CHAPITRE 4

CONTACTS, RELATIONS ET ECHANGES

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RECONSTRUCTING EARLY IRON AGE PATHWAYS IN THE UPPER RHINE VALLEY

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Abstract:
Existing cultural mapping of the Early Iron Age in Southwest Germany supposes that the Upper Rhine was a main communication corridor. However, precise location of routes, questions of the infrastructure and distribution remain unanswered. This paper focuses on reconstructing pathways as a starting point for further research on infrastructure, cultural distances and cultural morphology. An empiric pathway model will be reconstructed, based on the location of cemeteries. Resulting in paths following river banks or pointing to river crossings on both sides of the river. Those river crossings are also identified using small finds from the Bronze Age onwards. The reconstructed pathways are compared to theoretical models in order to determine parameters and conditions for location of paths. Different parameters, based on "Least-Cost-Path" applications, are used to establish three theoretical models.

Keywords:
Early Iron Age, Hallstatt, empirical pathway model, Least Cost Path, Upper Rhine

Résumé :
Reconstruction des chemins du premier l'âge du fer dans le Rhin Supérieur
Dans le sud-ouest de l'Allemagne, la cartographie culturelle du début de l'âge du Fer suppose que le Rhin Supérieur était une voie de communication principale. Cependant, les détails des chemins et de l'infrastructure restent inconnus. Cette présentation vise à reconstruire ces trajectoires de la période dans la région, comme point de départ pour des recherches plus approfondies sur la morphologie et les distances culturelles. Un modèle empirique des trajectoires a été construit à base des localisations des nécropoles. Sur les deux rives du fleuve, des chemins et des passages à gué sont répertoriés. Ces passages peuvent être corroborées avec la découverte de mobilier daté à partir de l'âge du Bronze. Ce modèle est comparé aux résultats d'autres modèles théoriques, principalement fondés sur l'analyse du chemin de plus faible coût (Least Cost Path).

Mots-clés :
premier âge du Fer, Hallstatt, analyse des chemins de moindre coût, Rhin Supérieur

Introduction

During the first half of the 1st millennium BC, fortified settlements with rich grave mounds in their surroundings occurred, both bearing imported artefacts from the Mediterranean World. Besides Mediterranean imports, chariot burials, bronze vessels and huge burial mounds are characteristics of the so-called "Fürstengräber" (princely graves) of the Early Iron Age (EIA). Likewise, fortified settlements including a specific set of characteristics are called "Fürstensitze" (princely seats ; Kimmig 1969). Archaeological studies reaching back to the 19th century mainly laid their focus on Fürstengräber and Fürstensitze. They are usually interpreted as indicators for a strongly hierarchical stratified society. In the last ten to twenty years a re-evaluation has taken place; addressing research questions concerning settlement hierarchy and cultural areas. Fürstensitze were assumed to be more than economic centres as defined by Christaller (Christaller 1933), but also cultural and religious centres inhabited by a noble family. Dependency between rural settlement and Fürstensitze can be drawn, if distinct cultural borders existed. Using cultural mapping as a method to investigate cultural borders, Nakoinz demonstrated a heterogeneous cultural pattern of EIA in Baden-Württemberg without a clear relationship between Fürstensitze and surrounding territories. Fürstensitze seem more likely to be located in contact zones near to communication corridors than as central places (Nakoinz 2013, p. 213, 215). The phenomenon of Fürstensitze situated at gateway positions needs to be studied in detail. Therefore, the infrastructure of communication corridors like the Upper Rhine Valley is in the focus of this paper.

1. Methods

Routes or tracks are scarcely known in the EIA, as in these times constructed roads, like those of the Roman Empire – solidly constructed – are unlikely. Possible remains are therefore poorly preserved. If there are no archaeological features to reconstruct a path, other features corresponding to paths are needed. Signs to mark prominent points of a path, like crossings, borders of territories or mountain passes, help to orientate in the landscape. Pathway-associated features might also include an inn or other features, even natural landmarks. In the Iron Age (IA), landmarks like monuments of former times also are likely to be used for orientation. Monuments like Neolithic gallery graves or Bronze Age (BA) grave mounds were still visible, much like grave mounds built in the IA are still visible in today's landscape. Where monuments are erected in lines over several kilometres, leading through an area and built from Neolithic to IA times, a correlation with pathways is very likely. Tracks next to grave mounds are well known in Denmark, like the so-called "Ochsenweg" (Müller 1904). Monuments marking borders of settlement areas are in no contradiction to monuments near routes. Medieval landmarks, marking the border of a territory, have been erected near paths to let travellers know they are crossing a border. Landmarks are intended to be seen, otherwise they would not serve their purpose. Grave mounds as monuments are clearly recognizable as human interference in landscape and can be used as pathway-corresponding features in IA contexts. Using tracks, it is

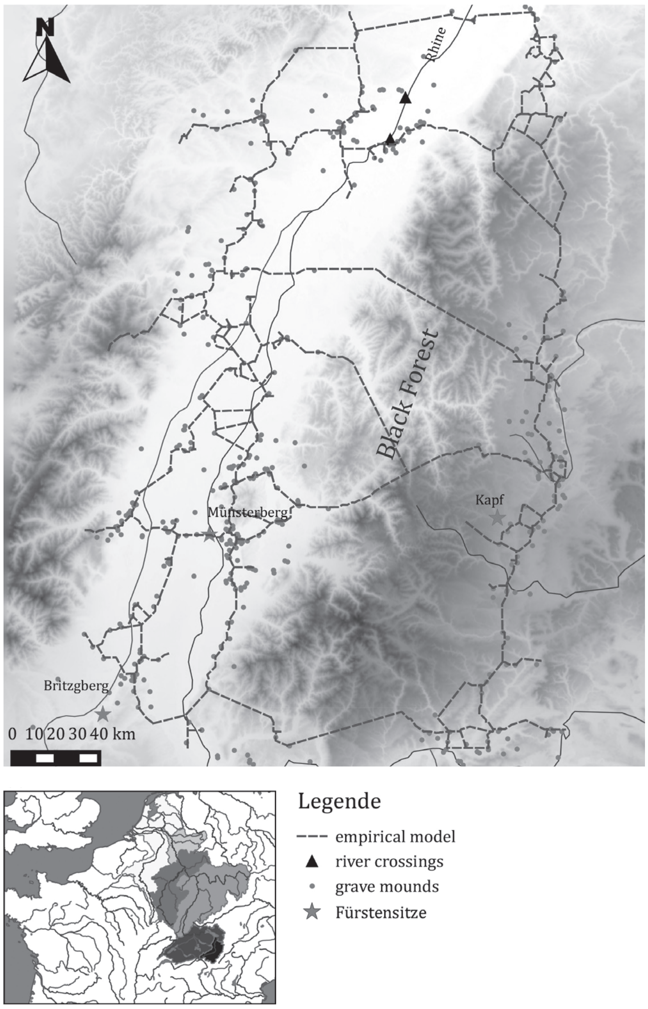

Figure 1: Empirical pathway model of the Early Iron Age in the Upper Rhine Valley. (Location of sites (SHKR Database, Mischka 2007, Wassong 2012, Engel 2013, Tremblay Cormier 2013, Jacques 2014), SRTM data provided by Shuttle Radar Topography Mission of the NASA; overview map showing the Rhine water system on a European scale).

highly likely that, depending on weather conditions, routes were slightly shifted to harder ground or to a higher level. So trying to reconstruct a specific route leading from one place to another is not feasible. But reconstructing a "path bundle" or a "path corridor" using monuments as landmarks will help to understand the ways of communication in IA times.

It is necessary to distinguish between real traffic routes and ideal traffic routes, which have been optimised with respect to specific parameters. Real traffic routes remain unknown in the EIA, but reconstructing pathways using the location of monuments results in an empiric pathway model. Paths are calculated on ridges of monument density using a dynamic Kernel Density Estimation, while local density maximums are recorded as nodes in the traffic system. The method will result in efficient paths, as zigzag paths are assumed to be undesirable. Using a weighted Delauny graph, the relative importance of multiple possible routes can be calculated (Nakoinz 2012a). The resulting empiric pathway model can be compared to theoretical pathway models to distinguish likely parameters of an idealistic traffic system (Nakoinz 2012b, p. 74).

The use of Least Cost Path (LCP) Analysis in archaeological records is acceptable, if frequently used paths are being considered. Optimisation of routes surely happened, if a connection has been used frequently over a longer period. Traders connecting settlements will use the shortest, quickest or safest way to reach their destination. Once-in-a-lifetime travels, like a crusade, are unlikely to be optimised as the terrain is unknown or local guides lead incorrectly for various reasons. Also, optimising is unlikely for paths of specific purpose, like processions in cultic contexts or paths avoiding tabooed areas. As this study investigates and estimates intensive interaction patterns resulting in frequently used traffic routes, applying LCP analysis will help to distinguish parameters used to optimise ways. The first LCP application (here: Herzog 2013, driving) is based on the use of wheeled vehicles using a critical slope value of 8 % (Herzog 2013, p. 183). Two more LCP analyses based on walking are included: One considers energy cost while walking (here: Herzog 2013, walking) resulting in the least exhausting way (Herzog 2013, p. 183). The second by Tobler is repeatedly used in archaeological studies considering intuitive walking speed resulting therefore in the quickest way (Tobler 1993). These different approaches to optimise a route according to efficiency will be compared to the empirical pathway model in order to evaluate possible parameters of the traffic systems.

2. Pathways in the Upper Rhine Valley

The location of the Rhine in Central Europe as the main part of a vast system of waterways is one reason for its importance from EIA times until today (Fig. 1). It connects the Alps, Central France, and thereby the Mediterranean area with northern Europe. According to its geological appearance, the Upper Rhine Valley seems to be an ideal communication corridor and thus a promising study area. The described method to estimate an empirical pathway model will be used to reconstruct the infrastructure in this region (Fig. 1). Other archaeological features concerning infrastructure will be used to compare and evaluate the reconstructed infrastructure. Besides well-published EIA grave mounds, unpublished and unexcavated grave mounds are included in this empirical model. As demonstrated in Figure 1, main routes are located alongside the rivers on each side of the Black Forest Mountains. At least three routes across the Black Forest indicate connections between areas on each side. Several river crossings can be identified by monument lines pointing to the river, sometimes from both river banks. Main paths following the right bank of the Rhine shift to the other bank in the upper quarter of the Upper Rhine Valley. In spite of excluding locations of Fürstensitze, empirical paths run from at least four directions to Münsterberg, which can be interpreted as an important site regarding communication and interaction. On the latitude of the northern extent of the Black Forest Mountains, river crossings are again traced by the empirical model.

In the smaller region of the Hagenau Forest, the empirical pathways are compared to river crossings recognised via small finds (Fig. 2). A continuous use of these river crossings (Logel, 2007, p. 27-50) from the BA onwards can be derived

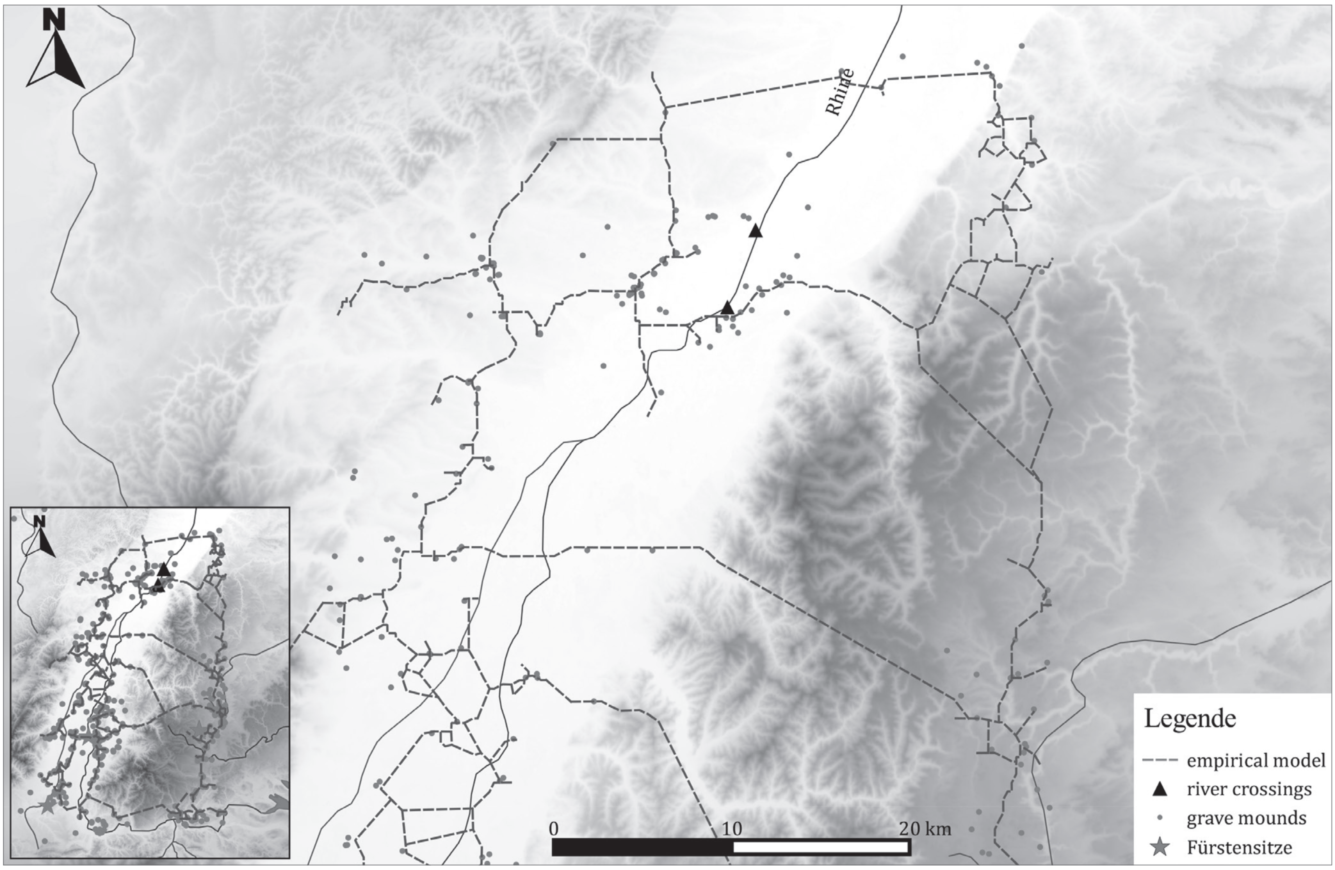

Figure 2: Empirical pathway model in the Forest of Hagenau (Location of sites (SHKR Database, Mischka 2007, Wassong 2012, Engel 2013, Tremblay Cormier 2013, Jacques 2014), SRTM data provided by Shuttle Radar Topography Mission of the NASA).

from dating these small finds. In this area, grave mounds form clusters or lines pointing to the next burial ground (Wassong 2015, p. 318), which demonstrates that monuments have been used as signs in the landscape to orientate and mark passages over a long time span. In comparison to the above-mentioned LCP functions, crucial parameters can be identified helping to establish a model to describe the empirical pathway (Fig. 3). A comparison between the LCP and the empirical pathway in the area around Hagenau shows some interesting divergence and overlaps with the empirical model. Especially grave mounds lying outside the calculated empirical model, but matching Tobler's LCP need further interpretation. The middle part of the second LCP (Herzog 2013, walking) corresponds well with the empirical model. Avoiding the use of specific way stations in the LCP calculation might be responsible for the western part of this connection. On the eastern part, the divergence could be a result of using the shortest path instead of a random walk estimation. It is possible that such a random, less optimised path using the same cost surface, matches the empirical model. Driving (Herzog 2013, driving) seems to have no influence on choice of paths, or the applied cost function in this geographical area.

Conclusions

Using the preliminary results of this case study, we are able to demonstrate continuity in using monuments as landmarks from BA to the EIA onwards. The described method to estimate empirical pathways operates efficiently, but none of the LCP functions used explains sufficiently the location of the empirical model. It is likely that other optimising parameters were more important than energy costs, wheeled vehicles or walking speed. In future, theoretical pathway models will consider and integrate other costs to evaluate their influence. Cost surfaces using cultural differences, visibility or interaction patterns will be integrated in combination with common LCP cost surfaces (geographical parameters). Combining geographical cost surfaces with non-geographical parameters should result in a more complex model, which is more likely to represent the EIA reality. In particular, combining cultural distances, derived from cultural mapping, will result in a well-approximated theoretical model. As in this example, existing LCP applications (geographical parameters) without additional cost surfaces and adaptation to the geographical area did not lead to adequate theoretical models, these additions and adaptations are next steps. Furthermore, applying random walk functions to LCP estimations will result in better-approximated theoretical paths in comparison to strict shortest path calculations.

In the Upper Rhine Valley, grave mound groups aligned to one of the biggest river systems in Europe reveal its importance in communication and traffic. The potential to identify river crossings using the location of grave mounds might help to describe the infrastructure of the Upper Rhine Valley more

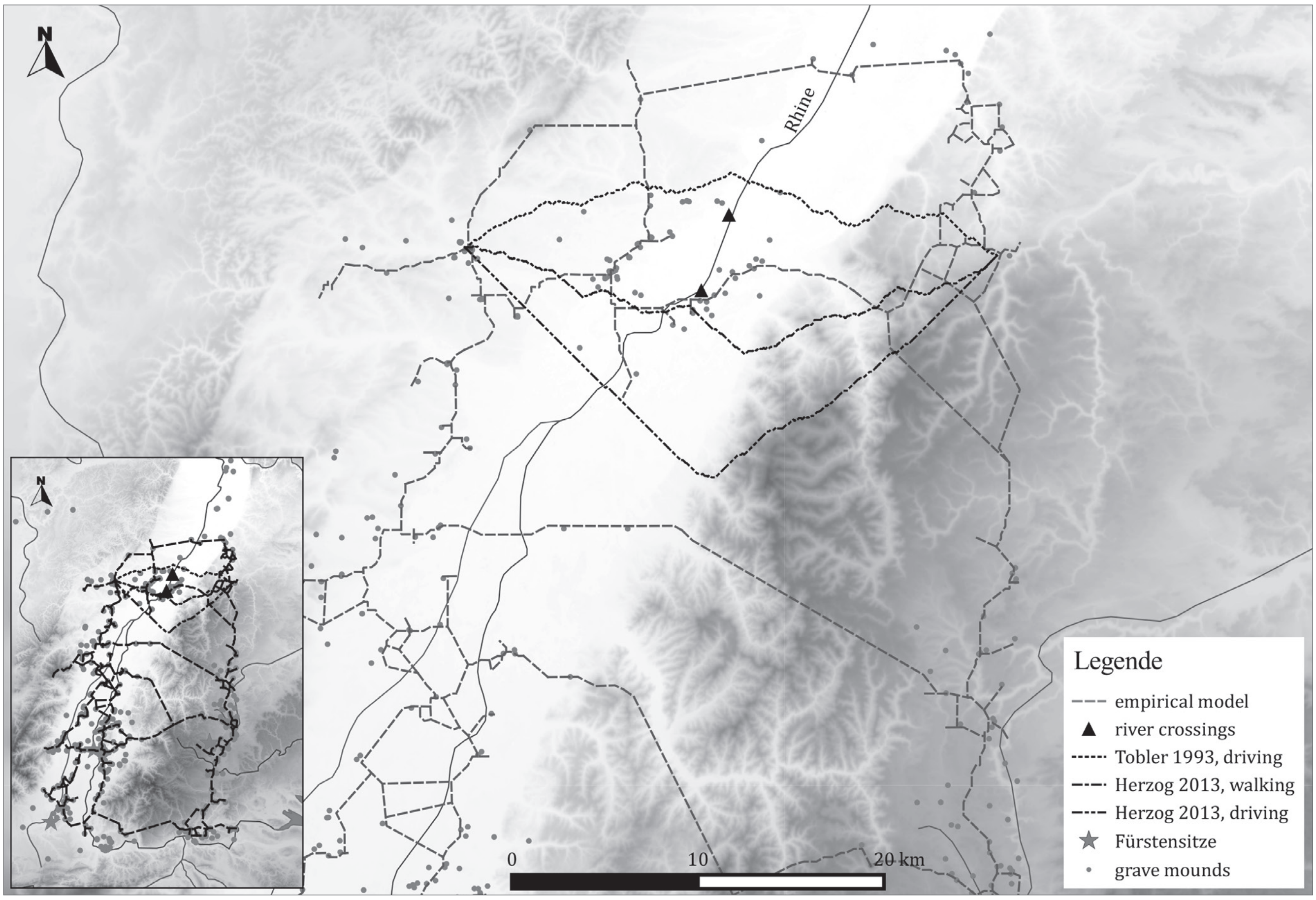

Figure 3: Comparison of empirical and theoretical pathway model in the Forest of Hagenau (Location of sites (SHKR Database, Mischka 2007, Wassong 2012, Engel 2013, Tremblay Cormier 2013, Jacques 2014), SRTM data provided by Shuttle Radar Topography Mission of the NASA).

precisely. Connections between Fürstensitze can be demonstrated using the example of Münsterberg, where empirical paths merge from four different directions. In future, the combination of non-geographical (cultural distances or interaction patterns) and geographical cost surfaces in theoretical models will be used to describe and explain communication systems in EIA societies. Communication between Fürstensitze as well as rural settlements can be described, which will lead to a better understanding of EIA cultural and social organisation. Through this, new knowledge about EIA infrastructure will be developed.

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