Franckesche Stiftungen zu Halle

Tief verwurzelt - hoch hinaus. Die Baukunst der Franckeschen Stiftungen als Sozial- und Bildungsarchitektur des protestantischen Barock / Metta ...

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Building the Francke Foundations. Architectural Design, Building Technologies and Materials.

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In previous research on the Francke Foundations' buildings and architecture, the proportional and measurement relationships have not been examined in any detail. Francke himself pointed out the significance of harmonious proportions. In his view, the buildings were the material proof of the *Fußstapfen* (The Footprints of Divine Providence), and their impressive size and volume were the evidence of his ministry as graced by God's divine mercy. For this reason – and Francke was certainly aware of this – rather than the Orphanage, as a building type, being designed as solely functional, he also wanted its architecture to be regarded as unique. After all, his aim was to convince his donors, mostly from the aristocracy, that his actions were pleasing to God. It was, thus, only logical not to adopt the construction standards commonly found in patrician town houses or rural buildings in the tradition of the former *Zum Goldenen Adler* inn on the site. Instead, with the Orphanage as the architecturally impressive main building of the Francke Foundations, he essentially took over the forms of representation used for royal or manorial buildings. However, he changed these designs at decisive points or, as with the very early example of a mansard roof over the Orphanage, virtually anticipated an architectural trend. In principle, the same applies to the multi-storey timber-framed courtyard buildings constructed after the Orphanage – the *Mägdeleinhaus* ('Girls' House'), *Englisches Haus* ('English House'), the *Pädagogium*, today replaced by a later building in solid construction, and above all the *Langes Haus* ('Long House'). This report aims, first and foremost, to present those aspects of the Foundations' architectural history which have now been re-examined and re-evaluated, and highlight the aspects that seem most promising in terms of their outstanding value in the World Heritage List proposal.

The mansard roof over the Orphanage

For the period around 1700, the Orphanage's mansard roof, with its surface divided into two sections, is undoubtedly the most prominent feature of the architectural design. The wood for the roof was felled in 1696/97, the frame constructed, at the latest, in around 1698, and the roof itself was finished by July 1699.[1] The mansard roof, hipped on the two short sides, comprises a steeply sloped lower roof, angled at 70 degrees, with an upper section set at a considerably shallower angle of around 38–39 degrees. The attic floors are each equally high, at around 390 centimetres. The two attic storeys are braced trusses (*liegender Stuhl*), not only tied on the eaves sides, but also under the hipped surfaces. Apart from some structural reinforcement and repairs, the roof construction with its 42 pairs of rafters and 11 roof trusses has largely survived in its original condition. It is made from spruce and pine timber rafted down the Saale river. The carpenter's marks on the roof trusses show that the mansard roof was jointed and framed up in one single assembly process. The structures are joined by mortise and tenon joints with, in addition, the straining beam and head braces at the tie beam levels sunk into balk joints. The top plates are pentahedrals and fixed to the roof trusses with mortise and tenon joints. These structural features are indicators of highly developed carpentry skills, similar to those used for leading roof constructions in the period around 1700.

In France during the second half of the 18th century, the mansard roof developed from the early 17th century curb roof to create a double pitched roof with a lower and upper section sloping at different angles. However, due to the geometrical derivation from the semi-circle or rectangle, the upper sections of the French mansard roofs, angled at 20–33 degrees, are significantly flatter than the Orphanage's mansard roof in Halle and, moreover, the lower roofs are, as a rule, set distinctly higher than the upper roof sections. This is the essential difference to the Orphanage's mansard roof, which has taken the façade's geometry as the basis for calculating the roof's proportions with an upper and lower section of equal height. François Mansart, architect to the French court, commonly employed this formative style of gambrel roof in his French chateau designs so that he was

later described by his biographers, Charles Perrault and François Blondel, as the inventor of the mansard roof, and this style of roof was named after him.[2] Most probably, though, this new roof construction was disseminated in the Holy Roman Empire in a variety of ways. To begin with, it may have been spread by French architects, some of them Huguenots, or by German architects travelling to France. The mansard roof was also promoted by such treatises as, for example, Nikolaus Goldmann's *Civil Baukunst* from 1696, which was published and supplemented by Leonhard Sturm, who was also active in Halle and directly in contact with Francke.[3] The earliest known recorded mansard roof in Germany is believed to be the Weser bridge gate in Bremen, dating from 1688 and the work of Huguenot architect Jean Baptiste Broebes, who was later also active in Berlin. However, the roof was taken down in the 19th century. In 1690 the French architect Roger erected mansard roofs over the elongated buildings at the Ratzeburg barracks, though these were destroyed just three years later in 1693 during shelling by the Danish forces.[4] Before 1700 mansard roofs were rare in northern Germany, and the first records of mansard roofs in southern Germany date from after 1700. The earliest surviving mansard roofs in southern Germany include the 1702/03 curved mansard roof of the *Vierzehnheiligen Pavillon* ('Pavilion of the Fourteen Saints') by Dientzenhofer at the residence of the Bamberg bishop, as well as the mansard roof dating from 1705 over the Orangery at *Schloss Erlangen*, with the latter roof designed by Gottfried von Gedeler, who was also active in Halle. The mansard roof over the staircase at *Schloss Weißenstein* in Pommersfelden, also constructed under Dientzenhofer's supervision, dates from 1711/12. The records only show the widespread use of the mansard roof in both southern and northern Germany from 1710.

To mark the laying of the Orphanage's foundation stone on 13 July 1698, a medallion was cast showing a view of the Orphanage with its main features, though with a stepped roof.[5] The earliest quality technical drawing showing the Orphanage with a mansard roof is dated to around 1700. The drawing is not signed, although from the evident quality of the pen-and-ink drawing, it was executed by an architect.[6] However, as yet, it has not been possible to identify the architect definitely. The fact that the Francke Foundations' Orphanage represents one of the earliest and, to the best of my knowledge, the only surviving mansard roof in Germany definitely dated to pre-1700 by dendrochronological analysis not only underlines the outstanding importance of this roof in construction history, but also evidences the high quality which Francke expected from the architects and carpenters.[7] When one understands the difficulties involved in preparing the plans for mansard roofs and their construction, the question inevitably arises of whether the Orphanage's well-tied roof was erected by a Halle carpenter or whether a carpenter with the requisite experience from a different town was brought in for this work. Undoubtedly, though, since this roof style was far more expensive and complex than a saddleback roof, the decision to build it cannot be explained by Francke's 'rhetoric of functionality'. Instead, it seems more than likely that, at the time this unusual roof was built, Francke wanted to create an architectural feature that would be sure of attracting attention.

Proportion and meaning: the Orphanage as a 'well-proportioned functional building'

The argument presented here, together with the interpretation of the proportions, is largely based on an analysis of the earliest surviving drawings of the Orphanage's façade and ground plan.[8] The four-storied, side-gabled building, covered by a mansard roof is vertically structured into 15 window or articulated bays. The central five bays are emphasised by a median avant-corps, only slightly projecting from the line of the façade, crowned by a triangular gable. Through this articulation, the façade is symmetrically divided into three parts. The corners of the building are set slightly back, while the concluding eave cornice is offset and continues on the gable ends. The substructure is divided horizontally into four storeys. A horizontal cornice unifies the semi-basement-like plinth storey and the elevated ground floor, which are now given a unified appearance by banded rustication from later building work. The first and second upper storeys are fused into a horizontal unit by a beam area set under the eave cornice, which in turn has meant reducing the height of the top windows. However, rather than this resulting in square window openings as on the design drawing, it led to rectangular windows of reduced height. The building's rear elevation, though, executed as a timber construction, clearly shows that the three storeys are designed to be of equally height and were not unified by cornices or mouldings to form horizontal units.

The building's display side is thus divided into three horizontal zones: the plinth and ground floor, the two upper storeys, and the mansard roof, which is similarly sub-divided into two storeys. At this point, it is evident that the dual

pitched mansard roof is an essential element in the building's structure and cannot be read independently from the façade's articulation. At the same time, it is obvious that the individual zones of vertical and horizontal articulation are, in relation to each other, designed to be of equal size. The number three is similarly repeated in the number of entrances, with two entrances in the plinth floor and the main entrance set in the centre of the elevated ground floor and accessed by a double-flight staircase. The lower entrances are each set on the central symmetric axis of the outer vertical zones, while the main entrance is in line with the main axis of symmetry. The position of the three entrances has been chosen so that they roughly produce the shape of an obtuse triangle, echoing the pediment. There is another entrance below the staircase. The present staircase, which dates from the 19th century, has an additional two flanking windows, most likely not part of the original design.[9]

Ground plan

The ground plan has an obvious oblong shape. The building's depth is equivalent to a third of its length (approx. 13 m/39 m or approx. 46 feet/138 feet, depending on the dimensions given on the copy). The layout of the ground floor on the plan from around 1700 corresponds to the structure as built, except for two staircases connecting the plinth storey/basement with the ground floor. The ground plan is divided into three zones of different sizes. The central entrance zone is only three window bays wide, and hence two bays narrower than the avant-corps articulation would suggest. The stair tower at the rear of the building stretches across the width of this entrance area. The stair tower is also designed in three bays with the corresponding entrances and exits. The central passage in the rear articulation leads directly into the courtyard, while the entrance to the right leads to stairs to the first floor. The ground plan zones on the sides of the rear entrance area, each six window bays in width, are sub-divided several times by splitting each of these zones into three. Each of these thirds facing the courtyard is divided by a long wall and two transverse walls into three smaller rooms, each with two window bays to the courtyard. The outermost of the transverse walls continues to the façade side so that the front section of the zone is divided in a 1:2 ratio, and hence each zone comprises five rooms in total.

Dimensional relationships between the elevation and ground plan

The fundamental dimensional relationships of the façade are established by the length of the building and the pediment. Not only is the top point of the pediment aligned precisely with the central symmetric axis, but it also sets the height of the rectangular plan of the façade. Dividing the rectangle in the centre produces two squares each with an edge length of approximately 69 feet. If one then extends the pediment's sides, these lines meet the outer edges halfway up the rectangle and squares. The distance between the window bays is similarly set by this underlying geometry. The central axis of the squares establishes the position of the fourth and twelfth window bays, while the symmetric axis sets the position of the eighth window bay. The other window bays are located by equally dividing the space. On the plan, the eaves height appears to be derived from this geometry, since it corresponds to the length of the two outer zones. Once the eaves height is set, it is then divided in the middle to establish the height of the lower façade zone with banded rustication and the upper horizontal wall zone. The height of the upper mansard roof floor is attained by doubling the height of the lower roof floor, which then also gives the total height of the building. The building's overall height can also be derived from the diagonal length of the rectangle. If this line is divided according to the golden section as described by Euclid, the longer section corresponds to the height of the building.

Interpretation

The setting of the key proportions as a ratio of 2:3:6 (breadth, height, length) on the ground plan and the façade's rectangular plan is a reference to the dimensions of the Temple of Solomon (2 Chronicles 3,3). The division into threes in the structure of the ground plan, the façade and, not least, the pediment is also a key feature in establishing the proportions. One could read this tripling as referencing the divine and, in particular, the Trinity. The problematic aspect of such an interpretation, though, is that there is, at present, no known record of Francke making any such direct statement on the significance of the Orphanage's proportions, or indicating that they should be understood symbolically. Nonetheless, Francke did describe how proportion has a crucial meaning for architecture in his treatise *Von der vermeinten Kostbarkeit des neuen Waysen-Hauses* (On the Supposed Magnificence of the New Orphanage). Here, in the fifth paragraph, he first notes how "everything which is expensive and decorates a

building was avoided". He continues: "...nonetheless the building has a fine appearance since rather a fine order and symmetry has been observed, which has been achieved without cost".[10] In addition, it also worth noting that Francke originally planned a fifth storey, though claimed it could not be added due to the poor quality of the ground.[11]

In fact, though, a fifth floor was constructed in the form of the mansard roof as a residential level at the very top of the building, and in principle belongs to the living area and not the storage and attic areas. This could explain why the height of the rectangular plan for the front elevation does not take the eaves height or the total building height as its point of reference, but the lower storey of the mansard roof. However, Francke did not want to entirely forego architectural ornamentation and interpretable symbolism, as is evident from the pediment with its two eagles, the sun and its reference to Chapter 40, verse 31 of Isaiah, the first of the prophets to foretell the coming of a Messiah and deliverance from Babylonian exile. The choice of this quotation, its contextual meaning, and its prominent position on the façade highlight how Francke wanted the construction of his Orphanage to be located in this tradition, and how he may also have seen himself in a comparable position to Isaiah. Given that Francke managed to have his Orphanage constructed extraordinarily quickly, against all the rationalising prognoses to the contrary, and how he presented this as proof of the "Footprints of Divine Providence", it would hardly be surprising if the Orphanage's proportions actually do refer to the Temple of Solomon. However these references were concealed in the planning process and thus only conveyed indirectly.

Around 1700, there was widespread interest in the Temple of Solomon. For example, the Hamburg model of the Temple was completed in 1692, and later acquired for the Dresden court of August the Strong, the Elector of Saxony and King of Poland. But even before the Orphanage's foundation stone was laid, Francke had also discussed the reconstruction of the Temple of Solomon with Leonhard Christoph Sturm, an architectural theoretician and practical architect. In 1694, to mark the founding of the University of Halle, Sturm presented Friedrich the First, the Prussian Elector, with a treatise on the Temple of Solomon, and later Francke corresponded with Sturm on the problems in building the Orphanage.[12] Even though this cannot serve as direct evidence of deliberately adopting the Temple of Solomon as the model for the Orphanage's dimensions, it would nonetheless be a plausible explanation for the choice of proportions.

The timber-frame constructions on the courtyard side

Only the front of the Historic Orphanage and the two sidewalls were built in solid stone construction. The rear of the building, together with the stair tower, were a timber-frame construction, an approach which was not only reasonable in terms of keeping costs low, but also in ensuring that the building was finished quickly. In this way, the masons could construct the three shear walls working independently of the carpenters. As a result, the process of joining the timberwork of the wall to the courtyard, the ceilings and stair tower could be carried out parallel to the stone work, which no doubt saved a considerable amount of time. The trimming and joining of timber-frame constructions, though, was common practice in the 18th century, even for grand and manorial structures, and was always employed when a large volume had to be erected quickly.[13]

The window bays on the courtyard wall correspond with the bays on the front façade. However, the wall section of each of the four outer bays are hidden by the building housing the Freylinghausen Hall to the south and by House 2–4 (the Orphanage for Boys built 1732–1734) to the north, so that there are seven bays in total open to the courtyard. Two pairs of two window bays are arranged in the rear-facing wall, while three window bays are in the stair tower projecting into the yard. The stair tower is constructed two storeys higher than the eaves, up to the roof ridge, where a protective shelter leads to a platform fitted with a handrail. The staircase conforms to the type usually found in stair towers. It comprises straight single stairs with three flights and two corner landings on each floor. This style of staircase facilitates straight, rectangular steps and hence an easy curtail step even with limited floor space.

The proportions of the square stair tower are notable. The tower's width is approximately equivalent to one third of its height, and hence also employs the same proportional relationship as that shown for the ground plan. The two courtyard wall sections were planned together with the stair tower, since there is only one corner post set in the spandrel between the tower and the wall. In that sense, rather than the tower being a separate structural shell additionally attached to the building, it forms a single constructional unit up to eaves height with the wall sections. Despite the heights of the rooms, similar to prestige buildings, and the large window surfaces, the design of the walls is unusually modest. The framework's structure is notably clear, articulated vertically by upright posts and horizontally by the sets of three

transom beams. The lower floors are constructed without bracing; only on the second storey have braces been set between the windows in the wall surfaces. In contrast, the tower frame's braces are included in each of the storeys on the front, angled to work against one another. This additionally emphasises the vertical line and optically accentuates the stair tower against the wall surface. The structure is also braced symmetrically on the windowless lateral faces of the tower, which are not visible in the front view. In terms of the construction, it would not have been necessary to double the posts on the outer tower corners or in the centre of the lateral tower faces. Even though this is somewhat hidden, one can here identify an aesthetic approach to the arrangement of the timbers which goes beyond the sheer building requirements.[14] The lack of any ornamental elements is equally striking, since contoured joist ends or similarly profiled sill plates and filling in the timber-frame houses of the well-to-do were standard decorative features at that time. Hence, one can trace similar design principles in the timber-frame construction for the rear elevation to those applied in building the façade side, including the avoidance of elaborate decorative forms and a structure based on the careful use of proportions. Moreover, the contrast between the horizontally positioned main building and the stair tower's upright rectangular cuboid shape implies a formal language which more reflects the cubic arrangements of structural dimensions in 20th century industrial architecture than the post and beam construction of Francke's day.

The *Langes Haus* ('Long House')

In terms of timber-frame construction, aside from the Orphanage, the *Langes Haus* is the most interesting and exceptional building.

The *Langes Haus* borders the eastern section of the courtyard to the north. Since its construction is aligned with the site's slope, the number of storeys varies between six storeys to the west and five to the east. The building is approximately 115 m long, nearly 26 m high at the highest point of the roof ridge at the western gable, and 12 m wide. The on-site measurements show not insignificant deviations from the measurements on the plan of the entire courtyard dating from 1717.[15] Working on the basis of the historic plan, there are clear relationships between the measurements in feet. To the west, House 8/9 (1717, =E–F on the ground plan) measures 120 feet in length, while the central House 10/11 (=F–G) is 160 feet and House 12/13 (=G–H) to the east is again approximately 120 feet long. Although the three buildings each have individual roof frames, since the measurements included the entire depth of the walls and two buildings share a supporting wall, the total length is only 398 feet and not 400 feet. Construction work started on the central building House 10/11 (=F–G) in 1713 to build a schoolhouse for boys attending the Latin School. The two adjacent buildings were then subsequently constructed between 1714 and 1716. Including the thickness of the ceiling beams, the storeys are 3 metres or 10 feet high. Each of the ceiling beams is supported by two joists. The eaves are below the topmost floor, i.e., in the western building the sixth storey belongs to the attic, as does the fifth storey in the eastern section. Below this storey, the eaves are set off by a contoured beam and a narrow eave covered with roof tiles. Inside the building, the external walls are slightly distorted inwards. The original construction is most likely a braced truss frame. This then has an added two-storey saddleback roof angled at approximately 50 degrees with a similarly braced truss frame.

In essence, this is therefore a roof with a steeply angled lower roof section and an upper section set at a shallower angle. This connection in the construction is disguised by the window band stretching without interruption from gable to gable, which creates the initial impression of a six-story eaves building. Through the suggested line of the eaves, it was possible to relate approximately to the Orphanage's eaves height, and so complete the courtyard optically at the same height. The *Pädagogium*, constructed in 1711 to 1713, also had a similar eaves height and eave structure to the *Langes Haus*, so that the courtyard was also unified with the same eaves line to the east. This effect is clearly evident on drawings and etchings showing the building from the perspective of Halle's moat, and here too the continuous eaves line creates the impression of the entire complex's coherence and unity.

The impression of a coherent and homogenous block is additionally underlined by the design of the façade. Across its entire length, the façade is characterised by the regularity of the distance between the uprights. The walls use two rows of horizontal beams, and the individual storeys are set on top of one another without any overhang. The transition between the storeys is only accentuated by the upper horizontal members of the frame, the visible ceiling joist heads, and the bulking above them. Here too, there is none of the standard decorative forms on the beam ends and bulking as found in well-to-do houses.

In contrast to the Orphanage's rear façade, the diagonal braces are not visible, although they were systematically tied into various member axes in the frame. However, they were dovetailed from the rear of the beams, and their wood size cut a few centimetres smaller than the size of the beams and struts so they could be covered with the infill plaster. The struts, which served to stabilise the timber-frame during the pitching process, were not supposed to be visible. The even grid of uprights and beams creates a pattern intensifying the façade's unified, coherent effect, which also disguised the break in construction between the three individual buildings. Normally, a building's exterior walls are finished with a vertical of their own, so that two uprights would mark the interface where two directly adjacent buildings join. However, in this case, the use of two uprights on the façade would indicate that this construction is actually three buildings. Evidently, efforts were made to avoid such an impression, and the façade designed to suggest this is, in fact, simply one building. This effect was certainly successful, since the Prussian monarch Friedrich Wilhelm I was amazed at the middle building "due to its length and height", and even today the *Langes Haus* is referred to as a single building.[16]

Nonetheless, functionally and in terms of the original access, the three buildings were never connected within the individual storeys. An internal cross wall without door openings additionally subdivided each of the buildings into two independent units. Each unit had a central entrance hall with, to the north, single-flighted, double stairs with a return landing. This structural development was retained on all storeys up to the first attic floor. Initially, there were two walk-through rooms and two rear-facing rooms opening off either side of the hall creating a ground plan structured into four fields on each side, with each field further sub-divided into two. Hence, one walk-through room and one rear-facing room formed a closed unit in itself. To access one staircase from the other, one first had to go out into the courtyard. Since all the timber-frame buildings were developed on the same principle until 1717, the courtyard had a key function as a connecting element between the units. Horizontal hallways connecting the staircases inside the individual buildings were only constructed much later. Here too, it is evident that although the avoidance of any ornamentation made the structural design and, in particular, the courtyard façade, appear ostensibly functional, the additional effort needed to conceal the bracing struts and connect the individual buildings by a continuous timber-frame pattern was a deliberate measure to increase the monumental effect.

With its combination of the number of storeys and its length, the *Langes Haus* is – to the best of my knowledge – Europe's largest surviving residential timber-frame house. Although large estates in Denmark may have elongated single-storey farm buildings reaching up to around 80 to 100 metres long, these are not multi-storey residential buildings. During the 18th century, there were also such long single-storey timber-frame buildings in army barracks, but none of these have survived. In the late 17th and early 18th centuries, some wings of palaces were timber-frame constructions, but these were later rebuilt in stone (as, for example, in Mannheim and Karlsruhe), and so here too there are no comparable examples today.

Conclusion

The Historic Orphanage's mansard roof is most likely the second oldest surviving mansard roof in Germany. It is, moreover, the only roof of this style, which came from France, that dendrochronological research has shown to date from before 1700.

The measurements of the buildings were careful planned and proportioned. The evidence shows that the 2:3:6 ratio of the Temple of Solomon was adopted for the proportions of the ground plan and the Orphanage's front elevation. The measurements often relate to the numerical proportions of 2, 3, 4, 5, 7, 10, and 15.

This is an outstanding example of a timber-frame construction. The *Langes Haus* has one of the first sheer grid-patterned façades in structural developments around 1700. This is also the longest and highest connected timber-frame façade of any residential building in Germany or Europe with up to five storeys of connecting internal double stairs with a return landing. For the further development of timber-frame building, the building also demonstrates a pioneering reduction of the wooden structure to vertical and horizontal elements without ornamental forms and projecting storeys; as such, this also anticipated structural developments in industrial timber-frame buildings in the 19th and early 20th centuries.

[1] Dendrochronological dating by the author (unpubl.). The reference to the finished roof can be found in Claus Veltmann, *"Und würde dann nicht ein solches Werk als eine Stadt, die auf dem Berge liegt, jedermann in die Augen fallen?* Die Bau- und Entwicklungsgeschichte der Franckeschen Stiftungen bis 1750," in Holger Zaunstöck (ed.), *Gebaute Utopien. Franckes Schulstadt in der Geschichte europäischer Stadtentwürfe,* Halle 2010 (Kataloge der Franckeschen Stiftungen, 25), 93–107, here 93.

[2] On this, see the very compact historical introduction by Romana Anselmetti, "Das Mansarddach der Stadt Basel," in Basler Denkmalpflege (ed.), *Dächer der Stadt Basel,* Basel 2005, 251–282.

[3] Hedda Saemann/Paul Zalewski, "Zur Genese und Transfer des Mansarddaches. Die Rolle von Architekten und Architekturtheoretikern," in Michael Goer et al. (eds.), *Hausbau im 15. Jahrhundert im Elsaß und am Oberrhein sowie in weiteren Regionen,* Marburg 2008 (Jahrbuch für Hausforschung, 58), 497–514.

[4] I am grateful to Bernd Adam (Garbsen) for pointing out these references to early mansard roofs.

[5] The roof frame is only shown by a decorative break between the upper and lower roof sections, although the change in angles characteristic for the mansard roof is not depicted. Whether one can then conclude that the mansard roof in its present form was only set when the roof frame was constructed cannot be said for certain due to the lack of precision in the medallion's image; see Holger Zaunstöck, "Das 'Werck' und das 'publico'. Franckes Imagepolitik und die Etablierung der Marke Waisenhaus," in Zaunstöck et al. (eds.), *Die Welt verändern. August Hermann Francke – Ein Lebenswerk um 1700,* Halle 2013 (Kataloge der Franckeschen Stiftungen, 29), 259–272, here 261.

[6] The drawing is reproduced in *Gebaute Utopien* [see note 1], 114. Zaunstöck addresses in detail the question of who the author of the unsigned pen-and-ink drawing might be. Compared to the sketches made by Georg Heinrich Neubauer of Amsterdam's *Oude Vrouwen Huys* (Old Women's Retirement Home) in 1697, it is clear that the latter is unpractised and lacks the skills needed for professional pen sketching. He would be more likely to come into question as the site manager and organiser, and less as the author of the draft design drawings. Gedeler could certainly be a possible candidate as the author, though a direct comparison with his pen-and-ink drawings for *Schloss Erlangen* show clear differences (wash, scroll rustic capitals, tendency to ornate script and flourishes which are lacking on the Orphanage plan). Zaunstöck also considers Johann Burchard Freystein who is documented as working on a plan in January 1699. Freystein studied mathematics and philosophy in Leipzig, and was later a member of the *Oberbaukommission* in Dresden. To evaluate Freystein's authorship, it would be necessary to view comparable drawings.

[7] An older surviving mansard roof may well be that on the gallery building at *Schloss Herrenhausen* in Hanover. Although this is not dated dendrochronologically, thanks to the information kindly provided by Dr. Bernd Adam, it should certainly be regarded as original and according to archive records was constructed in 1696. It is thus a few years earlier than the Francke Foundations roof.

[8] See for example, August Hermann Francke, *Segens=volle Fußstapfen des noch lebenden und waltenden liebreichen und getreuen Gottes/ Zur Beschämung des Unglaubens und Stärckung des Glaubens entdecket durch eine wahrhafte und umständliche Nachricht von dem Wäysen=Hause und übrigen Anstalten zu Glaucha vor Halle: Welche im Jahr 1701. zum Druck befördert; ietzo aber zum dritten mal ediret/ und bis auf gegenwärtiges Jahr fortgesetzet [...],* Halle 1709, frontispiece and pp. 3–8; *Kurtze Beschreibung derer Gebäude, welche denen in Glaucha an Halle gemachten Anstalten von anno 1698 bis 1717 neu erbauet word[en] nach Ordnung des davon gemachten Abrißes eingerichtet,* with a foreword by Carmela Keller, Halle 2011 (Kleine Texte der Franckeschen Stiftungen, 15).

[9] Leonhard Helten, "Die Stiftungen August Hermann Franckes im architektonischen Kontext," in *Gebaute Utopien* [see note 1], 133–137, here 133.

[10] Paul Raabe/Thomas Müller-Bahlke, *Das Historische Waisenhaus. Das Hauptgebäude der Franckeschen Stiftungen zu Halle,* 2nd revised edition, Halle 2005 (Kataloge der Franckeschen Stiftungen, 1), 24.

[11] *Das Historische Waisenhaus* [see note 10], 24.

[12] Hans-Henning Grote, "Die Franckeschen Stiftungen aus bauhistorischer Sicht," in Paul Raabe et al. (eds.), *Vier Thaler und sechzehn Groschen. August Hermann Francke – Der Stifter und sein Werk,* Halle 1998 (Kataloge der Franckeschen Stiftungen, 5), 131–142, here 136.

[13] This chapter in the history of building technology has not been systematically researched. The *Kleine Schloss* in Wolfenbüttel was constructed as a timber-framed building, as was *Schloss Herrenhausen* in Hanover, which was destroyed in the Second World War.

[14] The timber-frame construction on the topmost storey of the stair tower is only similar to the structure of the lower storeys in the front elevation. The lateral wall surfaces do not use doubled posts and diagonal braces. However, this might just suggest repairs at a later date. The platform's planks and protective shelter were most likely also renewed in the 19th century, though this needs to be confirmed by further dendrochronological research.

[15] See the drawing in *Kurtze Beschreibung derer Gebäude* [see note 8], supplement.

[16] Quoted in *Kurtze Beschreibung derer Gebäude* [see note 8], 1.