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Finding value in the ordinary to better understand the extraordinary. Systematic surveys in baroque roofs and medieval log-buildings

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ABSTRACT: Using two examples, this paper argues for the benefits in properly examining the supposed 'normal' or 'standard' constructions in order to better understand certain aspects of innovation or even make extraordinary discoveries. The systematic examination of numerous roof trusses over single-nave churches in German-speaking Switzerland in the first example give us a vivid picture of the construction methods in various regions over a span of 250 years. Based on these constructions, one can see which systems or approaches in constructing roofs were carried forward and which were not. In the case of the late-medieval log buildings in central Switzerland it is shown that within a rather run-down residential building lies the potential of great discoveries. Through systematic surveys and with the help of dendrochronology, over 30 log buildings have been discovered and documented dating back as far as 1300.

1 WHAT EXACTLY IS "EXTRAORDINARY"?

The field of construction history, for most part thrives on extraordinary and innovative solutions. But what constitutes the so-called "extraordinary"? What makes it stand out from the "ordinary"? How to define innovation and its influence on the built environment and the subsequent methods of construction? In order to answer these questions satisfactorily, one first needs to know what exactly defines the "normal" or the "ordinary". On one hand, it is by examining objects that have been built multiple times in a similar way, under similar circumstances and under the same technical conditions that one can start to build up an understanding of the standard methods. Similarly, questions about the typical planning of the building, the organization of the construction site and the construction process itself can only be answered satisfactorily if we first know what the "normal" is. On the other hand, it is possible that the supposedly "ordinary" in itself is more complex than assumed and has something extraordinary to offer if one only takes a closer look at it. This paper uses two separate pre-modern examples in timber construction in Switzerland that are based on the author's current and past studies, to show that the scientific examination of the ordinary, even the everyday, certainly has its potential and its merits.

2 "CRITICAL MASS" THROUGH SHEER NUMBERS: ROOFS OVER BAROQUE CATHOLIC SINGLE-NAVE CHURCHES IN GERMAN-SPEAKING SWITZERLAND

Church construction represented a significant part of the building industry in today's Switzerland from the 17th century up to the middle of the 19th century. In both Protestant and Catholic areas of central, northern and eastern Switzerland, one can speak of a veritable building boom, especially in the 18th century. In rural areas, in most cases single-nave churches were erected, showing a nave without intermediate support such as columns or pillars. At the end of the 18th century, these churches were somewhat standardized in their architectural form as well as decor (so-called "Landkirchenschema") and sometimes reached spans of over 20 m. A current project under the direction of professor Stefan Holzer and funded by the Swiss National Science Foundation (SNSF) consists in systematically investigating, for the first time, the roofs over these wide-span buildings in order to trace the developments in building technology and construction from 1600 to the middle of the 19th century. Up to now, research has primarily dealt with the architecture of these rural churches (Grünenfelder 1967; Horat 1980) or focused on a single family of master builders and their roof constructions or wooden bridges (Killer 1942). When studying the Catholic churches, it quickly became clear that the sheer number of single-nave churches built during the investigated period with a span larger than 10 m does not allow a selection of case studies to be made without preliminary visits to all of the roofs. On these occasions, a cross-section of the main roof truss was taken from each of the 101 churches, their construction being described and documented photographically (Figure 1). Since the task of building a roof truss over a single nave is always the same, this inventory of roof trusses provides an ideal basis for comparison. In the study area, especially in the late 18th century, different master builders or entire families of master builders decisively dominated the building trade. For example, Niklaus Purtschert

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(1750–1815) can certainly be considered as architect and planner of eight churches in Central Switzerland. Jakob Singer (1718–1788) is also sure to have built a total of eight single-nave churches. In today's canton of St. Gallen, Johann Ferdinand Beer (1731–1789), who was based in the Vorarlberg, designed and built about the same number of church buildings. Generally, the master builder would be responsible of the entire construction, including the works in stone and wood, and often the decoration in the form of stucco and vault paintings. Depending on region and time, the different tasks were then carried out by the master builder's more or less permanent construction team, which included at least masons and carpenters. In other cases, the master builder assigned the execution of his plans in sub-contracts to specialized craftsmen. The general construction method of the examined church roofs is in any case the so-called "liegender Stuhl", usually combined with a form of king or queen post. When comparing the roofs of the churches of the aforementioned master builders, minor but distinct constructional differences are noticeable. The comparison of several of the roof trusses by the same master builder clearly shows that the same construction variant was always employed. Obviously, each master builder had a kind of standard roof construction. For the master builder Niklaus Purtschert, for example, it is typical that individual trusses with cross braces are distributed at regular intervals over the nave roof (Figure 2). Interestingly, no other master builder of his time used this specific arrangement of roof trusses. On the basis of this observation and by looking at preserved plans, it is therefore evident that the master builder who designed the church (the architect, in modern terms) also designed the roof construction, even though all the above-mentioned master builders

Figure 1. Catholic church St. Jakob in Cham, Canton of Zug, Switzerland. Overview over the roof truss, erected in late Summer or Fall 1784 (Gantner 2018).

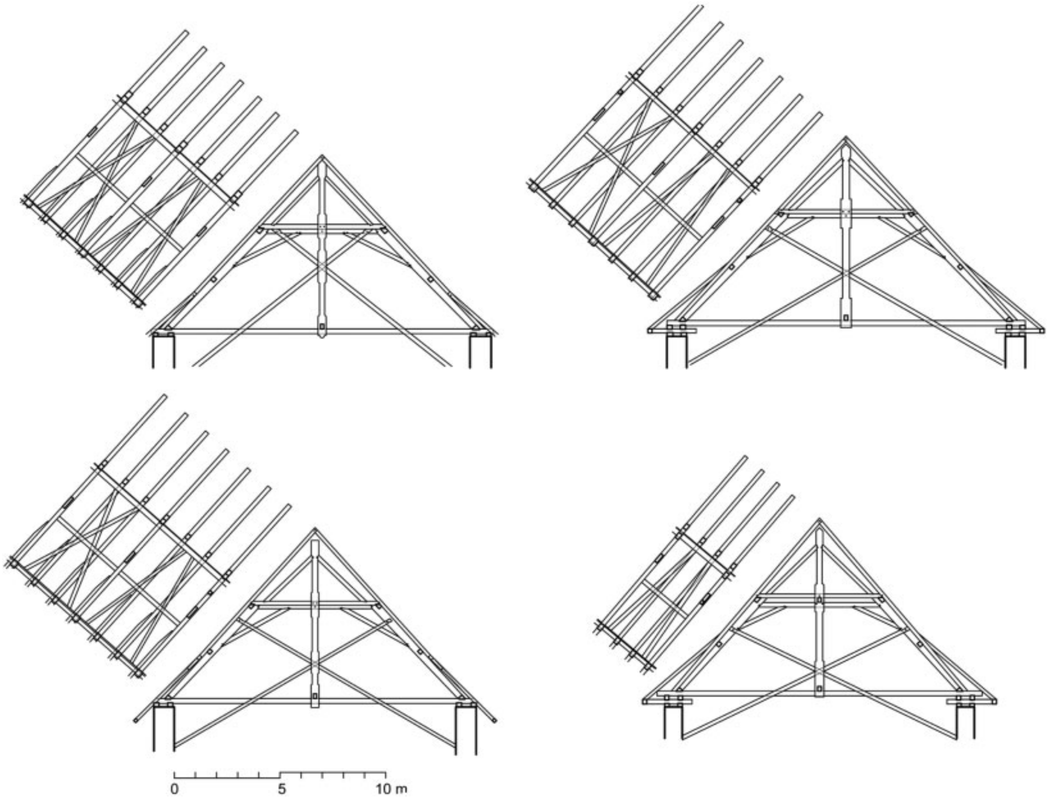

Figure 2. Comparison: roof trusses designed Niklaus Purtschert and built by various sub-contracted carpenters between 1778 and 1802. Cross braces in roofs with continuous tie beams are typical for this particular master builder (M. Gantner, 2019).

Singer, Purtschert, and Beer were trained as stonemasons. The fact that apparently each master builder applied a standard construction can be used to provide an additional level of argumentation in questions of the attribution of individual church buildings (Gantner 2020). In contrast to the visible architecture, which is subject to the taste of the times and to representation, it is only the efficiency of the construction which is important when designing a roof truss. It must be able to span the nave safely and permanently. The design and structural understanding of the roof, depending on the span and the ceiling construction, was certainly based on experience and apparently passed on from masters to students or employees. Thus, we find the same construction principles typical for Purtschert in early 19th century church roofs that were planned and built by master builders who had participated in Niklaus Purtschert's construction team a couple years earlier (Figure 3). The situation is similar with the church buildings of Josef Singer, Jakob Singer's son. Here too, his typical construction elements and their design were carried forward. Those master builders, who in architectural history are referred as "the heirs of Singer and Purtschert" (Reinle 1963, 366), not only took over the architectural scheme of the country church, but also the construction methods and the design of the roof trusses from their teachers. Although written sources and other historical documents vary greatly in terms of quality and quantity from region to region and over time, some statements can be made about the building industry, the organization and the building process of the Catholic rural churches (these also largely apply to Protestant church construction). As already mentioned, most building contracts were awarded as a whole, and the designing master builder was normally also the executing one. In addition, changes of plan during construction, which can be observed in buildings of the highest ranks, are extremely rare. Moreover, the construction time of the buildings can be delimited relatively well in most cases. Already Josef Killer (1942), in his work on the Grubenmann family of master builders in Appenzell, noted that the shell of the church buildings was, as much as possible, completed within one building season (spring to autumn). This procedure can also be traced in the examined Catholic churches. After the first foundation stone was laid ceremoniously in spring, the masonry was completed relatively quickly so that the roof could be erected in late autumn at the latest. The parish church in Cham in the Canton Zug, one of the largest investigated with a span of over 17 m was covered by its roof in 1784, merely seven months after the laying of the first foundation stone in May (Figure 4. Grünenfelder 2006, 75). The vault, typically a wood-lath-plaster construction, as well as the entire interior decoration was only built afterwards. Therefore, dated paintings on the ceiling serve as a *terminus ante quem* for the erection of the roof trusses. On the

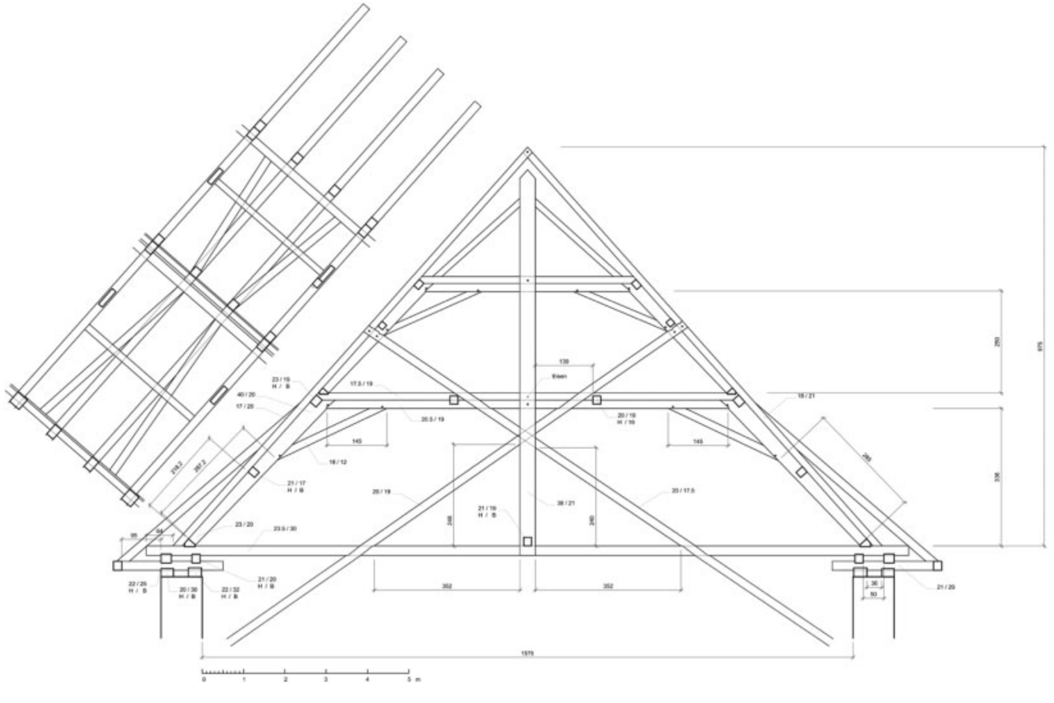

Figure 3. Catholic church St. Laurentius in Dagmersellen, Canton of Lucerne, Switzerland. Cross section of truss No. 3, erected in 1820 or the year prior. The two brothers Josef and Franz Händle, originally based in Tyrol, are known to have worked for Niklaus Purtschert prior to becoming Master builders on their own. Obviously, their roof trusses bear lot of similarities to those designed by their former employer (M. Gantner, 2018).

basis of historical sources, as well as through the dendrochronological evaluation of selected trusses, it is also possible to shed more light on the timber industry and the origin of timber. As far as the constructions are concerned, the large number of objects examined makes it easy to highlight innovations and their possible diffusion. In contrast, one can thus also pinpoint innovative ideas which remained unique and were not established, perhaps because they were considered too elaborate or not practical enough. Through the looking glass of the normal, innovation becomes somewhat more recognizable and classifiable in terms of its impact on later construction methods. In addition, the strengthening strategies for damaged roof structures can be better understood. Indeed, in some 18th century roof structures with interrupted tie beams, the various strengthening measures from the first half of the 19th century are very similarly conceived and give ideas which effects were intended (Gantner 2021).

From a conventional point of view, the individual constructions hold perhaps nothing extraordinary in themselves. Nevertheless, the sum of the built constructions exhibits how rational and in a certain sense economical these master builders already worked more than 200 years ago. The entire building boom of the late 18th century can in this sense be described as quite extraordinary. Through the systematic examination of the roofs of these rural single-nave churches, a high-resolution picture of the "roof landscapes" could be obtained, which on the one hand shows what can be regarded as the standard of construction at a certain time, reveling which construction details were typical for a region or for a school of master builders. On the other hand, it offers an ideal starting point for follow-up projects, which may extend the parameters regionally or time wise.

3 KEEP YOUR EYES PEELED! LATE MEDIEVAL LOG BUILDINGS IN CENTRAL SWITZERLAND

Since the late 19th century, it has been assumed that a particularly old stock of log buildings might have been preserved in certain areas of central Switzerland. With dendrochronology as a dating method used since the 1980s, this assumption could be scientifically proven for the first time by successfully dating the timber used for the construction of the "Haus Bethlehem" in Schwyz to the year 1287 (Descoeudres 2007, 11). This makes the house one of the oldest preserved residential buildings in Europe. Subsequent research led to the identification of certain construction features that are typical of these medieval log buildings (Descoeudres 2007; Furrer 1988). The most apparent of those features are the so-called "Einzelvorstösse". This means that only single logs of the inner walls really penetrate the outer walls (Figure 5). The remaining log ends are embedded in a dovetail-shaped groove, so that they are not visible on the exterior of the building. Another telltale sign of such a medieval log

Figure 4. Catholic church St. Jakob in Cham, Canton of Zug, Switzerland. Interior view of the nave with the typical late baroque stucco decorations and ceiling paintings by Joseph Keller and Joseph Anton Mesmer, dated 1785 (M. Gantner 2018).

construction are floor and ceiling planks that are visible from the façade (“fassadensichtige Boden- und Decken-bohlen”). From the middle of the 15th century onwards, the floor and ceiling planks are all around notched in the outer walls and therefore not visible from the outside (Gollnick 2018, 149–151). Due to the presence of these distinct features and through targeted surveys on buildings that were to be demolished or converted, as well as with the help of dendrochronology, over 30 of these log buildings from the 14th century have already been identified in the Canton of Schwyz, some of which have been dated to the exact year, documented and scientifically investigated (Brunner 2016, 248–253.). These log buildings from the early period of the Old Swiss Confederation (“Eidgenossenschaft”) that have been examined provide insight into the highly developed art of carpentry (Gollnick & Rösch 2018). The notion emerged that – contrary to the long-held interpretation of a wooden building as a farmer’s house – these late medieval log buildings were the dwellings of a local, perhaps regional ruling class or at least of socially higher-ranking persons (Descoeudres 2007, 76–77). The buildings are two-story log constructions rising above a masonry stone base (Figure 6). Each of the approximately 100 wooden logs of spruce or fir, which were needed for a single house, is made out of one single tree precisely shaped with a broad axe. The beams were stacked on top of each other on the short edge

Figure 5. So-called “Haus Bethlehem” Schwyz, Canton of Schwyz. The building logs of this House are dated to 1287 by dendrochronology. Note that the windows as well as the arbors are not original to the medieval building (Gantner 2013).

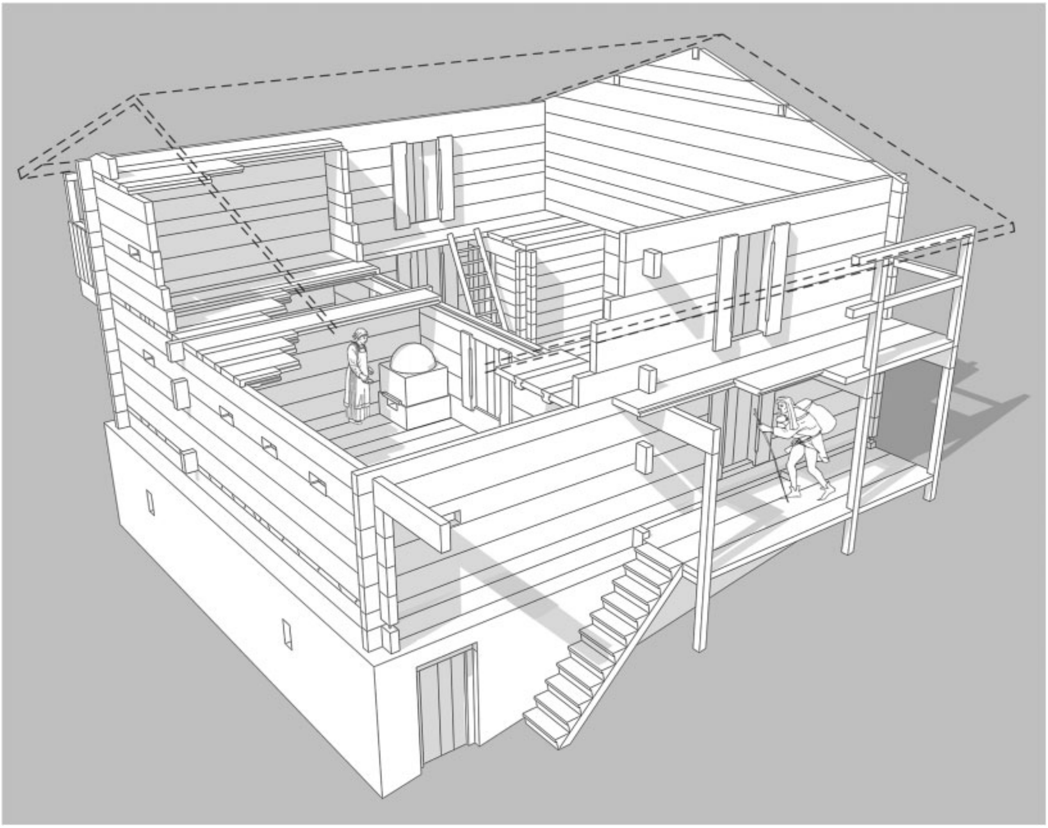

Figure 6. Perspective reconstruction of the house Gütschweg 11 (dated 1311) in Schwyz, Canton Schwyz, Switzerland. Only individual beams of the inner walls penetrate the outer wall of the log construction. In addition, the floor and ceiling planks are visible on the facades (reconstruction by U. Gollnick and P. Frey, 2016).

and additionally secured with vertically inserted dowels. The corners of the house square were interlocked to create the cross shape typical of log construction. The house entrances were located on the eaves side, and the doorways were usually equipped with a post that partially surrounded the ends of the logged wall. As windows in the 14th century, one must imagine hatch-like, long rectangular openings, which could be closed by simple board shutters (Descoeudres 2007, 29–33). The roof was constructed as a simple purlin roof and had a shallow pitch. Interestingly, all the log buildings examined share the same general interior layout (Descoeudres 2007, 40–52): the rooms in the front area of the house are considered as living and working spaces which could be heated smoke-free by means of a tiled stove as early as the 14th century. In the rear part of the house, there was a hallway leading across the house, the open-fire kitchen open up to the roof, as well as small chambers in the rear corners of the house. On the sides of the eaves there were loggias which could be entered from the inside of the house. This basic spatial disposition of a front living part and a rear economic part can be observed in rural wooden dwellings in the typical log construction regions of Switzerland until well into the 20th century.

The preserved log buildings allow us not only to examine their construction and layout, but also the traces left by the inhabitants of these houses over the past 700 years. Thus, a small history of dwelling can be traced, ranging from the black-painted, block-faced parlors of the late Middle Ages (Marinowitz 2016), through the ornate paneling of the 17th and 18th centuries, to the wallpaper of the 19th century and finally to the industrially produced paneling or plaster walls of the 20th century. On the basis of certain findings, it is also possible to draw conclusions about the practice of handicraft. Some traces also allow an insight into the world of faith of the former inhabitants. Prints with Christian content bear witness to the deep religiousness of the people, while objects hidden in dowel holes and jammed into crevices also allow an interpretation of what could be called superstition today (Gollnick 2016).

Many of these buildings, wherein a kernel of a medieval log building is preserved are somewhat run-down residential buildings that have been transformed countless times and where, at first glance, one does not recognize the hidden secrets these dwellings hold (Figure 7). Due to settlement pressure, these very buildings are increasingly threatened by demolition, and many have been demolished after or even during investigation and documentation. In worst-case situations, the demolition occurred even before the documentation of the building. The archaeological approach of prospecting and, if necessary, documenting and investigating those buildings or structures that are in danger of disappearing is one way of preserving exceptional historical constructions for posterity, revealing extraordinary, perhaps even unique constructions to be seen at only the second glance. Ideally, the investigation and public awareness work can make the extraordinary value of the object understandable to the extent that it can be spared from demolition and instead be transformed or converted.

Figure 7. House Gütschweg 11, Schwyz, Canton Schwyz, Switzerland. The building before the investigations. Traced, the late medieval log construction from 1311, which was in large parts intact at the time of the survey (Gollnick & Frey 2016).

4 CONCLUSIONS

There is absolutely nothing wrong with examining the extraordinary buildings of this earth, deciphering their history and documenting their innovative constructions. Nevertheless, as the example with the baroque roofs shows, an understanding is needed of what can be considered standard at a certain time and in a certain region and how the building industry was organized in each instance. This is the most certain way to classify and correctly understand the constructions that are labeled as innovative. Similarly, a closer look at the "normal" shows whether and how new ideas were implemented, which innovations resonated, possibly even became the new standard or which remained unique. The example of the log buildings shows that the extraordinary can be revealed behind the unimposing. In this case, one has to know what to look for. In addition, there must be the possibility to probe the objects, if necessary, meticulously examine them and, whenever possible, preserve them for posterity.

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