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Leonardo da Vinci a Benedikt Ried

Leonardo da Vinci and Benedikt Ried

## SUMMARY

Leonardo da Vinci was not only an “ingenious” painter, but first of all a universal advisor in varied areas including architecture and technical sciences. Benedikt Ried, on the other hand, was “only” an architect. The profession of an architect of his time included, however, a row of activities related to building planning and realizations. Some aspects of their work may be compared as they were contemporaries and it is impossible to exclude that they used the same sources. The first area in which it is possible to find common features is the architectural naturalism. Leonardo created the decoration of Sala delle Asse in the Castello Sforzesco which changed its vault into a stage for illusionistic branches and other floral motives. Similarly, Benedikt Ried designed the Royal Oratory in St Vitus Cathedral in Prague where the traditional ribs were substituted by stone branches. This kind of naturalism expresses an understanding of a building as an organism. The second common area is the fortification architecture. Benedikt Ried is the probable author of the outer fortification of Rábí Castle in south-western Bohemia, which is completely different from local tradition. This fortification includes a polygonal bastion, which is probably the oldest one in Central Europe. Leonardo is sometimes identified as the author of the fortress La Verruca near Pisa, defended by polygonal bastions. In his sketchbooks it is possible to find hundreds of fortification studies as well as studies dedicated to problems of ballistics and mechanics which could serve as a basis for his fortification studies. Nothing comparable is witnessed for Ried. His projects could use Italian examples, but otherwise they entirely depended on empirical experience. The highest expression of Ried’s art of vaulting is the vault of the Vladislav Hall in the Old Royal Palace at Prague Castle. The hall was vaulted with a series of cupola-like vaults reinforced by curvilinear ribs. To improve their static quality, Ried used a system of tie-irons and masonry belts on the rare side of the vault. The whole system is supported by buttresses sunken anchored deep under the ground of the hall. A similarly sophisticated solution was designed by Leonardo for the completion of the *tiburio* over the crossing of Milan Cathedral. It is not excluded that Ried knew Leonardo’s non-realized project and that he used it when he was vaulting the Vladislav Hall.

## SOUHRN

Leonardo da Vinci nebyl jen „geniálním“ malířem, ale především universálním poradcem v různých oblastech včetně architektury a technických oborů. Benedikt Ried byl naproti tomu „pouze“ architektem, práce architekta však v jeho době zahrnovala široké spektrum činností spojených s projektováním a realizací staveb. Vzhledem k tomu, že byli současníky a nelze vyloučit, že vycházeli z podobných zdrojů, lze srovnat některé aspekty jejich pozoruhodného díla. První oblastí, kde lze najít shody mezi oběma tvůrci, je architektonický naturalismus. Leonardo provedl výmalbu *Sala delle Asse* v Castello Sforzesco, jež proměnila klenbu sálu v jeviště iluzivních větví a dalších florálních motivů. Benedikt Ried pravděpodobně navrhl Královskou oratoř ve Svatovítské katedrále, kde jsou tradiční žebra nahrazena kamennými větvemi. Tento naturalismus symbolicky vyjadřuje chápání stavby jako organismu. Druhou společnou oblastí je fortifikační architektura. Benedikt Ried je pravděpodobným autorem projektu vnějšího opevnění hradu Rábí, jež se zcela liší od středoevropské tradice pevnostní architektury. Toto opevnění zahrnuje I polygonální bastion, patrně nejstarší ve střední Evropě. Leonardovi bývá někdy připisováno autorství pevnosti La Verruca u Pisy, chráněné polygonálními bastiony. V jeho skicách při tom najdeme nejen stovky studií opevnění, ale také studie zabývající se balistikou a mechanikou, které mohly sloužit jako podklad pro jeho fortifikační studie. U Rieda nic takového doloženo není, jeho návrhy mohly využívat italské podněty, ale jinak byly odkázány na čistou empirii. Vrcholným projevem Riedova klenebního umění bylo zaklenutí Vladislavského sálu ve Starém královském paláci na Pražském hradě. Sál byl zaklenut sérií kupolovitých kleneb ztužených v půdoryse křivkovými žebry. K jejich statickému zajištění Ried použil systémy kovových táhel a rubových klenebních pasů. Celý systém vynášejí opěráky, založené hluboko pod úroveň podlahy sálu. Obdobně složité strukturální řešení navrhl Leonardo pro dostavbu věžice nad křížením Milánského dómu. Nelze vyloučit, že Ried mohl zprostředkovaně znát Leonardův nerealizovaný návrh a že z něj čerpal při dokončení zaklenutí Vladislavského sálu.

**Klíčová slova:**

Leonardo da Vinci, Benedikt Ried, architektura, modernita, racionalita, renesance, gotika, architektonická kresba, Itálie, české země, vojenská architektura, Praha, Milán, Pražský hrad, Vladislavský sál, tiburio

**Keywords:**

Leonardo da Vinci, Benedikt Ried, architecture, modernity, rationality, Renaissance, Gothic, architectural design, Italy, Czech lands, military architecture, Prague, Milan, Prague Castle, the Vladislav hall, tiburio

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## 1. INTRODUCTION

Why Leonardo da Vinci and Benedikt Ried? In popular imagination, Leonardo even today occupies the place of an “ingenious” artist. As such, he became an important part of what we identify as European culture; moreover, he became one of the icons of this culture, popularized by books on “codes” and “mysteries.” Benedikt Ried, on the other hand, is known only to a handful of students. As (almost) always, reality was much more complicated. Leonardo was much more than a painter. He was most of all a technician, a universal consultant in varied matters<sup>1</sup>. He really was an author of robots, of urban plans and architectural studies, of technical projects of varied kinds. According to some modern authors, many of his devices really anticipated the technologies which were quite important in the time of the industrial revolution; many of them are appreciated even by people who are quite seriously involved in animatronics including an expert who recently developed his own robots for NASA<sup>2</sup>.

Benedikt Ried, on the other hand, was “only” an architect, or, better, a *baumeister* following the “Gothic” tradition of architectural design and construction<sup>3</sup>. In his time, however, to be an architect implied a relatively wide range of knowledge. Ried, in fact, realized buildings which belong to the technically most innovative architectures in pre-industrial history of Europe. The both men were contemporaries. It is quite luring to compare their works – a work of an architect who, as far as we know, never designed anything except for his buildings, and the work of an *uomo universale* who created hundreds of architectural drawings but never realized any of them.

There are, in fact, at least three important moments which relate the two personalities. The first of them is the very philosophy and technology of vault construction. The second is the new style of fortifications. The third common feature is the architectural naturalism or the organic metaphor in architecture. I try to analyze these common aspects of Benedikt’s and Leonardo’s oeuvre, beginning with their naturalism and ending with the most important realization of Benedikt Ried – the vault of the Vladislav Hall at Prague Castle, which may be compared to some of the Leonardo’s most innovative technological (or philosophical?) ideas.

## 2. THE ORGANIC METAPHOR

### 2.1. Sala delle Asse in the Castello Sforzesco

The most prominent example of Leonardo’s naturalistic project is the *Sala delle Asse* in Castello Sforzesco in Milan (ca. 1498), where the whole vault

was changed into a web of branches and foliage. The *Sala* is a large room in the northern tower of the Castello Sforzesco, the fortified seat of the Sforza family on the edge of the historical town of Milan. It was decorated for Lodovico il Moro, the ruler of Milan. In the time of its decoration, this older room was connected to a new built suite of rooms, serving to retreat of the duke and his family and linked externally by a loggia. Leonardo covered the vault and walls of the room with intertwined branches combined with a meandering golden rope. Apart of their symbolic reading, the wall paintings may be interpreted in the framework of its original heraldic and political context<sup>4</sup>. The three reconstructed inscriptions in the hall are related to political actions, joining Lodovico's political career to the personality of the Emperor Maximilian I: Maximilian married on Lodovico's niece Bianca Maria Sforza, supported Sforza's claims to Duchy of Milan, and aimed Lodovico in his fight against the French king Charles VIII<sup>5</sup>. Leonardo, however, designed something more than a simply decorative scheme. The vault of the *sala* seems to be supported by sixteen, resp. eighteen painted trunks. These trunks successfully replace piers or columns, which would "normally" support the springing of the vault. It means that Leonardo wanted to suggest that the tree with branches was an actual metaphor for the real construction of the hall – not just a decorative pattern.

Leonardo's design was not the only expression of architectural naturalism in Milan of the 1490s. In Bramante's *La canonica* built at St Ambrogio (project 1492-94), some of the columns were decorated with truncated branches<sup>6</sup>. It is quite probable that both Leonardo and Bramante were inspired either by the architectural treatise of Marcus Vitruvius Pollio (*De architectura libri decem*, book II, I, 2-3) or by modern architectural treatises (Leon Battista Alberti, *De re aedificatoria libri decem*, IX, I). On the other hand, the Palais du Roure in Avignon, built for Giuliano della Rovere since 1476, has a portal with naturalistic decoration quite in the "northern" or "Gothic" manner<sup>7</sup>. Such buildings probably were not unknown in the cosmopolitan milieu of Milan, and they also could supply an inspiration for Leonardo's and Bramante's projects.

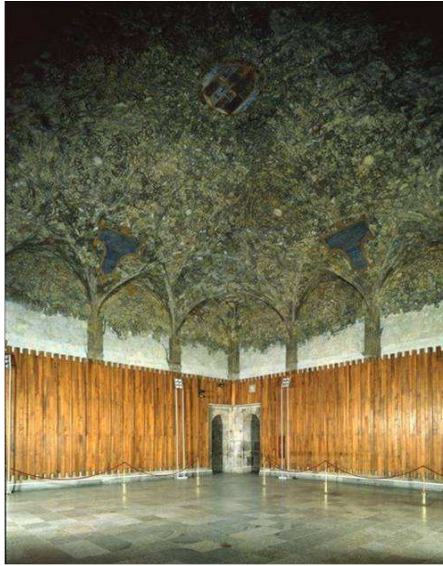


Fig. 1. Leonardo da Vinci, the decoration of the Sala delle Asse, Milan, Castello Sforzesco, ca. 1498.

The emblematic use of floral decoration was no novelty in the history of court architecture. At the beginning of the 15th century, the vault of the staircase in the tower of John sans Peur at the palace of Burgundian dukes in Paris (hôtel d'Artois, av. Etienne-Marcel 20) was given exactly this kind of decoration (designed by Robert de Helbuterne, 1409-11). The oak branches, growing into the vault, meet with hawthorn and hop, which also were a part of ducal emblems<sup>8</sup>. In this context, the Royal Oratory in St Vitus Cathedral – the most important naturalistic design realized during Ried's reconstruction of Prague Castle – loses its seemingly exceptional character and becomes an integral part of late medieval court culture.

## 2.2 The royal oratory in St Vitus Cathedral in Prague

The oratory was practically a new created vault inserted between two piers of St Vitus Cathedral and made accessible from the adjacent Royal Palace by a bridge. It is dated after 1490, as its balustrade bears the coats of arms of countries ruled by the Czech king Vladislav Jagiello since 1490, including the Hungarian Kingdom<sup>9</sup>. The oratory was practically made up by a single vault, from which a pendent boss was suspended. From this pendent keystone, decorated with Vladislav's initial "W", the additional



vaulting was constructed. The surface of vault heads was decorated with truncated branches, and the ribs were changed into stone branches as well. The whole follows the tradition of “Gothic” engineering with its capacity to shock the viewer by audacious technical solutions. The nearest example may be the pendent bosses in the sacristy of St Vitus Cathedral, designed by Matthieu of Arras and Peter Parler in the 1350s. In this comparison, Leonardo’s *Sala delle asse* was “only” a product of highly creative mind which, however, remained at the level of pure decoration. This purely decorative approach to the organic quality of building was not, however, the only Leonardo’s contribution to this theme. Before analyzing the very organic understanding of the architecture in Leonardo’s most sophisticated design let us scrutinize a quite different area of his interests – the fortification studies.



Fig. 2. Prague, St Vitus Cathedral, The Royal Oratory. Designed by Benedikt Ried (?), completed before 1490. Photo Pavel Kalina

### 3. THE NEW ART OF FORTIFICATION

#### 3.1 The new fortifications in Italy and Leonardo’s fortification studies

Second theme which was important both for Leonardo and Benedikt is the art of fortification. The second half of the 15<sup>th</sup> century was a period of profound changes in fortifications on the both sides of the Alps, dictated by the warfare development, especially by the use of new and effective artillery<sup>10</sup>. The old system of vertical walls and towers was no more useful facing the modern cannons. This obsolete system was replaced by a new type of fortification using a fluent fortification line reacting to the demands

of terrain and solving the most important tasks of the new military architecture: how to combine the defense against enemy guns with the necessity to allow one's own forces to move according to the needs of fight, being at the same time protected against the enemy fire. The response was the abolition of static and passive wall-and-tower structure and the evolution of early bastion system with elements of active defense.

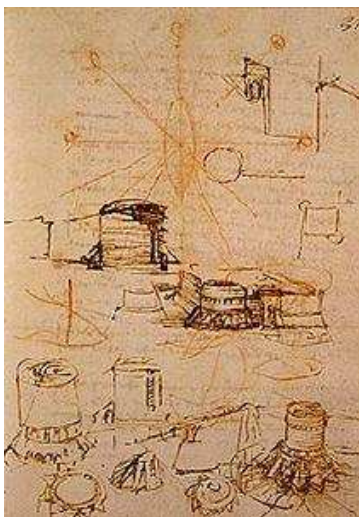


Fig. 3. Leonardo da Vinci, fortification studies. Codex Madrid II, f. 37r.

Leonardo fervently participated in this development. We have ca. six hundred drawings from his hand, showing varied studies of military architecture; even the number of his anatomical studies is not much higher. He, however, did not realize any of these projects<sup>11</sup>. How should we interpret his drawings? Are they real plans, or are they mere manifestations of fantasy? Some scholars thought that they were not realizable with the building technology of their time. The documents nevertheless show that Leonardo was involved with very practical aspects of their realization. Sometimes it seems that the drawing represents a core of a realizable project – or a potential project<sup>12</sup>. Some of those projects which dramatically differ from the tradition are just those which were based on Leonardo's ballistic research. It is further evident that Leonardo was interested in theoretical and practical problems of stability and equilibrium; he studied structural analysis and researched the loading of piers with vertical thrusts. He could be inspired by the Brunelleschian tradition (it should not be forgotten that he began his career in the workshop of Verocchio, who was given the task

to install the bronze sphere on the top of Brunelleschi's lantern at Santa Maria del Fiore Cathedral in Florence), but he could also consider the northern building tradition. This is quite probable, as he preferred stone arch, typical for the Cathedral tradition, to the brick wall, which was the typical construction in Italy.

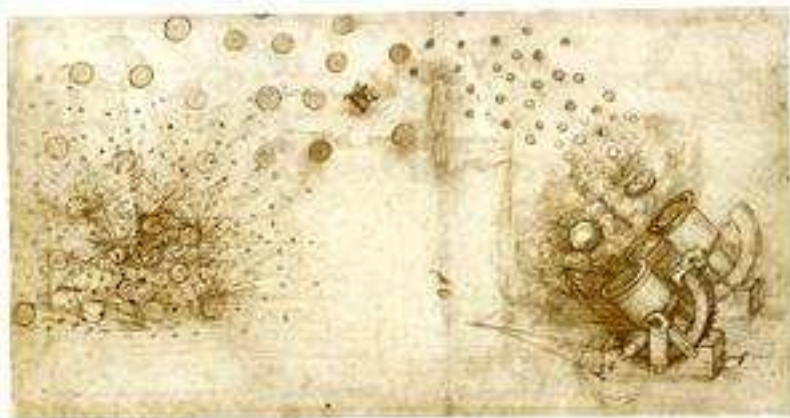


Fig. 4. Leonardo da Vinci, a ballistic study. Codex Atlanticus, f. 30v-31r.

Leonardo developed his fortification studies especially in the 1480s and in the 1490s, when he worked on the *tiburio* project for Milan Cathedral. In his designs he researched the problems of triangular inclined bastions (Paris, ms. B, f. 5r, 24v, 57v, ca. 1485-1490). His study of building technology, related to the *tiburio* project, will be discussed later. The next development of the 1490s was related to Leonardo's research in ballistics, geometry and mechanics, including building mechanics. Around the year 1498 he suggested new solutions based on the research of the impact of projectiles on an inclined wall. His geometrical studies lead him to designs of star-like fortresses (Codex Atlanticus, f. 134r, 135r/48v-a, 48v-b). His projects of constructions with parabolic walls would be probably realizable only using the reinforced concrete (Codex Atlanticus, f. 132r, 133r/48r-a, 48r-b)<sup>13</sup>. All this suggests the high theoretical level of Leonardo's thought and an almost incredible potential of his inventions. On the other hand, we cannot attribute to him any realized military architecture with certainty.

### 3. 2 The fortification of the Rábí Castle

Quite different was the situation of Benedikt Ried. We have no sketches of military architectures which could be attributed to him. It is highly

improbable or practically excluded that he would have experimented in ballistics or statics of military structures. His name is, however, traditionally related to the fortifications of Prague Castle, Švihov, and Rábí. Although we have no immediate evidence that he was their only author, it is more than probable that he really designed these military structures. In this paper, I focus on the outer fortification line of Rábí which represents the most progressive military architecture in early 16<sup>th</sup>-century Bohemia.

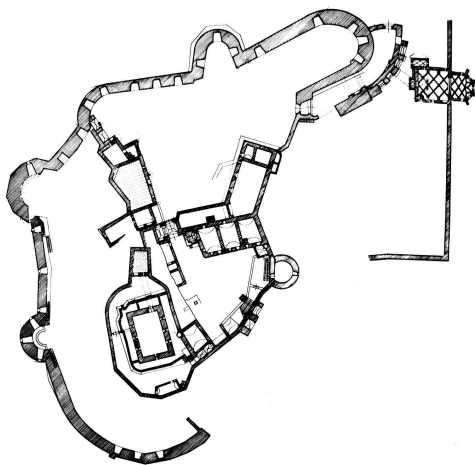


Fig. 5. Rábí Castle, Bohemia, 14<sup>th</sup>-16<sup>th</sup> century, the ground plan.

Rábí was one of the biggest castles in the Bohemian Kingdom even before the 15<sup>th</sup> century<sup>14</sup>. Since the end of the 15<sup>th</sup> century, it was rebuilt and re-fortified for Půta Švihovský of Riesenburk and later for his sons and heirs. In this period, an outer ring of fortification surrounded the earlier core of castle buildings. As Půta acted as the supreme judge of the Kingdom, he could easily met Benedikt Ried: the office of the judge was situated immediately in the Old Royal Palace, which was rebuilt under Ried's personal supervision. Ried's direct intervention in the design of Rábí fortification is not witnessed by archive sources. We know instead that he was in contact with the family of Riesenburk already in 1505, when he was called as an expert to examine the fortification of their castle Švihov.

The recent archeological researches and dendrochronological analyses date the outer fortification circle of Rábí Castle to the period ca. 1500-1510<sup>15</sup>. The fortification has nothing to do with the local tradition. The traditional

tower-and-wall system is completely abandoned and replaced by a fluid defensive line, reacting to the terrain and most probably designed in order to make possible the defense against the gunfire from nearby hills. In the north-east, at the entrance, the fortress is protected by a huge torion, flanking the gate. More to the west there is a horseshoe-shaped cannon bastion, slightly protruding to the east. The western part of the fortification was strengthened by a polygonal cannon bastion to the north and by a smaller round cannon bastion to the south. The whole system enabled defensive fight at two levels: from the light guns and from the cannons.



Fig. 6. Rábí Castle, the polygonal bastion of the outer fortification, ca. 1510.  
Photo Pavel Kalina

The polygonal bastion has no parallel in Central Europe. We find comparable structures only in Italy. One of them is the fortress La Verruca near Pisa, whose fortification was attributed to Leonardo by Carlo Pedretti, as it is documented that Leonardo supervised the fortification when La Verruca fell into the Florentine hands during the war between Florence and Pisa<sup>16</sup>. In fact, it is not certain whether Leonardo really participated in designing of the preserved fortification. The idea of a polygonal bastion is, however, witnessed in Leonardo's sketches.

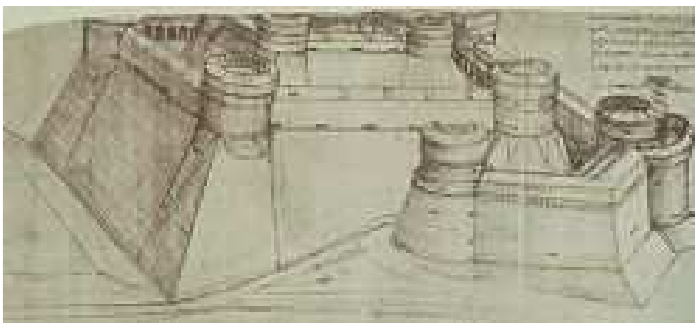


Fig. 7. Leonardo da Vinci, project of a fortress with round and polygonal bastions. Codex Atlanticus, f. 41v.

It is possible to suppose that the whole system of the Rábí fortification is a result of careful ballistic considerations and of applied geometry. We do not know, however, what Ried could know about ballistics. There are no drawings related to these problems not only from his hand, but in Central Europe in general. Ried (or another author of the fortification) either simply followed the Italian examples, from which the work of Francesco di Giorgio was probably the most important model<sup>17</sup>, or worked purely on the basis of his empirical experience. Such a method did not exclude a highly sophisticated use of applied geometry – on the contrary, the geometrical designs of architecture were quite standard at least since the 13<sup>th</sup> century. The same approach – the combination of empirical knowledge with high art of geometry was typical for Ried's best known realization – the Vladislav Hall in the Old Royal Palace at Prague Castle.

## **4. THE BUILDING AS AN ORGANIC WHOLE**

### **4.1 The Vladislav Hall**



Fig. 8. Benedikt Ried, The Vladislav Hall. Prague, The Old Royal Palace, ca. 1490-1502. Photo Pavel Kalina

The Vladislav Hall was a subject of many publications<sup>18</sup>; here I focus on the technology of its vault. The hall was inserted into third level of an already existing structure of the Old Royal Palace. The first level was created by the oldest, “Romanesque” palace with very thick walls. Above this floor, a new, “Gothic” floor was built in the 14<sup>th</sup> century. The level of the recent Vladislav Hall was created at the same time. As a result, the walls of the hall are to a relatively high level still the walls of the 14<sup>th</sup>-century building. In this floor, it was decided to build a new hall which would occupy its full size. Further, it was decided to vault this immense interior space with one vault over the span of ca. 16m.

Benedikt divided the length of the hall into five units. These five bays of the hall were vaulted by five identical vaults. They can be described as irregular cupola-like vaults, reinforced by star-like patterns of curvilinear stone ribs; the vault heads were built of bricks in two layers. The lateral thrusts of the vaults were lead into internal piers, separating the individual bays. On the north side, it was possible to add external piers. The piers were lead under the ground of the hall, where they rest on the masonry work of older, Romanesque and Gothic floors of the palace. Moreover, the enormous vaults were strengthened by tie-irons, visible from the front side<sup>19</sup>. Finally, the vaults were given reinforcing masonry belts on their rare side<sup>20</sup>. This extremely complicating system enabled the vaulting of a sixteen-meter span without axial supports. It may be described as one of absolute peaks of



“Gothic” engineering, deeply rooted in the tradition of Cathedral architecture.



Fig. 9. Benedikt Ried, The Vladislav Hall, a detail showing the top of the vault. Photo Pavel Kalina

#### 4.2 Leonardo da Vinci and the *tiburio* of Milan Cathedral

The Vladislav Hall must have been planned since ca. 1490. Simultaneously, the Italian architects stood before the completion of Milan Cathedral. The Cathedral was begun in 1386, but was not finished yet. Since 1467, the Cathedral was built by Guiniforte Solari, who died in 1481. He was succeeded by Hans Niessenberger (1482-3), who left Milan in 1486<sup>21</sup>. His contribution to the building was demolished, and the problem of completion initiated a discussion, in which Bramante, Leonardo, and Francesco di Giorgio participated.

By the 1480s, the Cathedral lacked its most sumptuous part: the *tiburio* or the tower over the crossing. The erection of the crossing tower was a part of the local, Lombard tradition. The problem consisted in the structural weakness of the crossing area. Any architect who was to complete the *tiburio* had to guarantee the structural stability of the building. Leonardo dealt with this extremely complicated task in a series of drawings, preserved in Codex Atlanticus (Milan, Biblioteca Ambrosiana), Codex Trivulzianus (Milan, Biblioteca Trivulziana) and in the so-called Codex B (Paris, Bibliothèque de l'Institut de France)<sup>22</sup>. Leonardo also created a lost model, completed by 1488. It is, of course, a question how far was the unpreserved model influenced by preserved drawings, and whether these drawings represent sufficiently all ideas Leonardo had when he designed his solution.



An apt source which may indicate the most important features of Leonardo's approach to the completion is the written report of Francesco di Giorgio, submitted to the Cathedral council. This report, approved by other invited architects with the exception of Amadeo, supposed an extensive use of tie-irons; some authors suggest that the whole report could be inspired by Leonardo's model<sup>23</sup>. This is a remarkable parallel to Ried's solution for the Vladislav Hall. There are, however, still other more general coincidences – and, naturally, big differences between the two projects.

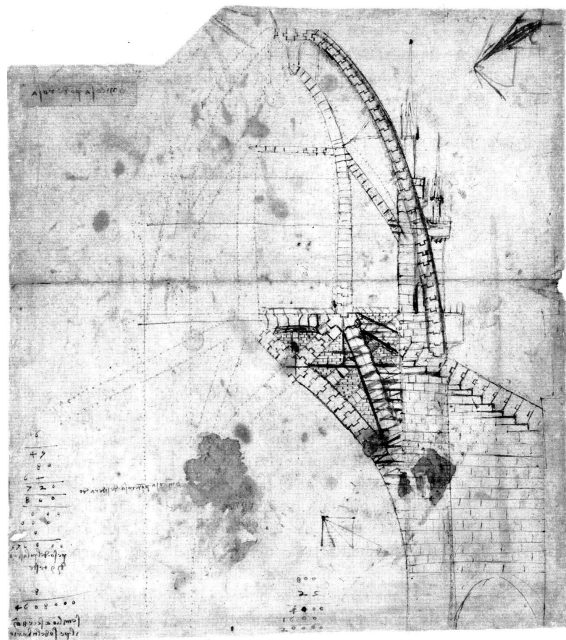


Fig. 10. Leonardo da Vinci, the final study for the *tiburio* of Milan Cathedral, ca. 1488. Codex Atlanticus, f. 850r/310r-b.

The first notable coincidence is the application of Gothic finials in Leonardo's most sophisticated, in all likelihood final and decisive design. This surprising detail was, in fact, related to Albertian theory of holistic treatment of the building<sup>24</sup>. In Prague, nobody was ever surprised by the Gothic elements like buttresses supporting the northern front of the Vladislav Hall in contrast to the "Renaissance" windows. These elements were interpreted as a residue of Ried's "Gothic" training. It is, however, possible that this combination has the same purpose as the addition of

Gothic pinnacles to Leonardo's project of *tiburio* – it could harmonize the seemingly disparate parts of the building.

The second coincidence lies in the systematic approach to the building, as it was developed both in Prague and in Milan. Last but not least, we should not forget that Leonardo dealt with many purely technical aspects of building. He, e. g., created a series of drawings representing cranes, used by Brunelleschi during the construction of the cupola at Santa Marie del Fiore and left at the building site. There is even an evident relationship between Leonardo's fortification studies and the *tiburio* project, witnessed by such studies as the drawing in Codex Madrid I, f. 113v<sup>25</sup>.

Leonardo's project clearly followed the example of Brunelleschi's double-shell cupola for Florence Cathedral. Leonardo, however, did not simply imitate his model, as his design is even more complex than Brunelleschi's solution. His main aim was to increase the connections among individual parts of the building, to create links between individual areas and bonds within the masonry itself. He considered the whole as an organism; it was probably not incidental that he developed his anatomical studies exactly at the same time. He interpreted the structurally weak part of the building as a body which is ill and which needs a medical treatment<sup>26</sup>. Ried certainly could not know this theoretical context of Leonardo's work. He could, however, use Leonardo's drawing or model as a source for inspiration for his own vaults. We should not forget that Ried in all likelihood apprenticed in the Vienna mason lodge. Hans Niessenberger or Nexemperger, who unsuccessfully participated in Milan Cathedral's completion, came to Italy from Graz<sup>27</sup>. The relationships between Milan Cathedral mason lodge and Central Europe were quite strong already in the 14<sup>th</sup> century, and it is not excluded that Ried either travelled to Milan or could be informed about new projects for *tiburio* on the basis of transportable drawings.

## 5. CONCLUSIONS

The oeuvre of Leonardo da Vinci was a subject of innumerable studies in the last decades. In the last years, the research focused more and more on the mental processes which led to the origin of his works. In 2006, the Florentine exhibition held in the Galleria degli Uffizzi summarized the results of many of these researches under the title *La mente di Leonardo*; this title may be translated as the *mens*, the way of thinking of Leonardo<sup>28</sup>. At the same time, a parallel attention to Leonardo's *thinking on paper* was given by Martin Kemp in a catalogue of exhibition organized by the Victoria and Albert Museum in London<sup>29</sup>. According to Kemp, Leonardo thought visually. His method may be described as visual modeling. His

drawings were created to remake natural processes, as “analogue” models. Leonardo always stressed that he was without book learning, that he was a disciple of experience. He called his drawings *dimostrazioni*<sup>30</sup> and interpreted himself as a true son of nature. Notwithstanding this, we may observe his studies as products of highly speculative mind, no matter how deeply they were connected to Leonardo’s actual experiences from his workshop.

We have no designs we could attribute immediately to Ried. We can, however, suppose that he used the same design methods which were used by his predecessors and contemporaries north to the Alps<sup>31</sup>. Their building planning was based on ground plans, elevations, and simple sections. They never used perspectival rendering of buildings. Their art of vaulting was based on a geometric process which enabled to determine the heights of rib intersections, defining in this way the three-dimensional shape of the rib-pattern<sup>32</sup>. Given this, the whole vault was geometrically defined with a method which resembled a mere application of software to a given task. All practical problems resulting from such a rigid way of designing were solved on the basis of the architect’s personal experience with buildings<sup>33</sup>.

If compared to the projects of his Central and North European contemporaries, the work of Leonardo was based on the rational speculation about the created universe. The work of Benedikt Ried was, on the contrary, fully rooted in the immediate experience with this world. The both approaches proved their advantages in following centuries. It is my idea that these two approaches may be interpreted as two ways leading to the modern rationality in varied areas of modern life: they resulted in the combination of **rational knowledge** with strictly **empirical experience**.

Leonardo showed a fascinating example of systematic approach to the building. His ideas about architecture could be sufficiently expressed through his perspectival drawings and through sketches which prepared them. Ried’s architectural thought was, on the contrary, fully and finally incorporated in his buildings. These buildings represent not only extremely sophisticated symbolical and aesthetic structures, but also most accomplished examples of building technology known from pre-industrial Europe.

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