Investigating historical traffic routes and cart-ruts in Switzerland, Elsass (France) and Aosta Valley (Italy)*

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INTRODUCTION

In a research project carried out within the context of making an inventory of historical traffic routes in Switzerland (IVS), ten cart-rut sites have been investigated in Switzerland, Elsass (France) and Aosta Valley (Italy). While cart-ruts at these sites are generally ascribed to the Roman period, the research has revealed that most of the available evidence points towards a more recent date. In two cases it was possible to determine the period of use, starting from the thirteenth and sixteenth century respectively and ending in the eighteenth century. Furthermore cart-ruts discovered in the region exhibit a whole range of gauges, challenging claims for a standard gauge. Considering the recent interest in the subject experienced in Central Europe and the Mediterranean, this work is intended to be a contribution to a hopefully intensified interdisciplinary and international research in the future.

The inventory of historical traffic routes in Switzerland (IVS)

One result of the law on the protection of nature and cultural heritage (1966) was the creation of three inventories, aimed at protecting such heritage and assist in the formulation of an appropriate planning strategy. The first inventory was concerned with landscapes and natural monuments (BLN). A few years later this was followed by an inventory for constructed sites (ISOS), which aims to protect the architectural heritage. When these two inventories were being compiled, it became apparent that one element of our heritage being particularly affected by the negative aspects of modern development was the historical traffic routes. This led to the setting up of the latest inventory, IVS, intended to survey and document these routes and their networks in the country.

Started in 1984, IVS is funded by the Federal Road Office (FEDRO) and will be completed in 2003. The responsibilities of the project fell under Professor Klaus Aerni (Geography Department) and Professor Heinz Herzig (History Department) from the University of Berne, both academics now retired. The members of its staff – mainly historians and geographers - number thirty people directed from a central office with management-specialised services and divided into ten regional groups.

Historians focus on archival research and they aim to retrieve documents illustrating routes belonging to the historical period. A map series dating from the second half of the eighteenth century showing all the country to a scale of 1:25000 or 1:50000 is particularly useful.

Through this information, geographers are then able to retrace and survey the routes on the field. The final result is a documentation comprising text, illustrations and the inventory map distinguishing between routes of

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national, regional and local importance. This documentation is a binding instrument for federal authorities and will be at the disposal of the various cantons, helping them in planning decisions.

Through this project a substantial number of historic routes have already been documented. In the Alpine region, mule tracks with a width of 1.50-2.00 metres are often encountered. These tracks often reveal prominent retaining walls and are mostly paved with pebbles enclosed within a border of stone slabs at the sides.

In the Midlands wide cobbled passageways are not uncommon. Some of them are related to pilgrimage routes. Most are related to local destinations but a number lead to Santiago di Compostela in Spain. The networks of these latter routes received UNESCO recognition as a World Heritage Site.

In the eighteenth century engineered roads characterised by standardised widths, gradient and radius at curves came into use. The first to be constructed in the Alps was built by the engineer to Napoleon Nicolas Céard at the Simplon Pass in 1805. The roads are of such quality that most of them even resist the strain of modern traffic.

The inventory also comprises elements related to roads and traffic such as inns, customhouses, hospices, castles, mills and quarries. Another example are "milestones" erected by the Republic of Berne during the eighteenth and nineteenth centuries showing the duration of walking along a particular route. Chapels, road crosses, oratories and shrines are relatively common in Catholic region. However they are not found in regions touched by the Protestant Reformation of the sixteenth century. Leper asylums and the accompanying chapels are also included in such a survey. Situated at a distance from larger towns, these buildings were found along main traffic routes so that lepers could benefit from alms giving by travellers. Particularly useful are inscriptions since they often reveal the date of route construction or repair and on occasions the reason behind such an activity.

The research project on cart-ruts

This project is part of a wider research program entitled "Development of settlements and traffic networks from the Roman period to the early Middle Ages" and has been supported by the Swiss National Fund for Research. As cart-ruts are generally attributed to the Roman period, a study of the subject was included in the project. The tendency to ascribe the cart-ruts to the Romans might base on the following reasons:-

i) the fact that the major cart-rut sites in Switzerland show similar gauges (i.e. distance between the centre of each rut trail) led some scholars to believe that a standard gauge of 1.08–1.10m must exist. Subsequently this phenomenon was explained to have been only possible with a central governing empire such as occurs with the Roman period (Mottas 1987: 21-22).

ii) cart-ruts within Roman roads (e.g. the ones at Pompei) are a vivid illustration of use of ruts in this period.

iii) some cart-rut sites known in Switzerland coincide to the Tabula Peutegeriana, a third to fourth century A.D. route map of the Roman Empire.

iv) ruts incised in a solid rock may give an impression of durability and old age especially when they show signs of weathering.

v) it is not uncommon to assess things of an unknown age and ascribe to them a date older than they really are. Essentially this has something to do with the fact that remains of a more remote antiquity are generally of greater interest than others of a more recent date. Undoubtedly all this has put a bias towards an older date.

Results from archival research conducted fifteen years ago have posed a challenge to this hypothesis. Research has revealed that the cart-rut site at Vuiteboeuf (see further down) was still in use in the eighteenth century, experiencing a repair phase in 1712 (Mottas 1987). Some years back, Vogel and the author of this paper measured a number of cart-ruts and found variation in the gauge from 1.05–1.15m, challenging previous ideas on standard cart-rut gauges between 1.08–1.10 metres.

These two observations led to further research, concentrating on seven sites in Switzerland, two in Elsass (France) and one in the Aosta Valley (Italy) (Figure 1). In Switzerland the cart-rut sites tend to be grouped in the north and northwestern parts of the country (the Jura region), an area characterised by limestone ranges.

It soon became clear that standardisation of recording methods was needed in order to allow comparison of

rut profiles between different regions and countries. Initially this was done using a profile gauge, but later this was replaced by a more sophisticated device, which gave results accurate to the nearest millimetre (Plate 1). This instrument allows the measurement of co-ordinates of any profile point. The data obtained from this exercise was subsequently processed with the aid of CAD software. This allowed us to elaborate the cart-rut profile and calculate the gauge (Figure 2).

Vuiteboeuf (Switzerland)

Most of our research was concentrated on a site at Vuiteboeuf. The cart-ruts here may be followed for about 1.5 to 2km (Figure 3). The area lies in a corridor connecting the Swiss Midlands to France. As the site coincides with a route indicated on the Tabula Peutegeriana, some scholars interpreted this as evidence for a Roman communication from the nearby centre of Aventicum to the west.

Three road systems were found above the village of Vuiteboeuf. The latest one, with a general gradient of 5%, is the cantonal road still in use today, and dates back to 1838. An earlier road with a gradient of 10-11% and constructed in the 1760s, shows already standardization of features typical of engineer designed roads. Both routes reveal nine curves along their course.

The cart-ruts contrast from the two roads mentioned by having only one curve, necessitating an average gradient of 16%. Although traffic on older foot trails and mule tracks was also present in the area, cart-ruts were the first route to be used by vehicles.

Under supervision of the archaeologist responsible for the Canton of Vaud, various excavation works were carried out to determine the extension of the cart-rut system. Most of the retraced cart-ruts are found in solid rock. In areas where the rock was unfavourable, the ruts were incised in a pavement of slabs of stone to ensure continuity.

There is much to suggest that cart-ruts needed regular maintenance leading to the occasional replacement of older trails. Evidence for this comes from detached stone blocks containing carved cart-ruts found further down along the slope. In general when a cart-rut trail fell into disrepair a pair of new ruts was carved further down the slope, usually obliterating most of the earlier trail. This resulted in a lateral downhill succession (Figure 4), which consists of the whole trail of the latest cart-ruts, accompanied by remains of earlier trails further up along the slope. In one area at Vuiteboeuf a lateral downhill succession of approximately thirty trails can be observed.

In some cases the gradient of the slope became too steep for the construction of a new trail below the older one. In this situation the later cart-ruts were cut into the slope creating a lateral succession into the hillside. On flat terrain, but sometimes also on hilly regions, a vertical succession of cart-ruts can be observed showing persistence of several generations on the same track.

The study of over fifty cart-rut profiles measured with our new device revealed that in the latest twelve generations, four different gauges (approximately 1.15m, 1.13m, 1.11m and 1.09m) were in use. Contrary to our expectations, the earlier cart-ruts had the wider gauge, the gauge diminishing in later centuries. It cannot be excluded that within the older trails other gauges were in use. Unfortunately their state of preservation did not offer suitable locations for measuring profiles.

Notwithstanding these investigations, no clue as to the date of the ruts was apparent. This led us to formulate a working hypothesis to address this problem, namely that a traffic route may be dated by the objects that are lost along its course. Again under supervision of the archaeologist we conducted a survey of the cart-rut area using a metal detector. The finds were bewildering, ranging from objects relating to traffic, everyday life, tools and even weapons. Particularly numerous were nails from carts and horseshoes.

Horseshoes and coins found during the survey were very useful for dating purposes. In general both groups of objects appear on the ruts after the thirteenth century. Six coins dating from the Celtic and Roman period were also found. Their position in relation to the cart-rut system suggests that they have to be related to the traffic along the routes, which is older than the cart-ruts.

The studies revealed that coins persisted on the cart-ruts into the modern period, but no horseshoes dating after the eighteenth century were traced. It is certain that the construction of the engineered road led to this result. As transport with carts was shifted to the new road no horseshoes were found on the older route. Notwithstanding, the older route still provided a shorter way for people on foot, explaining the persistence of coins along the cart-ruts.

With the assistance of the local technical school, the cart-rut site was surveyed and results recorded through Geographical Information Systems (GIS). The GIS in this case provides a computerised inventory comprising data of archaeological interest and road history. This will serve for planning activities and further investigations in future.

Langenbruck (Switzerland)

Langenbruck is a well-known site attracting many visitors throughout the year. Its fame comes from the fact that its cart-ruts coincide well with a communication revealed in the Tabula Peutegeriana, assigning this route to the Roman period. A detailed look at the site, however, shows that this traditional opinion has to be revised.

A six metre high cut in the limestone crest with remains of a series of cart-ruts reveals that this site was used repeatedly along the centuries, resulting in a vertical succession of cart-ruts.

The final pair of cart-ruts in this succession goes back to the eighteenth century when a new road was constructed. At the same time an old winch that pulled carts up the steep slope went into disuse. It is well possible that the Roman Road passed through the same cut in the crest, but it would have been on a higher level than that visible today.

Julierpass (Switzerland)

Lying at an altitude of 2100m, the cart-ruts on the Julierpass are one of the few sites found in the Alpine region. A Roman date is claimed for this cart-rut system, because it once again coincides with a route shown in the Tabula Peutegeriana and secondary to the presence of two Roman columns on the culmination point of the pass in the vicinity. This complex cart-rut site, however, has a lateral downhill succession of seventeen tracks revealing, once again, a long period of use. Archival research by a German scholar has revealed that in the historical period the Julierpass was used for transit traffic, especially between the first and eleventh century A.D. (Ringel 1997: 211-295). A fifteenth century traveller's account describes the cart-ruts as being old and not in use (IVS Dokumentation Kanton Graubuenden 2000: GR 31.1, GR 31.1.3). While cart-ruts at the Julierpass as well as in Langenbruck might have a Roman origin, it is certain that the succession of cart-ruts has been constructed and used in the following centuries.

Donnaz (Italy)

A pair of cart-ruts passing under an arch at Donnaz in the Aosta valley are without doubt one of the more interesting cart-rut sites (Plate 2). Although the arch and milestone suggest use of this path during the Roman period two details question this attribution. An irregular base to both the arch and the milestone suggestive of lowering of the road level is conspicuous. These observations can be assumed to indicate that the original Roman road was situated approximately half a metre higher than the actual level. The lowering of the road surface seems to be the result of a vertical succession of cart-ruts, most probably revealing a post-Roman use of the route. The broadest gauge (1.60 metre) recorded in the survey was found at this site.

Saverne (France)

This site extends over several hundred metres and offers a unique opportunity for assigning a date to the cart-ruts, which are here incised in sand stone. The most important tracks occur under a rock shelter, which overlies a series of ten different cart-ruts. Rock-cut incisions along the rut are the first noteworthy features, probably intended to stop the carts along the route. The second striking features are holes for the construction of an edifice, several inscriptions and a pictograph of pliers suggesting that a forge was found along the route. The presence of incisions representing two pairs of mule shoes (most probably used as mould for their production) provides further support.

The area is illustrated in a painting showing a sledge being pulled by a man (Plate 3). It remains unclear whether the vehicle represented is painted authentically or is the result of the painter's imagination. The importance of the painting, however, comes from the illustration of two inscriptions on the overhanging rock. Fortunately these inscriptions still survive today. The first inscription records that in 1524 the Bishop Wilhelm of Strasbourg had commissioned the road for the benefit of everyone (Plate 4). The other inscription dates back to March 1616 and documents the decision to install the broader gauge of cart-ruts at the site (Plate 5). The traffic with carriages on the cart-ruts has certainly come to an end in 1738 after the construction of a modern road in the same ascent. The possibility of direct dating with the aid of inscriptions is a stroke of luck. Without the presence of these inscriptions the cart-ruts would most probably have been associated with the Roman Saverne and the *Mansio* (Roman station for exchanging draught horses) in the vicinity.

Ernolsheim (France)

This site is found four kilometres away from the previous one. In his comprehensive study, Ring (1990) postulates an old age of the site because of Celtic and Roman remains in the vicinity. Nevertheless it must be estimated that the last generation of a greater succession of cart-ruts is much younger. Evidence for this comes from the equivalence of gauge (1.22m) with the sixteenth to eighteenth century site of Saverne and documents listed in Ring's article revealing use of this route up to the eighteenth century. Both Saverne and Ernolsheim are good examples to show that dating cart-ruts with nearby settlements is highly delicate.

Formation by wear or deliberate carving

The question whether cart-ruts have been deliberately cut or the result of the mechanical wear by the passage of carriages is discussed wherever they appear. Especially in Malta this question seems to have often featured in various controversies (Evans 1934; Gracie 1954; Ventura and Tanti 1994). The author believes that the initial rut was an artificial groove of at least 4cm depth in order to provide an efficient guidance to the wheels right from the beginning. Secondary processes due to erosion and wear are then responsible for a continuing shape of the rut. Support for this comes from several places. At Langenbruck, ruts in an oak beam (placed to provide continuity to a trail of ruts) show an even and distinct form, contrasting with the rugged surface between the ruts. These features are evidence for the deliberate cutting of the ruts and the wear of the space between the ruts by the hooves of the draught animals. It appears logical that this technique used here in wood has also been applied on rock surfaces. Furthermore close examination of many cart-ruts reveals that the single ruts are often formed by a succession of straight segments with abrupt changes of direction where the segments meet each other. This feature can by no means be explained with the mechanical wear of passing carts.

Further support for carving of the ruts comes from stone working tools found near the cart-ruts in Vuiteboeuf and from a document revealing a commission to two masons to carve ruts at Hauenstein (Canton of Basel-Country). Although for some, the carving of cart-ruts may appear to require considerable labour, experiments by the author have revealed that their production can be done without great difficulties. The length of cart-ruts that may be produced daily employing traditional tools and techniques is about seven meters in limestone and one metre in granite. This rather big difference in production seems to be one of the reasons for the predominance of cart-ruts on limestone bedrock compared to harder types of bedrock.

Conclusions

Other than documenting a total of ten sites, the study reveals that in contrast to the prevailing opinion of a standard gauge, cart-ruts in Switzerland show a variety of distinct gauges. Furthermore all investigated sites show a succession of several cart-rut trails, revealing use over a long period of time. There is strong evidence that most of these sites have been in use up to the eighteenth century. In two cases (Vuiteboeuf and Saverne) it was possible to determine the period of use starting from the thirteenth and the sixteenth century respectively and ending in the eighteenth century. Only in three cases (Langenbruck, Julierpass, Donnaz) a Roman origin is possible. In addition, the succession of cart-ruts shows that the duration of life of one trail was quite limited: from the site at Vuiteboeuf an average of few decades can be estimated.

The Maltese Islands

Although the Maltese Islands are not included in the IVS research project, our interest in cart-ruts made the archipelago a necessary destination. During our (the author and Mr. Werner Vogel) stay on the islands we had the opportunity to visit the cart-ruts at Misrah Ghar il-Kbir, Nadur, Ghar Zerriegha, Ghar Mundu, Mtarfa and the areas between Hagar Qim and Mnajdra and the remains behind the Roman Domus at Rabat. In Gozo we visited similar sites at Ta' Cenc, Dwejra and Qala.

Rough tape measurements on various sites revealed dominance by two gauge ranges within the V-shaped cart-ruts: 1.30–1.32 and 1.40–1.42m. Among the modern broad ruts, a centre to centre gauge of 1.35 metres is common. The cart-ruts near the quarry at Ghar Zerriegha revealed a vertical succession of more than ten trails. Furthermore, a short section of a cart-rut following the path between Hagar Qim and Mnajdra (GR 495691) revealed a section with pointed impressions, which may be interpreted as evidence for deliberate cart-rut carving with a pick.

A number of cart-ruts occur very close to modern roads, an observation already noted by previous authors (Trump 2000: 34). Our experience in Switzerland goes a long way to suggest that some roads in the Maltese Islands might have taken the role of cart-ruts in some places.

Finally, a literature review and discussions on the subject has revealed that the cart-ruts found on the Maltese Islands still pose a considerable problem to scholars. We think that more fruitful results may be obtained in the future if more research is conducted using the following guidelines:-

i) extensive archive research may throw light on the ending phase of cart-rut use.

ii) scientific methods to date the cart-ruts directly are likely to yield better results. Lichenometry may date cart-rut surface exposure while pioneering experiments in cosmic ray dating of rock surfaces may provide further information. A promising approach is also the study of karstification as applied in a pilot project by Drew (1996). The continuation of this experiment seems to be worthwhile.

iii) creation of an inventory of known cart-rut sites and assessment using Geographical Information Systems should help in establishing the type of cart-rut network found on the islands.

iv) more detailed scientific study of cart-rut profiles may help in distinguishing cart-rut subgroups.

v) archaeological excavation of covered cart-rut sites and application of radiocarbon dating to helpful artefacts may provide useful information on the period of use of these features.

Finally there is certainly one thing that may be said on the cart-ruts found on the Maltese islands. Even if further investigations would proof - comparable to the situation in Central Europe - a younger age than generally estimated, the Maltese cart-ruts have enough outstanding characteristics to be promoted to a World Heritage status.

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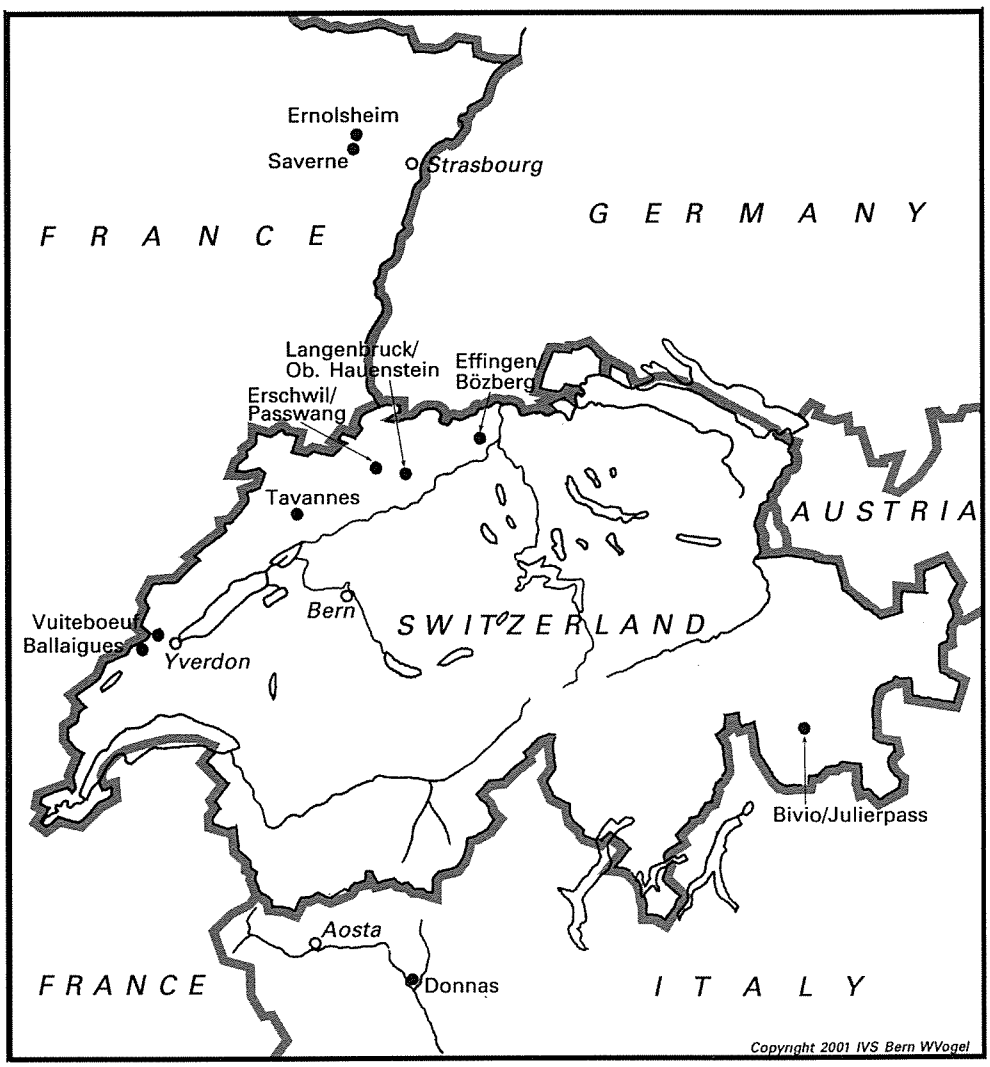

Figure 1: Investigated Cart-ruts in Switzerland, Elsass (France) and Aosta Valley (Italy)

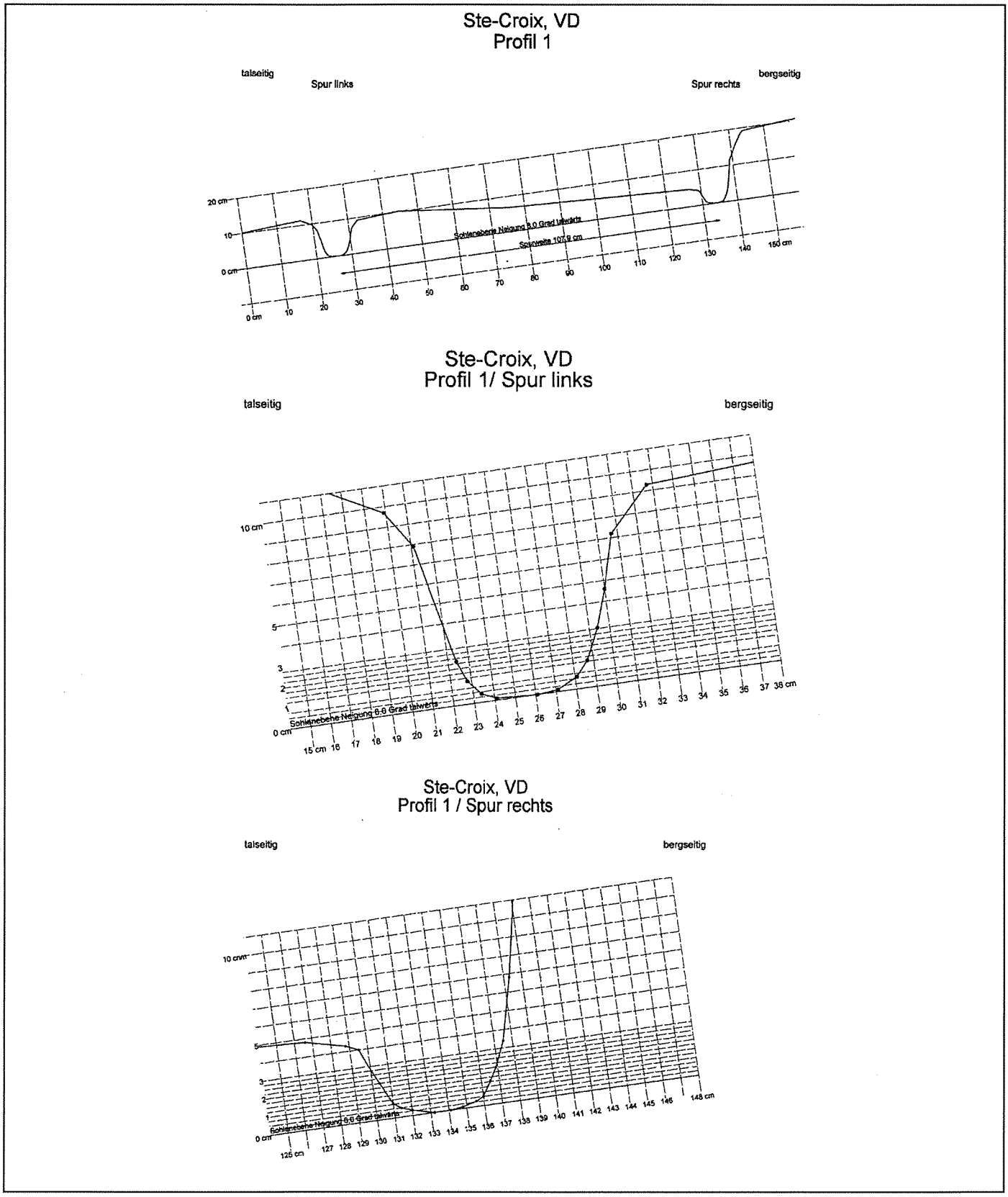

Figure 2: Measurement of Cart-Rut Width: Profile
(English translation: Talseitig - towards valley; Bergseitig - towards hill; Spur links - left rut; Spur rechts - right rut; Profil -profile; Spurweite - distance between ruts; Sohlenebene Neigung 8.0 Grad talwärts - gradient of plane between ruts is 8.0 towards valley)

Plate 1: Instrument for measuring cart-rut profiles

Plate 2: Cart-ruts at Donnaz, Aosta valley, Italy

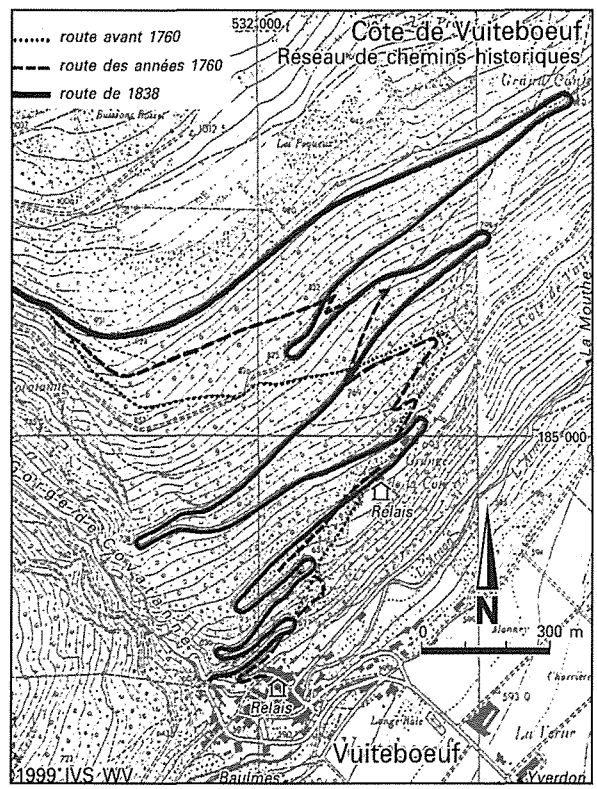

Figure 3: Network of historical routes in the hillside at Vuiteboeuf, Switzerland.
(English translation: route avant 1760 - route before 1760; route des années 1760 - route of the 1760ies; route de 1838 - route of 1838; relais - station for changing horses)

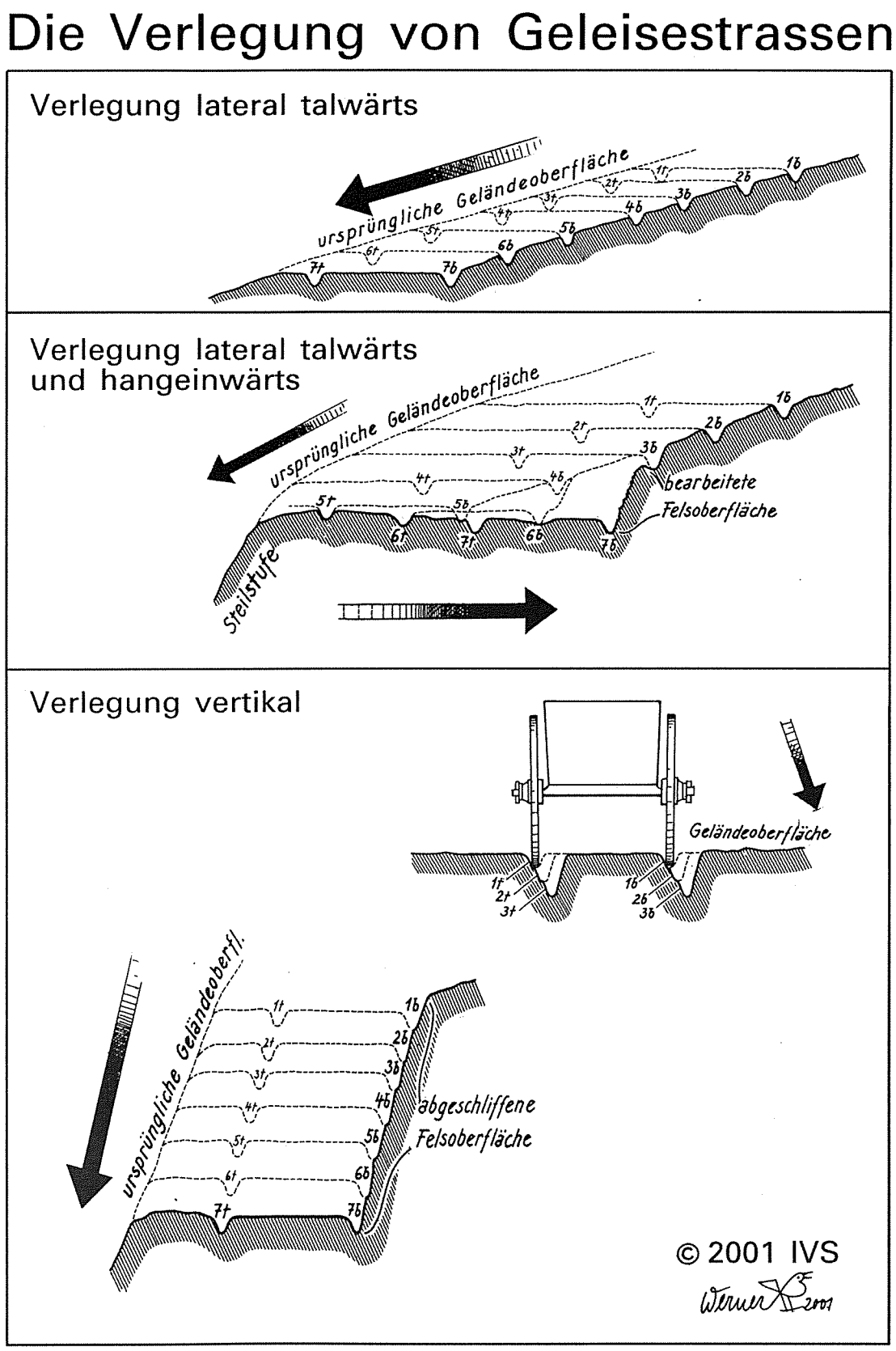

Figure 4: Succession of cart-rut tracks
(English Translation: Verlegung lateral talwärts – Lateral downhill succession; Verlegung lateral talwärts und hangeinwärts - Lateral downhill succession and displacement into hill; Verlegung vertical – Vertical succession; ursprüngliche Geländeoberfläche – original surface of terrain; bearbeitete Felsoberfläche – worked rock surface; abgescheliffene Felsoberfläche – worn out rock surface

Plate 3: A painting of the overhanging rock with a man pulling a sledge and niches with inscriptions at Saverne, France

Plate 4: Inscription recording a commission for a road by Bishop Wilhelm of Strasbourg at Saverne, France

Plate 5: Inscription recording the installment of the broader gauge on the ascent at Saverne, France