who provided me with the digitized and printed plans of the Dünsberg. Further thanks go to Susanne Sievers for proof reading and offprints of her articles, and Martin Girschick for general support and advice in Apple Macintosh related questions. Special thanks to Graeme Earl for his advice, suggestions and help whenever I had problems with the software or in writing my dissertation. Also thanks to the RGK, which provided me with a room in Frankfurt for two weeks and allowed me to use its excellent library. Last but not least I want to thank all my coursemates for their support and the good atmosphere on the course.
Appendix A

Chronology

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Table A.1: Chronological overview.
Appendix B

Nomenclature of the map

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<td>20</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td>top I</td>
</tr>
<tr>
<td>22</td>
<td>13</td>
<td>top II</td>
</tr>
<tr>
<td>23</td>
<td>12</td>
<td>top III</td>
</tr>
</tbody>
</table>

Table B.1: Overview of different gate nomenclatures.

1 Gates 19 and 20 are mentioned by Reeh (2001), but were not numbered.
Appendix C

Plans

Figure C.1: Plan of the Dünsberg by Dehn (1958)
Figure C.2: Plan of the Dünsberg by Reeh (2001)
Figure C.3: Plan of the Dünsberg by the FH-Frankfurt (1988/89)


