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Shaelyn J. Vinson

*University of Arkansas Fayetteville*

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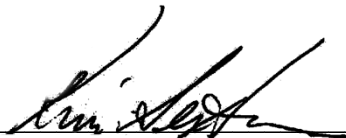
Exploring the Contemporary Use and Understanding of Precedent in Architectural Design via a  
Comparative Analysis of Brunelleschi and Le Corbusier

A thesis submitted in partial fulfillment of the requirements for the  
Honors Program of the Department of Architecture at the  
Fay Jones School of Architecture + Design

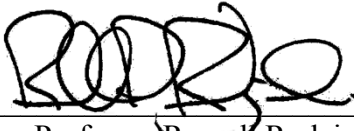
by

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Spring 2016  
University of Arkansas



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## **Abstract**

As a student of architecture, conducting precedent research before diving into the design phase of a project is something that I am very familiar with. But, following each project's precedent research, is often an overwhelming feeling of uselessness for the material found. For each project, assignments call for students to find a certain number of buildings on which to base their project. While historically this step makes sense, 21<sup>st</sup>-century architecture students are taught that there is no "new" architecture, and that copying and collaging together existing buildings is the best way to achieve a successful design. This post-modern method of thought which is very common in American schools of architecture puts future generations of architecture at risk of producing a mess of collaged buildings with meaning no deeper than the metal wallpaper they are wrapped in. This thesis, therefore, has its origins in personal experience as well as a deep concern for architecture's future. I have conducted this research in part with the hope of encouraging academia to reconsider the effectiveness of two-day, project-specific, internet-based, precedent research and to focus instead on the precedent as being more than just a building that helps solve "problems."

In order to demonstrate how architectural precedents can have a much more profound impact on building design, this thesis will study the use of precedents by two architects who became icons of groundbreaking movements and revolutionaries in the history of architecture: Filippo Brunelleschi (1377-1446) and Charles-Édouard Jeanneret-Gris (1887-1965) better known as Le Corbusier. This study begins by introducing the training and architectural styles of the respective architects as the backdrop to their thorough incorporation of precedents as models and processual

methods in their architectural designs. I then conduct in-depth formal analyses of two buildings from each architect's oeuvre to demonstrate how in two distinctly separate time periods the use of precedent was essential in creating an architecture for future generations to learn from. In doing this research, I hope to shed light on the need for a reevaluation of the way today's design curriculums have simplified precedent research, when, in fact, they should be focusing on it on a much deeper level.



## Introduction

In architecture schools across America, students are told that the great buildings of the past had an essential role in every architect's design process. In the influential Beaux-Arts School of architectural training, created in Paris in the nineteenth century, the classical buildings of Greece, Rome, and the Italian Renaissance played a key part in the evolution of a successful architectural design. Even in the era of twentieth-century Modernism (e.g., the Bauhaus school), when admired projects broke away from all past traditions, the use of architectural precedents remained indispensable in handling site issues, resolving technological problems, and exploring typological options.

Nevertheless, the modern heroes of the discipline – the architects most admired by the profession and the public – are those who dismiss the past and break the mold. I am proposing a written study of the use of precedents by two architects who became icons of groundbreaking movements and revolutionaries in the history of architecture: Filippo Brunelleschi (1377-1446) and Charles-Édouard Jeanneret-Gris (1887-1965) better known as Le Corbusier. These two architects were situated at critical historical junctures 600 years apart: Brunelleschi at the cusp of the transformation of the Middle Ages into the Renaissance and Le Corbusier at the threshold of the Modernism's break from the historicizing traditions of two millennia of European architecture. Brunelleschi appears to have rejected the immediate Gothic past in order to return to a pure form of classicism, but was that indeed his intention and did he succeed? Le Corbusier explicitly declared himself to be striving toward "New Architecture" in his 1923 book *Toward a New Architecture*, but he traveled extensively and kept voluminous sketchbooks of historical buildings he saw on the way. Precisely because the work of Brunelleschi and Le

Corbusier departed radically from what came before, the use they made of architectural antecedents can reveal quintessential aspects of the role of precedent in design at moments of significant cultural change, moments much like ours.

This research examines the use of precedents by Brunelleschi and Le Corbusier by focusing on two key buildings in their respective careers: one landmark edifice early in their oeuvres and then a key later building. This project will be a welcome contribution to the fields of both architectural history and architectural design. Several recurring themes link Brunelleschi and Le Corbusier together in their uses of precedent, and yet historians have not explicitly studied the two designers jointly in this respect. Foremost among these topics is the role of Classical architecture. Many scholars focus on how Classical architecture was an important precedent in the work of Brunelleschi and Le Corbusier. William Curtis' article, "The Classical Ideals of Le Corbusier", for instance, discusses the great extent to which classical buildings influenced the Swiss architect's architectural thought and output. Surprisingly, at least for Brunelleschi who is supposed to have "rediscovered" the true principles of Classical architecture, historians and critics have highlighted the role of non-classical precedents, such as the vernacular and even the Gothic. These studies highlight the ways in which historical contexts shaped these architects' notions of suitable precedents. Since historians consider both Brunelleschi and Le Corbusier to be the "fathers" of their architectural style, a deeper, more nuanced understanding of the ways in which they *utilized* the past to change architecture's future is needed.

The originality and creativity of architects like Brunelleschi and Le Corbusier seem to deny any role to authoritative buildings from history. Yet, this is rarely the case.

What is clear is that the way in which precedents have been interpreted and viewed has radically changed throughout history. Without an explicit understanding of how these perceptions have shaped architects' work, we have an incomplete grasp on architecture's relationship to time. Today, when anything from computational programs to inhabitable flesh models the ways in which architects conceive of built form, it is important to reconsider the built paradigm, to re-examine how architects in the past used precedent in the generation of their designs, and to investigate how the buildings of the past impinge upon the work of the present. In so doing, the wellspring of precedents in contemporary design processes can be better understood and appreciated in all of its depth and variety.

## Chapter 1: Precedent and the Revolutionary Architect:

### Thresholds in Space and Time

#### **Modernities Before Modernity: Filippo Brunelleschi and the Transition from Medieval Gothic to Renaissance Classicism**

Historians often consider Renaissance architecture (ca. 1400-1600) to be a major shift from the Gothic style of the past (ca. 1150-1450 AD). Brunelleschi is written into history as the “father” of the Renaissance for initiating the breaking from the Gothic past and moving toward a more classical architecture. The Gothic buildings which Brunelleschi knew were those of central Italy, and he and his contemporaries referred to them as “German” or “modern.”<sup>1</sup> The Goths, of course, were one of several Germanic peoples who sacked the Roman empire in late antiquity, but it was not until 16<sup>th</sup>-century architects like Raphael and Giorgio Vasari assigned the term “Gothic” to this architecture to express their overall displeasure with the asymmetrical and ornate aesthetic of the style.<sup>2</sup> In the 15<sup>th</sup> century, the Gothic was still admired in Italy, but perhaps not overtly so by Brunelleschi. The defining architectural elements of Italian Gothic included the pointed arches, ribbed vaults, and less often flying buttresses, as seen in several buildings in Brunelleschi’s native city of Florence, even in the small scale Strozzi Chapel in Santa Maria Novella of 1348 (Fig. 1). Architects combined these structural elements to create a light, colorful, and airy architecture that departed from the heavier and darker spaces of the Romanesque era before. The ribbed vaults

lightened the load on the walls so that stained glass could replace masonry between the piers, letting in more light through the stained glass windows. The pointed arches

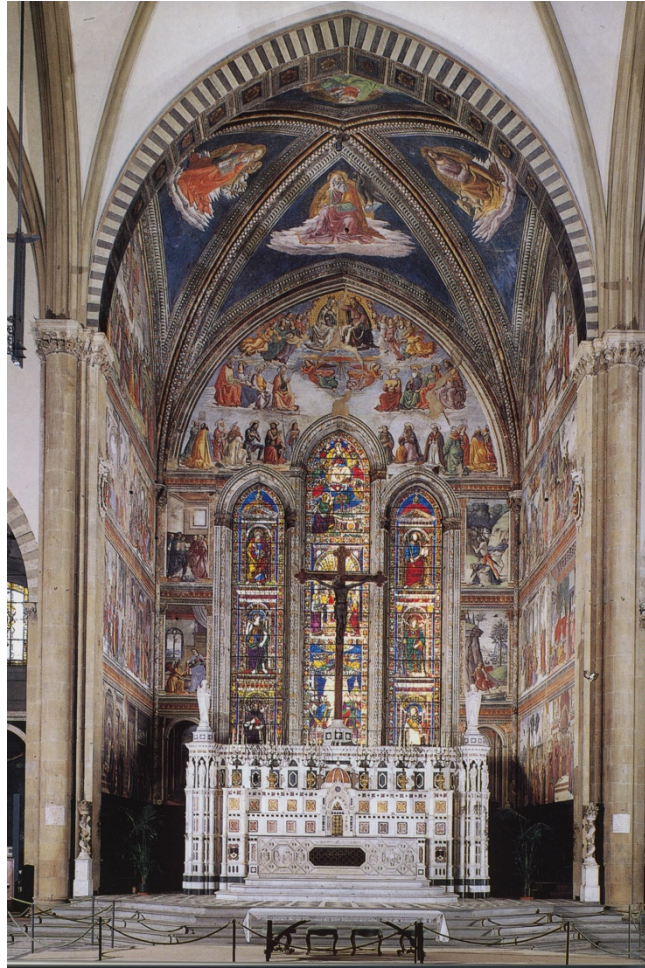


Figure 1 Strozzi Chapel in Santa Maria Novella, 1348

directed the thrust of the vaults downward with precision so that the windows could be higher and wider, essentially replacing stone walls with glass. Flying buttresses supported the vaults so that the entire light, skeletal structure could be raised much higher than previous buildings. The structure used in Gothic architecture was inherently decorative. The elements themselves, aside from the structural capacity, created a vertical emphasis that encouraged the viewers' eyes to travel the full height of the space. The sweeping shafts on the columns, allowed to be much smaller in diameter

because of the pointed arches, were unbroken from floor to ceiling and often connected straight to the ribbed vaulting. Brunelleschi and his contemporaries undoubtedly understood the otherworldly effects of Gothic spaces but chose to turn their back on them in favor of buildings which historians often view as more direct, pure, and honest.

The art historical narrative casts Renaissance architects as heroes who returned to an architecture derived from the classical world. Filippo Brunelleschi stands at the pinnacle of the early Renaissance pantheon of deliverers from the “Dark Ages.” With strict devotion to simple proportional relationships and a strong symmetrical component, his architecture appears to be very rational in its nature in contrast to the resolute lift of Gothic architecture. Brunelleschi brings a complete panoply of classical vocabulary—classical columns, semicircular arches, hemispherical domes—to replace the complex plans and elevational systems present in medieval buildings. His buildings were the first instances of Renaissance design, and his architecture became the benchmark for what this style would become.

When historians describe Brunelleschi as the “father of the Renaissance” they often insinuate that he was creating a completely new architecture that rejected recent (Gothic) methods of design. However, some scholars such as Heinrich Klotz and F. D. Prager, point out that there are actually many Gothic elements in his architecture, and so it could never represent a true break from the medieval past. As Klotz put it, Brunelleschi’s architecture was, “...never exclusively classical, but never truly Gothic.”<sup>3</sup> Although Prager may be too hasty in attempting to dismiss him as a revolutionary all together, his buildings, when analyzed carefully, do suggest that Gothic architecture was indeed one of the formative influences in his designs.<sup>4</sup> Obvious evidence of this is

found in Brunelleschi's Old Sacristy (1421) in Florence, the first of four monuments this thesis analyzes in detail (Fig. 2). The Old Sacristy's ribbed dome, for instance, recalls one of Gothic architecture's signature structural elements (i.e., rib vaults) in a chapel which seems to encapsulate the Renaissance principles for which Brunelleschi is

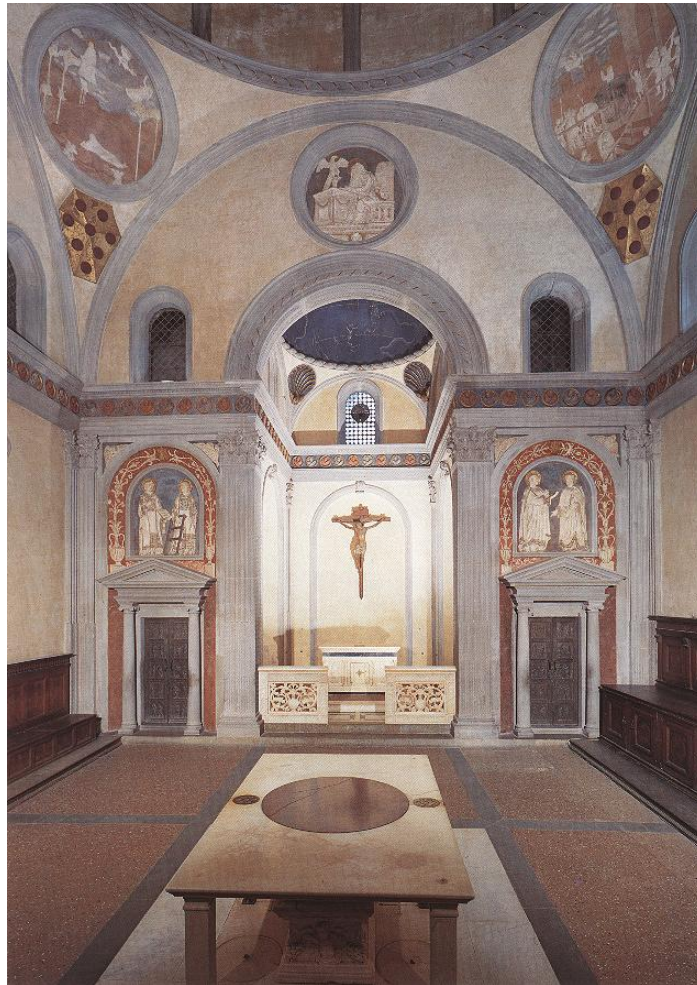


Figure 2 Old Sacristy, Brunelleschi, Florence, Italy, 1421

otherwise so famous, such as the classical pilasters throughout the space (Fig. 3).

Brunelleschi did not merely replace Gothic colonnettes and ribs with pilasters; instead, his use of pilasters was extremely calculated. He endowed the pilasters, normally purely decorative elements in classical architecture, with the illusion of structural heft or potential by making the sides of the pilasters a full flute in thickness (Fig. 3). This

created the illusion that the pilasters were not simply applied to the wall as thin decorative overlays, but rather that they continued deeper into the wall as if they were structural elements necessary to hold up the dome. This small detail, that is, the suggestion that two pilasters are actually a solid square pier mostly hidden behind the wall, is overlooked by all but the most experienced observers. It was one of many details that made Brunelleschi's architecture rife with opportunity to rise as a new design model for his observant contemporaries to follow, but it was not one found in ancient Roman architecture.



Figure 3 Pilaster detail in the Old Sacristy

### *Precedents versus copies in Renaissance architecture*

Compared to other architects of his time, Brunelleschi was extremely thorough and genuine in his design and, presumably, in his choice of precedents. Nothing was just simply surface deep in his architecture, even if his contemporaries might have missed some aspects of his invention. Marvin Trachtenberg, when comparing the Old Sacristy to the Pazzi Chapel in Florence (1441), a later building often attributed, or misattributed, to the Florentine master, states that "...the functional logic of Brunelleschi's variation is not only impeccable but grounded in antique precedent."<sup>5</sup> Being a new trend in 15<sup>th</sup>-century design, Brunelleschi's architecture would be imitated by fellow architects who did not always understand his underlying principles or the logic of their antique precedents. In fact, Trachtenberg described this era of architecture as being a time in which "Patrons demanded copies of 'originals' that were highly valued because of their iconography, style, patronage, and other factors..."<sup>6</sup> Trachtenberg essentially raises the question of whether the Renaissance truly brought a reinterpretation and morphology of antiquity with new invention and ingenuity, as Brunelleschi's designs seem to be, or if it was a period in which architects simply reproduced classical elements as a decorative bling for an otherwise modish architecture. As Trachtenberg observed, "copying inherently serves to mask or blur the copyist own style,"<sup>7</sup> which was the antithesis of the way in which Brunelleschi designed. "Brunelleschi," Trachtenberg continues, "tended to obscure his specific sources in intense syncretistic fusion."<sup>8</sup> For other architects following Brunelleschi, design was more about the accurateness of the applied decorative elements and their effects. These architects, in essence, were fashioning collages or summaries of classical architecture

while Brunelleschi was utilizing classical forms to create an architectural theory or morphology for his own time.

Being at the forefront of a new “movement” in architecture, as opposed to an imitator, it is not surprising that Brunelleschi designed so that the DNA of his architecture was in and of antiquity, that is, in products of the past which he adapted to become specific to his own personal style. What is intuited from this brief overview of the Old Sacristy (a thorough analysis follows in chapter 2) is that his use of precedent was not what one could predict by looking at either the immediate Gothic past or at the work of his contemporaries. He examined the parts and how they, as individual pieces, created the whole, whereas other architects of the same time used classical elements and buildings as exemplars to recreate. The evidence of the Old Sacristy suggests that, for Brunelleschi, precedents were not to be accepted passively as models to imitate, but that they were, in a sense, ideals to be generated by the architect through analysis before applying them to design. This thesis is in part dedicated to unpacking how major architects like Brunelleschi and Le Corbusier deployed precedents in their work and how the precedent was therefore a factor in changing architecture at critical moments in history.

### *Brunelleschi's training and travels*

Brunelleschi's formative years reveal many essential experiences that may have impacted the way in which he studied and utilized precedent in his architectural career. Antonio di Tuccio Manetti's *Life of Brunelleschi* (1480) is the main, if problematic, source on Brunelleschi's early life. Manetti was only 23 years old when Brunelleschi died in

1446, and his biography of Brunelleschi's life is often criticized as a hagiographic aggrandizement of Brunelleschi's life. But, according to Trachtenberg, even if the biography is a somewhat garbled recounting of the architect's life, much of the information Manetti provides is grounded in fact and, more importantly, verifiable in his architecture today.<sup>9</sup>

As a boy, Brunelleschi trained as a goldsmith. He succeeded in the art and was well known in this field; he was especially recognized for his acute attention to detail.<sup>10</sup> A defining moment in his life came in 1401 when he competed for the commission of a set of bronze doors for the Baptistery of San Giovanni in Florence (Fig.4). The competition ended with a citizens' committee unable to reach a decision between Brunelleschi's design and that of his competitor, sculptor Lorenzo Ghiberti (1378-1455). They were given the opportunity to complete the design collaboratively, but Brunelleschi refused this offer with the understanding that if he could not control the outcome entirely he would rather not have the commission. According to Manetti, anger over the loss of this commission is what drove Brunelleschi to make his fateful trip to Rome where he would encounter the remains of classical architecture at its source (differences between classical Greek and Roman architecture were not yet readily understood or appreciated in the Renaissance).<sup>11</sup>



Figure 4 Bronze door panels for competition, F. Brunelleschi (left) and L. Ghiberti (right)

Elements of architecture from Rome, presumably derived from this visit, are consistently present in Brunelleschi's design from methods of construction in his domes to the decorative elements and the Classical orders. Manetti's biography is specific in its account of the details of Brunelleschi's time in Rome. He travelled with his good childhood friend, the sculptor Donato di Niccolò di Betto Bardi, better known as Donatello (1386-1466). Together they acted as "treasure hunters" in exploring ancient Roman ruins for sculptures and art. But, during this time, Brunelleschi also studied the remnants in order to "...rediscover the fine and highly skilled method of building and the harmonious proportions of the ancients...."<sup>12</sup> Through excavation, he was able to study the architectural measurements and the over-all *partis* (i.e., basic architectural concept) of the remains. Manetti clearly wanted his readers to understand that Brunelleschi used his analysis of ancient Roman buildings to inform his designing process, which may well have been the case. During the excavations, Brunelleschi studied not only the

measurements that informed his proportional system, but also elements such as masonry, columns, bases, capitals, architraves, cornices and pediments. By focusing on the exact nature of the relationship of the assembly and parts, Brunelleschi would be well prepared to create a language for an illustrious signature style in architecture.

While Manetti's narrative is well grounded in evidence present in Brunelleschi's buildings, the architect may never have been the archeologist Manetti claims, but instead an informed traveler. Trachtenberg recognizes that there were, and still are, two Romes in which Brunelleschi immersed himself: the city of the ancient remains that Manetti focuses on and an extensive network of surviving early Christian churches dating back to late antiquity.<sup>13</sup> Most of these churches were "remodeled" in the later Renaissance and Baroque periods, but Brunelleschi would have seen in them in close to original condition. If Brunelleschi studied the construction techniques and details of the ancient imperial ruins, Trachtenberg insists that his "... keenly analytic, imaginative, and willful eye seems to have perceived [the churches] in [their] structural and even decorative forms...."<sup>14</sup> In the churches he would have observed the less prominently-displayed structural techniques and details in ornamentation. In his careful attention to detail (Fig. 3), it is evident that he was looking closely at the decorative armature of surviving churches. The wall containing the arched opening to the chancel in the Old Sacristy (Fig. 2) is an example of how Brunelleschi's structural elements not only as decoration but also to represent a solid construction of the space. An interior painting of Old St. Peter's Basilica shows how he may have been looking toward these surviving churches to study their use of structural elements to enhance the spatial quality (Fig. 5). Historians often disagree on what Brunelleschi studied while he was in Rome, but they

all agree that “the evidence... proves that he studied in Rome before building anything.”<sup>15</sup> Through a close analysis of his architecture, this thesis will confirm that both the Roman ruins and the early Christian churches fueled his capacity to utilize and generate architectural precedents.

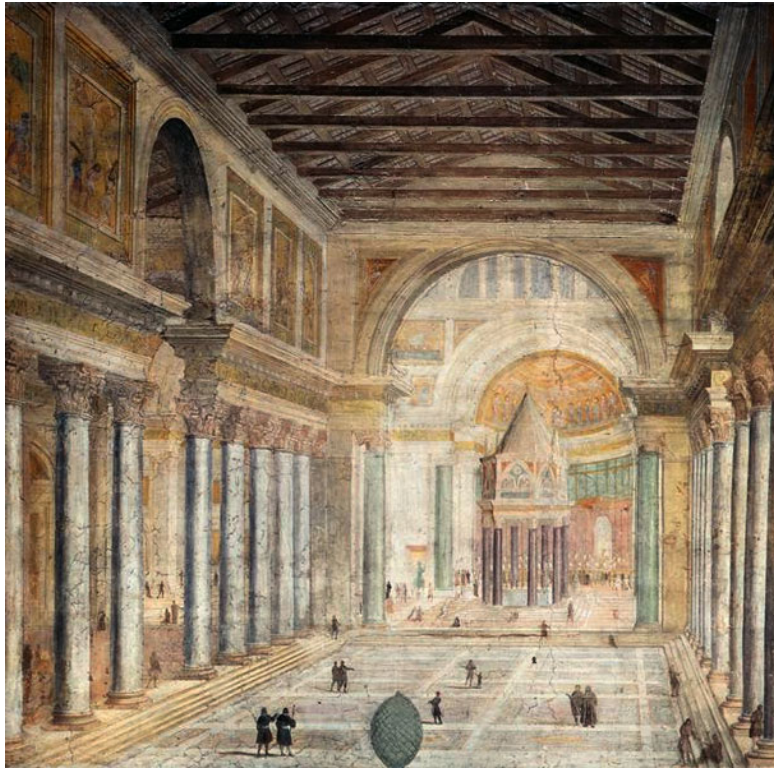


Figure 5 Interior of Old Saint Peter's, painting, 1649-52 by Filippo Galiardi in S. Maria ai Monti, Rome

### **At Modernism's Threshold: Le Corbusier and Art Nouveau**

Charles-Édouard Jeanneret (1887-1965) (better known as Le Corbusier in his architectural career) is as well recognized as the “father” of the International Style as Brunelleschi is of the Renaissance. The name Le Corbusier is tightly attached to any conversation on Modernist architecture specifically and modern architecture in general. Modernism in architecture is synonymous with the so-called International Style. Its most common defining characteristics are quite well-known: rectilinear forms, austere surface planes devoid of any ornamentation, open floor plans, and a visual weightlessness

created by extreme cantilevers. The International Style and early Renaissance architecture are similar in that both rejected previous architectural styles. In both cases, too, architecture is coming from a decorative style and moving toward design principles that seem “purer” in comparison (as noted above with Brunelleschi). In the case of the Renaissance, the impulse to move forward appears to have come from the distant Roman past, whereas Modernism would find inspiration in the present and future. Le Corbusier consciously strove to be revolutionary in his architectural design and thought, clearly seen in his written corpus of out-spoken opinions on what constituted good building. Moreover, unlike Brunelleschi, Le Corbusier authored a small, but influential theory of architecture which contains his stated views on precedents. Although his aesthetic education began in the tenets of the progressive Art Nouveau movement (ca. 1890-1910), he would become a “STARchitect,” in contemporary terminology, when he began to reject the philosophy and formal vocabulary of this school.

Whereas Gothic architecture may be viewed as a foil to Brunelleschi’s revival of the “good” classical style of the Renaissance, many historians claim that the Art Nouveau movement was an important predecessor for Modernism; both as a highly decorated style for Modern architects to strongly reject and as a precedent for the ability to create high-quality products at the scale of mass production.<sup>16</sup> The Art Nouveau Movement was an all-encompassing style that involved not only architecture but also interior design, graphic art, and decorative arts such as jewelry, furniture, textiles, and many others. It was a counterpoint to industrial production which was already the primary mode of making and building by this time, but the designers of the school were also concerned by the lack of integrity in the hand-made objects that merely imitated the

forms of earlier artistic periods. The goal of these artists was to produce better quality design and craft that would avoid pointless decoration seen previously. Formally, the architecture in the Art Nouveau movement was characterized by the undulating asymmetrical lines that were easily recognizable as deriving from nature. Long sinuous lines were representative of vine tendrils while other elements were meant to describe flowers or insects. The combination of these forms and materials like ironwork, ceramic, glass, and brickwork created a "...fusion between structure and ornament,"<sup>17</sup> so that decoration was not additive, something merely applied to a structure. A good example is work done by the Spanish architect Antoni Gaudí (1852-1926). One of his most famously characterized Art Nouveau designs is Casa Milà in Barcelona, Spain (1912) (Fig. 6). "With its undulating façade and surrealist sculptural roof, Antoni Gaudí's Casa Milà appears more organic than artificial, as if it were carved straight from the ground."<sup>18</sup> The philosophy behind the movement held that art should be a way of life.<sup>19</sup>



Figure 6 Casa Milà, Antoni Gaudí, 1912

Everything that could be inspired by the movement, should be, which, for many upper-class Europeans, meant transforming their everyday life to revolve around these aesthetic ideals. From furniture to dinner-ware, the bourgeoisie adapted every aspect of their lives to abide by the principles. Considering the architecture for which Le Corbusier is most famous, the Art Nouveau movement may seem like an unlikely training ground, but its principles influenced not only Le Corbusier but many other important modernist architects of the 20<sup>th</sup> century like Walter Gropius (founder of the Bauhaus School) and Louis Sullivan (who coined the phrase “form follows function”).

### *Le Corbusier's education*

In contrast to Brunelleschi's training in Florentine guilds, Le Corbusier had formal, academic training in the arts and many influential teachers in his earlier years of learning. Le Corbusier began by studying painting and architecture with a Ruskinian education under one of the foremost exponents of Swiss Art Nouveau, Charles L'Eplattenier (1874-1946). Most of what L'Eplattenier taught Le Corbusier derived from the writings of the English architectural critic John Ruskin (1819-1900). His writings were popular with the Art Nouveau movement and encouraged a disregard for structure and an intense focus on the “...sculpted decoration, polychromies, and the skin of the stone”<sup>20</sup> This education in many artistic media inspired him to travel and paint what he saw, leaving him with a corpus of images of potential precedents. Most importantly, he learned how to see architecture and how to translate what he saw into something of his own.

By 1913 Le Corbusier was developing his own ideas on regulating straight lines in contrast to the flowing organic linear patterns he learned to admire in his Art Nouveau training. Le Corbusier was an avid reader and found interest in August Choisy's *Histoire de L'Architecture* (1899)<sup>21</sup>, to whom he attributed his enthusiasm for regulating lines. But his own views of regulating lines differed almost entirely from those of Choisy. Le Corbusier used these lines in his architecture to create a pleasing aesthetic and appeal to the viewers' senses rather than Choisy's use of oblique sightlines to inform designs that fall into the category prescribed by the Greek *pittoresque*.<sup>22</sup> For Choisy, this style left irregular ground contours and existing site conditions as they were and forced new "further aesthetics and visual factors" (buildings) to become an overlay on the historical determinants. Choisy used his version of regulating lines to create symmetry in an otherwise asymmetrical landscape.<sup>23</sup> One way Le Corbusier put his interpretation of regulating lines into practice was in the strong horizontal window elements present in many of his buildings. A well-known example of this is in Villa Savoye, Poissy-sur-Seine, France (the subject of an analysis in chapter three), where regulating lines can be seen informing the windows as well as the overall composition of the building (Fig. 7). Indeed, regulating lines came to be an important feature of his early breakaway style.



Figure 7 Villa Savoye, Le Corbusier, Poissy-sur-Seine, France, 1931

### *Classicism and Le Corbusier*

Line was just one of Le Corbusier's early architectural principles. Classicism, albeit in an abstract form compared to Brunelleschi, was another formative source of formal ideas for the young architect. He encountered it working in his second architectural office in Berlin, that of modern "classicist" Peter Behrens (1868-1940), where he worked for five months in the years 1910 and 1911. Behrens taught Le Corbusier what Francesco Passanti has termed the "remarkable virtuosity in the use of proportion" and used proportions routinely in his practice.<sup>24</sup> In working for Behrens, the two pillars of Le Corbusier's old Ruskinian education—the emphasis on individual making and the importance difference between truth and imitation—were shattered when he visited Behrens' AEG factory in Berlin (1909).<sup>25</sup> Behrens had been commissioned for the improvements to this building, originally constructed in 1892. He was also employed by the AEG as an artistic consultant. Behrens' design to improve the old industrial building involved combining a neoclassical and commonsense approach.

He famously combined classical elements, like a non-structural colonnade on the façade, with a pragmatic emphasis on technology and production (Fig. 8). The combination of abstracted Classical elements and functional use that Le Corbusier saw in the AEG factory dramatically changed his attitude toward Classical architecture and began to impact the way he designed. Because of his education under L'Eplattenier, which was deeply rooted in the Art Nouveau style, Le Corbusier had been intensely opposed to the use of Classical language in architecture at first. He had been under the impression that proper “attention went to nature and [the] growth process... and medieval precedents.”<sup>26</sup> It was not until he was finally convinced to visit the sprawling Baroque palace Versailles in 1908 that the potential for classical clarity first revealed itself, but his work in Behrens’ office resolved his earlier ambivalence, and he realized how vital classical proportioning would be in his work.



Figure 8 AEG Turbine Factory, Peter Behrens, 1909

As with Brunelleschi, travel was key in Le Corbusier’s “collecting” of architectural models. He was a very well-traveled man and highly susceptible to environmental

influences. The buildings he saw and recorded often became fodder for his generation of architectural precedents. While he continuously traveled throughout his career, his earlier travels through Italy and Greece underline the essential framework upon which he based much of his work. In 1907 Le Corbusier made a trip to Italy, but did not make it any further south than Sienna. On this trip, while still under the influence of his Art Nouveau education, he studied only medieval architecture and did so more through the lens of a painter than an architect. Le Corbusier made his second trip to Italy in 1911 primarily to study Rome but he took a route which led him first through Athens, where he saw firsthand the effects created from classical design principles, which he had encountered working with Behrens at about the same time. Le Corbusier was fascinated with the Parthenon. Although reluctant, or so some historians believe, the great modernist hero admitted to the Parthenon being the “indisputable Master” of the basis of all measurement in art.<sup>27</sup> Stanislaus von Moos believes that his goal in studying the Parthenon so intensely was to establish ultimate rules of architecture and understand the quality behind the austere present (Fig. 9). In Behrens office, starting in 1910, Le Corbusier had begun to shift his mode of thought from creativity in detail to a focus on the organization of a whole. In Athens, he found that “...classicism provided the means for conceptualizing in a new scale.”<sup>28</sup> This new understanding helped him to formulate guidelines for his own design process and to establish the rules that would define the International Style.



Figure 9 Le Corbusier's watercolor at the Parthenon



Figure 10 Le Corbusier's pencil drawing of Villa Lante, Rome, Italy

By the time he got to Rome in 1911, Le Corbusier's enthusiasm for a strict study of Greek classicism had diminished in light of the expanded canon of classical and contemporary structures he found there. He began thinking about the future of architecture itself. He studied how "... classical architecture reduced down to the raw play of horizontals, verticals, and volumes..." could be used as a precedent in his design.<sup>29</sup> Because of this, Le Corbusier was not limited to studying just the ruins in Rome; he also took many photographs and sketches of modern Rome. He studied the spaces of the large piazzas like Piazza del Campidoglio and the dynamic urban space present in the Baroque stairs of Santa Maria Maggiore. Renaissance villas in Rome were of interest to him as well, and when he sketched them, he was always certain to note the volumetric qualities of the space (Fig. 10). He also visited Hadrian's Villa in Tivoli (ca. 117-128 CE), Italy just outside of Rome. Here, not only did he draw influence from the regulating lines and volumes of the architecture, but his artistic background drew him to observe the lighting strategies used throughout the villa. In his countless on-site sketches, he drew the forms along with the light and shadow in the spaces (Fig. 11). combination with the heavy influence Athens had on him, Le Corbusier indeed

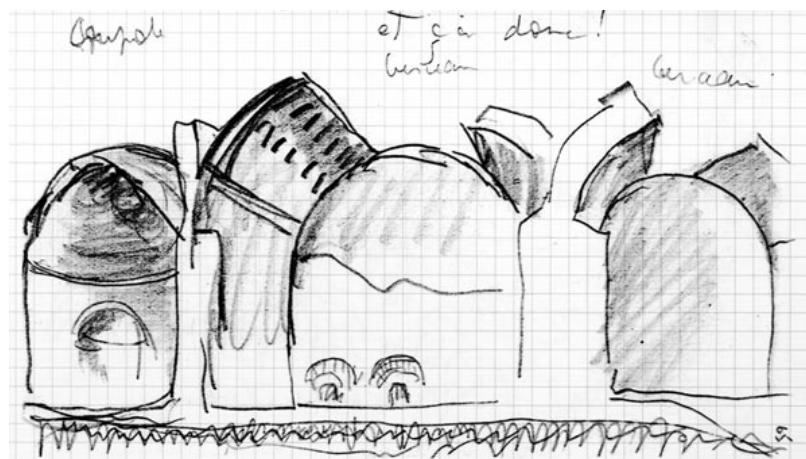


Figure 11 Le Corbusier's Sketch of light and shadow at Hadrian's Villa

began establishing his own unique habits of design early on in his career in architecture. There was not one specific monument he was searching for in his travels to use as a precedent, but instead, he was obtaining a catalogue of examples that, unbeknownst to him at the time, would be essential in defining his architectural style.

The forward-looking positions of the Art Nouveau school notwithstanding, Le Corbusier would soon declare that architecture had lost its way: "We must start again from zero," he would famously say, to give the 20<sup>th</sup> century an architecture that correctly represented the industrial age rather than struggled against it. He argued that broken lines and irregular forms present in Art Nouveau "provoked an unpleasant sensation in the viewer."<sup>30</sup> Classicism helped lead Le Corbusier to the principles that would form the foundation of the International style. For Le Corbusier, as Francesco Passanti concluded, "...classicism was not about recreating the past, but about an appropriate expression of the present."<sup>31</sup> He viewed classicism more as a cultural unity conveyed through classical principles and new and traditional building types. He would not utilize classical elements in new architecture to create a false shallow sense of unity. The classicism seen in Le Corbusier's buildings is not as black and white as it was in previous incarnations of the style like Brunelleschi's of the Renaissance. Le Corbusier infused his architecture with classical proportions and lines informed by ancient structures such as the Parthenon that, while maybe not immediately present to the viewer, evoke the same harmonious sensations as that of ancient classical architecture.

In order to understand how these two innovative architects put these principles into practice, we have to look closely at their architecture to see deeper than the

average viewer. We must examine the architecture by its individual parts in order to fully comprehend the intended effects of the buildings as a whole. To discover what precedents Le Corbusier and Brunelleschi were using when designing, it is crucial that we analyze each component of the building in order to re-assemble it in the same way they would have thought about their designs.

## Chapter 2: Brunelleschi: The Evolution of Precedent During His Shift from a Tectonic Assembly to a Stereotomic Method of Design

This chapter analyzes the formal qualities of an early and late building in Filippo Brunelleschi's architectural career in order to understand what buildings or ideas he could have been using as precedents when formulating this new style we now recognize as Renaissance architecture. It begins with the Old Sacristy (begun in 1421), one of Brunelleschi's earliest and most well-known buildings and the best example to describe his signature architectural style, and ends with Santa Maria degli Angeli (begun in 1434), a partially completed edifice which appears to point to deeper involvement with imperial Roman architecture.

### **The Old Sacristy Formal Analysis**

Giovanni di Bicci de' Medici (ca. 1360-1429), founder of the famous Medici bank, commissioned the Old Sacristy as his burial chapel in 1420. The building is attached to the transept of the church of San Lorenzo in Florence (Fig.12), a parish church largely managed by the Medici family. This project was the perfect opportunity for Brunelleschi to put new ideas to fruition, coming after his first architectural commissions for the Florence Cathedral's cupola (1418) and the Loggia of the Innocents (1419). The desire for a personal burial chapel as a nearly self-contained building was itself a novel idea in that it foreshadowed one of the underlying principles of Renaissance culture: the importance of the individual.<sup>32</sup> The new architectural style he had just introduced in the

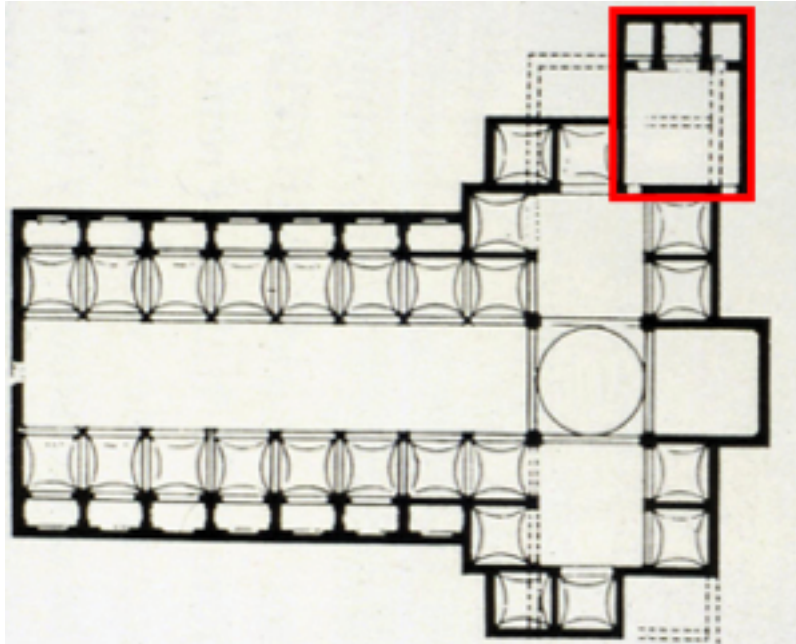


Figure 12 Plan of San Lorenzo with the Old Sacristy outlined

Loggia of the Innocents was thus given validation in the need for something new to serve an unprecedented program.

### *Volumetric clarity*

The Old Sacristy, broken down into simple forms, consists of three volumes: a cubic base, an interstitial portion containing the semi-circular lunettes and triangular pendentives between them which together support the dome, and the dome itself (Fig. 13). The cubic base, which is the portion that people would occupy, contains an altar table at its center and a small square chancel with the altar proper. It was designed to ground occupants, so to speak, and it represents the simplicity or even starkness of life on earth. Because a square was second only to the circle in representing the purest geometric form in Renaissance architectural theory, the square plan (Fig. 14) evokes a calm rational space intended to provide harmony and clarity. A continuous wrapping classical entablature in grey pietra serena stone establishes the transition from the

square base to the lunette zone defined by four arches in grey stone inscribed on the walls and the pendentives that hold the base ring of the dome. This zone plays the role of an intermediate section between the perfect square of the plan and the perfect circle of the dome. The highest section of the space is the dome itself which is a half sphere with a perfect circle resting on the pendentives below. This sequence of spaces is a clear example of Brunelleschi's keen attention to creating space ordered by geometry. He effectively draws on the precedent of the Vitruvian ideal of a circle set into a square, in this case magnified into three dimensions as a sphere set into a cube. Each of the three superimposed registers has the same height, giving each equal importance in Brunelleschi's mind.

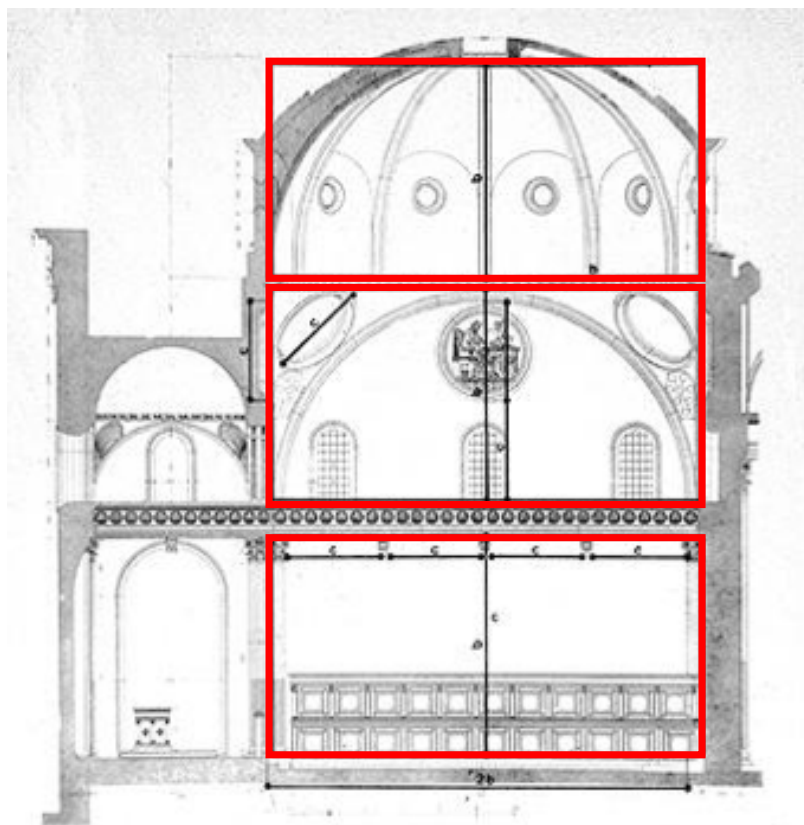


Figure 13 Sectional drawing of the Old Sacristy describing the three-part vertical separation

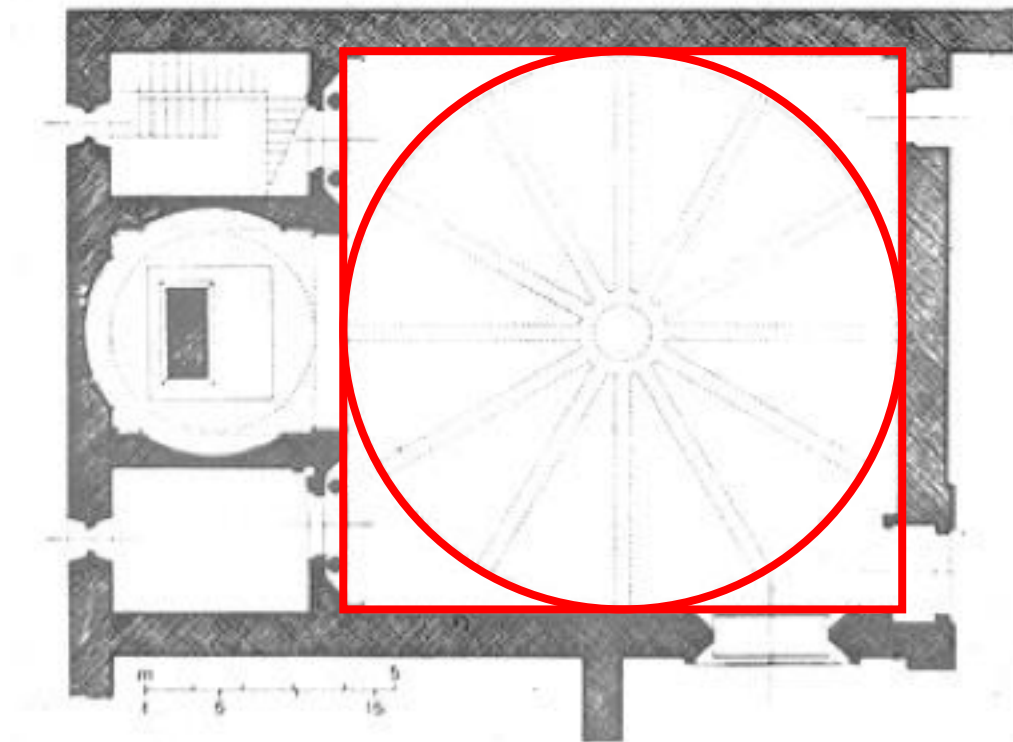


Figure 14 Plan drawing of the Old Sacristy showing the square plan with reflected circular dome

Although no previous three-part vertical spatial organization predates Brunelleschi's design for the Old Sacristy in Florence, he may have used Gothic, Byzantine, and even Early Christian architecture as precedents rather than relying exclusively on Rome as his biographer Manetti suggests. Some historians have noted similarities between the Old Sacristy and the 12<sup>th</sup> century Baptistry of Padua in Padua, Italy (Fig. 15). The Baptistry of Padua has a square base, very similar to the scale of the Old Sacristy, vaulted with a dome resting on pendentives, a design which can be traced back to Byzantine architecture which populated the region of the Veneto where Padua is located with its early medieval buildings. The plan for the baptistery also has a small adjoining domed chapel similar in proportion to the altar in the Old Sacristy. As Howard Saalman points out, however, there is no definitive proof that Brunelleschi

travelled across the Apennines, but that is not to say that a man with such intellectual curiosity would be kept from such “architectural loadstones” as Venice, Padua, and Ravenna.<sup>33</sup> Manetti’s biography of Brunelleschi glorified the successes of his modern Renaissance hero, but did not necessarily recount of every single aspect of his life. The possibility that Manetti was not aware of some Brunelleschi’s travels especially during the architect’s early training years is highly likely. The Baptistery is adorned with beautiful Gothic frescoes dating to the fourteenth century covering every inch of wall surface, but the pictorial program is not what would have fascinated him. Judging by his Old Sacristy design, it was the technical aspect of the space that would have engaged his interest, more precisely the aesthetic of the structural technique and the way the dome is gently resting on the pendentives. Brunelleschi, as noted above, gave equal hierarchy to each third of the Sacristy interior as a way to reconcile the equal importance of the levels of one’s salvational journey from earth to heaven. The Baptistery of Padua, while using very similar vaulting techniques, does not have the same dynamic spatial qualities; the vertical divisions of the space are played down to the point of disappearing so that the dome is the obvious focal point of the space. Hence, the volumetric organization of earlier, non-Florentine medieval buildings was suggestive to Brunelleschi in providing an overall conception of space but not in the unique articulation of that space.

Brunelleschi’s modernity is located in the detailing of the Old Sacristy. Although unnoticed by architectural historians, Brunelleschi’s signature style really comes through in the manner in which he terminates the pendentives. The strong continuous horizontal entablature wraps around the whole space, including the smaller chancel, supports the

points of the pendentives, and transfers the heaviness associated with the dome onto a series of pilasters (Fig. 16). In contrast, the Paduan Baptistery squeezes the point of the pendentives down the corner of the room until eventually terminating or disappearing into the floor. Hence, instead of simply copying how he had seen the architecture before, for instance, in the model of this baptistery, Brunelleschi extrapolated the DNA from this space and grafted it onto his mathematical methods of design. Clearly, he took pride in representing the structure of his designs whether it was the actual structure that supported the building or not. He was always conscious to give those experiencing the space a rational explanation for what was present. He was not interested in making the people guess about what was going on; he was much more interested in creating a unified harmony in the spatial volume of the space.



Figure 15 Baptistery of Padua, Interior



Figure 16 Old Sacristy, Interior

### *Line: the entablature and the pilasters*

The entablature that wraps the entire space, moving in and out of the major and minor spaces, and eventually even connecting the Sacristy to the larger cathedral, is more than just a wide grey line that creates and divides spatial units. Upon close examination of Brunelleschi's work, I find that line plays multiple roles, in this case creating a complete harmony for the chapel. The entablature is a tool he used to solve many problems. Unlike in the Baptistery of Padua, Brunelleschi's square plan was to be perceived as a square which then gave way to the more divine circle dome representing heaven. To do this, he created the appearance of a separation of the lower from the

upper portion while avoiding the rigidity that often presents itself when vertically dividing a space composed of two such distinct geometries. By using a unifying element to envelop the space as a whole Brunelleschi created a clarity that liberated the mind's eye of the occupants to travel the distance from the earthly zone into the heavenly realm. His intention to leave the walls blank without frescoes or distracting ornament is accentuated by the singular prominence of the entablature that provides a sort of frame for the unadorned walls, as if deliberately framing white canvases. In order to enhance



Figure 17, Old Sacristy wall with foliated consoles

the long entablature on the wall opposite of the apse, Trachtenberg observed that Brunelleschi inserted a set of three foliated consoles to create a resolute lift to the element that would otherwise seem to sag from the weight (Fig. 17).<sup>34</sup> But Brunelleschi did not wholly invent a new “technology” here, because consoles can be seen supporting the long expansive cornices on the exterior of many ancient Roman temples but not supporting an interior entablature such as the Maison Carree (16 BC) in



Figure 18 Maison Carree, Nîmes, France, 16 BC

Nîmes, France (Fig. 18). The classical modillion was frequently used in the Corinthian order, which is Brunelleschi's preferred Classical Order, and they resemble the foliated consoles used in the Sacristy. Consoles are not new to this time period, but Brunelleschi used them to reference the Corinthian order and incorporated them in a unique way to suggest the structural weight of the entablature (which had no real heaviness) without strictly copying the Roman precedent.

The strong horizontal entablature is supported by the lines created by six-fluted Corinthian pilasters that strive upward in the vertical direction. Brunelleschi was very particular in the making of these pilasters, as mentioned earlier in the paper in the description of the one full flute on their small sides. The intentionality behind that small detail was one of many in this space in which Brunelleschi consciously linked the weight of the architectural elements he used to their role as lines that unified the space visually. He carefully related the width of the different arches inscribed in the walls directly to the number of flutes on the pilasters that supported them. For example, the arch in grey

pietra serena stone that defines the entrance to the chancel is the widest of the arches in the lunette zone and, therefore, is supported by a full pilaster with six flutes. The semi-circular wall arches that make up the pendentives are smaller in width and join only at the corner to make the width the same as the choir arch but folded in two at a 90-degree angle. As a result, each half is supported by half of a pilaster containing three flutes and these two halves fold neatly into a corner to combine into a whole pilaster (Fig. 19). Another way that Brunelleschi demonstrates the role of well-defined line in

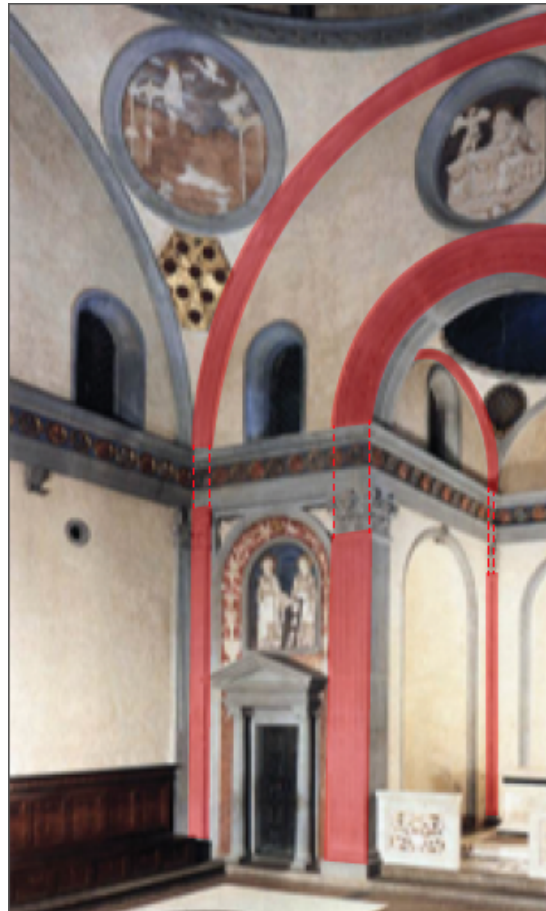


Figure 19 Old Sacristy relationship of arch width to pilaster sizing

articulating his interiors again involves the pilaster fluting. In the corners of Old Sacristy's small chancel, he inserted a small corner of a pilaster only one flute wide to support the equally small wall arches in this altar room (Fig 20). This detail is not

necessary structurally or aesthetically and to some the oddity of it could seem like a mistake, but nothing about Brunelleschi's design was a mistake or unintentional. Everything related to process, to the long mental gestation of the design thinking preceding execution. In terms of precedents, it is hard to say where Brunelleschi could have gotten the idea of the one-flute pilaster. It is a prime example of his fascination with the beauty of structure, but the actual idea seems to have been entirely his own. He implemented his understanding that applied architectural elements like the arches and pilasters have little intrinsic value unless they can be at least perceived as performing the structural actions. In this sense, in spite of the Classical forms, Brunelleschi's use of continuous line follows the dictates of Gothic architecture in which continuous colonnettes attached to piers lead the eye from the floor high up to the ribs of vaulted ceilings overhead.



Figure 20 Old Sacristy, Pilaster detail in the Altar room

## Color

Brunelleschi's color palette is an easily recognizable characteristic presented in nearly all of his interiors regardless of their architectural program. He used a combination of white and grey *pietra serena* stone to enforce and enhance the underlying principles in his designs. In the Old Sacristy, the contrasting grey stone used in the pilasters, entablature, and arches highlights and adds emphasis to his system of virtual structural represented by membering (rather than letting the structure of the load-bearing walls stand alone). The white washing of the remaining surface was not intended to be a canvas for colorful frescoes. In a way, as mentioned before, the structural elements are framing this blank canvas to evoke a calm rational to the viewer just as the blank white surface is reciprocally accentuating the detail of the grey members. This minimalist palette, compared to the previous Gothic color scheme of vivid stained glass or frescoes and exhibited real but decorated structural members, was to become the new aesthetic style for Florence in the 15<sup>th</sup>-century and the seed of early Renaissance architectural design throughout much of the Italian peninsula.

To my knowledge, no scholar wondered if Brunelleschi had used or manipulated a precedent for his bi-chromatic schemas. The lack of any unnecessary decoration may have been a reference to early the Christian basilicas such as Santa Sabina in Rome (432 AD) that Brunelleschi thought embodied a purer design by virtue of their lack of ornamentation and simple color schemes (Fig. 21). But even the carefully restored basilica of Santa Sabina may have had frescoes above the nave colonnade by the 15<sup>th</sup> century, when Brunelleschi may have seen it. The church is more modest in scale than the once profusely frescoed interiors of Rome's great early Christian basilicas like St.

Peter's the Vatican and St. Paul's Outside the Walls, but it is impossible to say for certain whether or not its clerestory zone was originally left unpainted. Stark contrasting



Figure 21 Santa Sabina, Rome, Italy, 432 AD

colors were something Brunelleschi was exposed to very early on in his career in Florence's Romanesque Baptistery of San Giovanni (1056-1128), a building which would be associated with the future church of San Lorenzo church in Florence (see below), to which the Old Sacristy was attached. In the Renaissance, Florentines revered the Baptistery as their city's most treasured antiquity, Roman in origin, even if "renovated" in the 11<sup>th</sup> century (none of which is true). The building has a color scheme in the façade as well as on the interior of the space that is similar to the Old Sacristy, but where Brunelleschi used the two colors to articulate virtual structure, the baptistery boasts white, green, and red marble on the exterior to create a unique mosaic of decorative patterns (Fig. 22). Both buildings undeniably share an appreciate of sharp color contrasts, but, in good fashion, Brunelleschi found a way to reinterpret this

precedent without directly copying it by adapting the idea to suit his modern eye's need to give expression to structural relationships that were not actually there.



Figure 22 Baptistery of San Giovanni, Florence, Italy, 1056-1128

### *The Corinthian order*

Brunelleschi's early designs, as represented by the Old Sacristy, were a unique compilation of his ideal classical order, the Corinthian order, and the linear expression of Gothic structure, but what caused him to be so disciplined in his use of the Corinthian order is an issue that few historians have explored. Howard Saalman notes in his study of the Old Sacristy that all the Corinthian capitals on the pilasters are identical.<sup>35</sup>

Saalman's quiet discovery raises the question of whether Brunelleschi saw a particular capital in his travels which struck him as particularly perfect in representing the classical world or if it was Brunelleschi's intense attention to detail that led him to study many

Corinthian capitals. He may have wanted to create his own modern design worthy of the perfection he deemed necessary for this new era of architecture, one purified of Gothic “excess” (even as it embraced aspects of the clear expression of Gothic structure). According to my studies on the forward-thinking Quattrocento architect, the second of these options is more likely. Just as he had adapted the pilaster to work for him, instead of letting the pilaster dictate his design, he could have easily created a variation on the “idea” of the Corinthian order.

Brunelleschi’s fascination with the Corinthian order has also been studied by architectural historian Gabriele Aroni in his study of the architect’s work on the Basilica of San Lorenzo in Florence from 1420 to 1490.<sup>36</sup> Aroni analyzes Brunelleschi’s use of the Corinthian order compared to the Vitruvian ideal of the order. Although I am still not convinced Brunelleschi had access to Vitruvius’ *Ten Books on Architecture*, Aroni argues that Brunelleschi created a hybrid of the traditional Vitruvian Corinthian order and the Romanesque interpretation of it used 100 yards away in the Baptistery of San Giovanni. But I would argue that because Brunelleschi was using the Classical order on interiors rather than exteriors, he had to adapt the proportional relationship of the capital to the entablature. Traditionally, the Corinthian order gives equal importance each of the elements comprising the entablature (cornice, frieze, and architrave). In the Old Sacristy, however, this dimensional relationship is skewed. Brunelleschi shortened the height of the cornice letting the frieze and architrave dominate the overall composition (Fig. 23). Similarly, the idea of reduced proportions of parts in the Corinthian entablature is present on the interior of the Baptistery of San Giovanni, demonstrating that he used

local architecture that “still had some reflections of the splendor of ancient Roman architecture,” as inspiration.<sup>37</sup>



CORINTHIAN CAPITAL ACCORDING TO  
VITRUVIUS, AS ILLUSTRATED IN THE  
CARLO AMATI EDITION  
(1830)



CORINTHIAN CAPITAL OF THE LESENES  
IN THE OLD SACRISTY OF THE  
BASILICA OF SAN LORENZO  
(CIRCA 1425)

Figure 23 Corinthian capital according to Vitruvian model and Corinthian capital in the Old Sacristy

As for the capital of Brunelleschi's Corinthian order, he would not have needed to read Vitruvius' writings to be exposed to an ideal Corinthian order from which to derive his own version of the capital. Comparing the images of Corinthian capitals based on Vitruvius' writings to those of the Pantheon in Rome (126 AD), it seems clear that Brunelleschi looked at buildings of greater antiquity than the Baptistery and that he quite likely used this ancient building as the basis for his own design. The Pantheon's capitals are made up of all the essential elements needed to formulate a Corinthian capital: three rows of acanthus leaves, an abacus blossom, eight helices, and an inner bell (Fig. 24). Aroni produced a series of drawings that very clearly point out this difference between the Corinthian capitals advocated in Vitruvius' books (and so those of the

Pantheon as well) and Brunelleschi's interpretation of them. Brunelleschi reduced the three rows of leaves down to two and abstracted the foliage in these rows to be less



Figure 24 Corinthian capital from the Pantheon

recognizable as acanthus leaves and more identifiable as oak leaves – commonly used in local late-medieval Florentine capitals. He also used full protruding volutes instead of simpler helices, giving the capital more importance in the overall composition of entablature – capital – pilaster. If the Pantheon's capitals supplied the exemplar that Brunelleschi referred to when adapting the order to fit his new design style, then it is understandable how he was able to arrive at such uncanny correspondences to Vitruvius' idealized Corinthian order without ever reading his work. It also furnishes more proof that his trip to Rome, and specifically to the Pantheon, was one of the most influential moments in his career.

## **The Santa Maria degli Angeli Formal Analysis**

If the Old Sacristy perfectly captures the essence of Brunelleschi's signature style at a very early moment by accurately displaying his close attention to detail and unique approach to incorporating structure into the design, a building from later in his career will demonstrate how Brunelleschi adapted his use and understanding of precedent after years of experience and thought on the poetics of architectural design. This section of the chapter considers a lesser known building, Santa Maria degli Angeli, an oratory begun in 1434, which at first glance seems to contradict everything I have established so far. Upon further analysis, however, it will become clear how Brunelleschi, as his career and life progressed, altered the way he used and viewed precedent, demonstrating that modernity required precedents that were not fixed objects but flexible "ideas" that drove innovation.

Fourteen years after Brunelleschi built the Old Sacristy, Matteo and Andrea Scolari (the heirs of condottiere Filippo Scolari) commissioned Santa Maria degli Angeli as an oratory for the Calmadolese monastery in Florence.<sup>38</sup> Brunelleschi's original design for the building was a domed octagonal structure with eight chapels radiating about a central space where the main altar probably stood. According to the external view provided in the Codice Rustichi (1450) the Oratory was situated in one corner of the monastery's walls, where one door gave access to the public while the another entrance opened on the side within the conventional enclosure for the monks (Fig. 25). Brunelleschi's original design was never fully completed, which caused it to fall to partial ruin. A wood roof was built over the partially erected walls in 1503 and the monastery was suppressed in 1786.<sup>39</sup> The property changed hands several times until the Italian

veterans' administration, the Associazione Nazionale Mutilati e Invalidi di Guerra, purchased it in 1932 and had architect Rodolfo Sabatini complete the rotunda in 1937.<sup>40</sup> But Sabatini altered the Brunelleschian fabric in places so that the building as it exists today stirs much controversy in the architectural history community. Historians and architects in the Renaissance, and up to the present day, have produced numerous hypothetical reconstructions of Brunelleschi's intended design. Some of these inspired Giuseppe Marchini's 1936 landmark monograph on the Angeli Oratory, which refocused modern attention on the edifice.<sup>41</sup>



Figure 25 Santa Maria degli Angeli as shown in Codice Rustichi

Although the design and construction of Santa Maria degli Angeli got off to a quick start, Brunelleschi did not live to see it completed, because the construction was halted in 1437 due to a lack of funding.<sup>42</sup> When Brunelleschi died in 1446, the foundations and walls were built at a height of 11.33 *braccia* (6.60m).<sup>43</sup> So, the floor plan is known, as are the interior and exterior elevations at least up to the completed height. The design of upper part of the elevations, as well as the dome, have become a

subject of considerable debate. Fortunately, a few drawings by near contemporaries survive to provide at least a partial understanding of the intended design. Being one of his last known designs, the drawings present or suggest many elements which had not appeared in his previous works, such as a new complexity in the vaulting in the chapels. In spite of the fact that only 6.60 meters of the building were completed in his lifetime, the design is a useful example to historians and designers who seek to understand not only how Brunelleschi employed architectural precedents but how his use of them transformed over time. Moreover, an examination of the formal qualities of Santa Maria degli Angeli leads to the discovery of new precedents Brunelleschi may have used and how the familiar ones he had been using took on new meaning as they influenced his later work.

### *Reconstructing the intended design*

The surviving walls of the 1430s and the drawings by near contemporaries supply the evidence for modern reconstructions of Santa Maria degli Angeli. Howard Saalman provides a detailed account of three key drawings: an interior sketch of the Oratory (Laurenziana Cod. Ashburnam 1828 fol. 85) (Fig. 26), a drawing of the plan and a projected elevation of ca. 1492-94 by Giuliano da Sangallo (Vat. 4424 fol. 15) (Fig. 27), and an anonymous annotated plan of the Oratory (Uffizi 7982A) (Fig. 28).<sup>44</sup> In spite of the survival of these three drawings, reconstituting Brunelleschi's interior elevation has been particularly vexing.



Figure 26 Santa Maria degli Angeli, Sketch of interior from Medicea collection

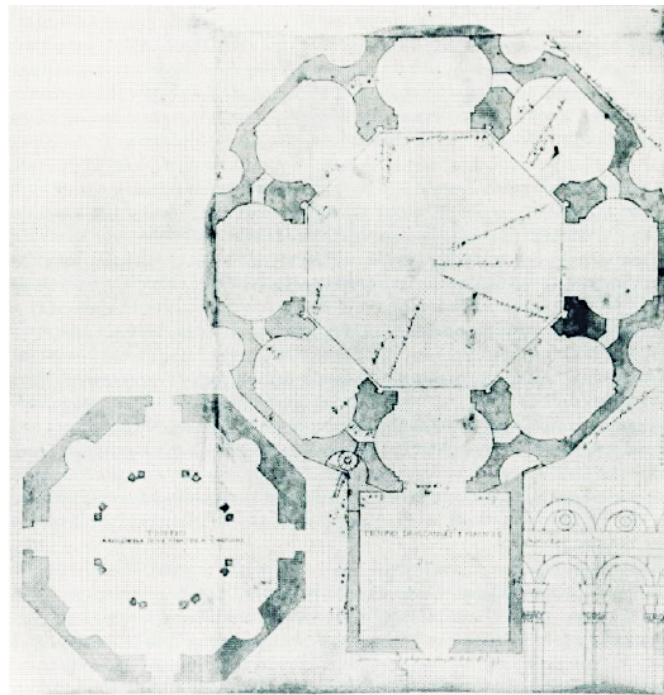


Figure 27 Giuliano da Sangallo, Plan of Oratory

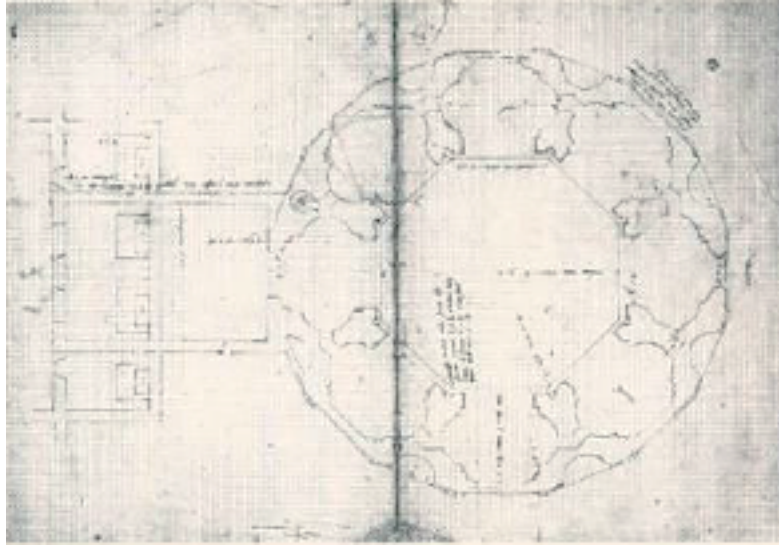


Figure 28 Anonymous, Plan of Oratory

Inspired by Marchini's 1936 publication, Arnaldo Bruschi, Miarelli Mariani and many other historians produced a series of scholarly contributions that refocused attention on the Angeli Oratory in 1936, which Marchini then combined with his own interior elevational studies to create a summary of interior elevation studies (Fig. 29).<sup>45</sup> Each elevation proposes a different interpretation of Brunelleschi's intended design. For the purposes of this paper I will choose the elevation that most closely relates to the

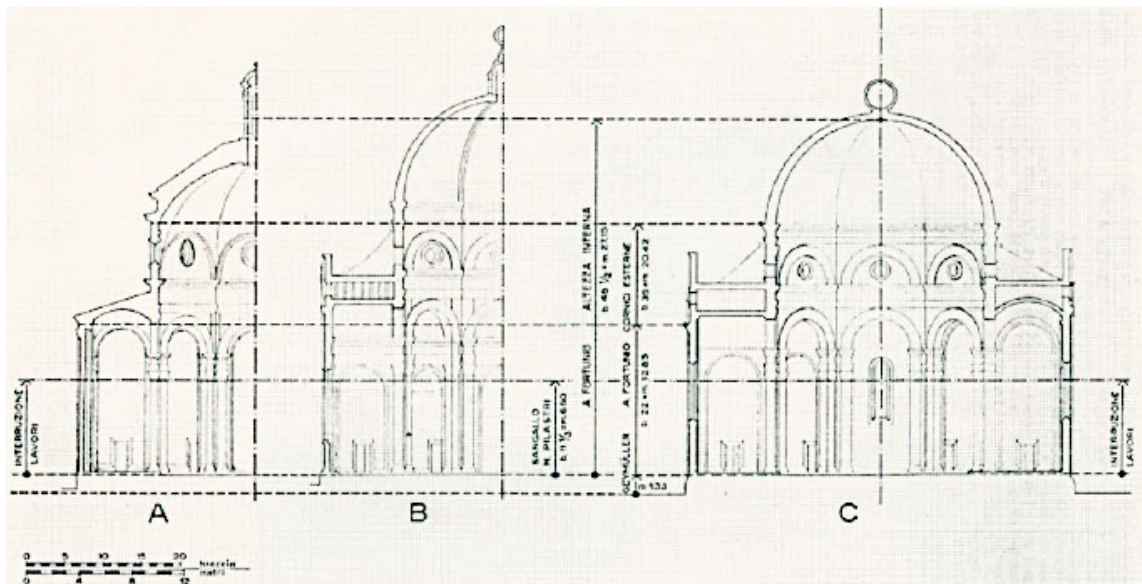


Figure 29 Marchini's summary of Santa Maria degli Angeli interior elevation

interior sketch from the Medicea collections (Fig. 26) and the elevation provided on the Sangallo plan (Fig. 27), because they are the oldest indications of Brunelleschi's ideas. The sketch gives a clear idea that each radiating chapel would have been capped with a barrel vault with axis parallel or perpendicular to the main space of the Oratory. Of Marchini's three possible reconstructions shown in Figure 29, Elevation "A" (Fig. 30) suggests that Brunelleschi intended for the chapels to have individual domes instead of barrel vaults, which would follow suit to Brunelleschi's previous designs, like that in the

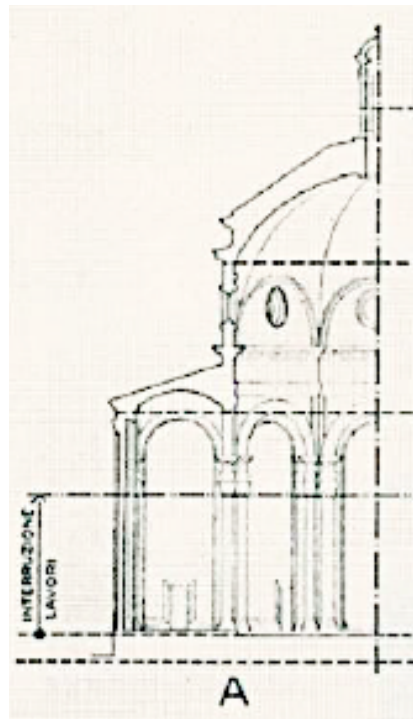


Figure 30 Santa Maria degli Angeli interior elevation "A"

chancel of the Old Sacristy. But the interior sketch contradicts this reconstruction, so the elevation labeled "A" in Marchini's summary will not be the focus of this paper.

Hypothetical reconstruction "B" has Brunelleschi letting the entablature be a continuous wrapping element throughout the building (another stylistic element present in his Old Sacristy) (Fig. 31). But, because "B" shows an entablature atop the pilasters supporting the arches of the chapels and continuing to wrap inside the chapels, a condition which

is clearly lacking in the interior sketch as well as in the two-bay elevation on the Sangallo plan, I will not use it as the basis for analysis in this chapter either. I have found that the

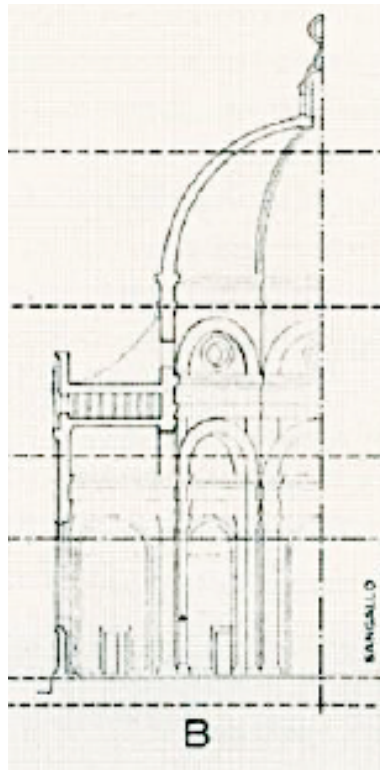


Figure 31 Santa Maria degli Angeli interior elevation “B”

illustration labeled “C” to be most faithful to the oldest surviving drawings of the Oratory, so it will furnish the basis on which I will conduct my formal analysis (Fig. 32). It very closely relates not only to the Medicea sketch and the Sangallo plan, but to the interior elevation as well. From this point forward any mention made to the elevation refer to image “C” from Marchini’s elevation summary.

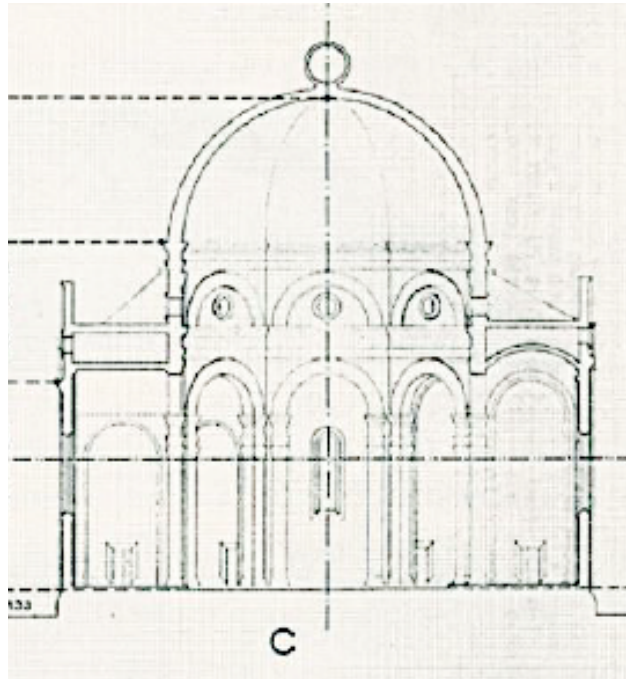


Figure 32 Santa Maria degli Angeli interior elevation "C"

### *Volumetric qualities*

The first thing to recognize about Santa Maria degli Angeli is the stark contrast between the planar aspects of Brunelleschi's early designs and the frank three-dimensional sense of a spatial volume in the Oratory. The space it encloses appears to be palpable, capable of pushing and pulling against malleable but solid walls. In the Old Sacristy, Brunelleschi emphasized the flatness of the walls and architectural elements to give viewers a sense of structural underpinnings and the classical language of the membering that articulated the interlocking geometries. A comparison of the plans of these two buildings shows that by the end of his life, he gravitated toward a design strategy that involved much more than strict proportions and an aesthetics of virtualized structure (e.g., the pilasters which represent a trabeated structural skeleton). Historians

often describe this building as sculpted and conceived of as volumes and mass. They presume that he studied the remains of imperial buildings in Rome such as the so-called Temple of Minerva Medica, now thought to have been a garden pavilion or nymphaeum (Fig. 33).

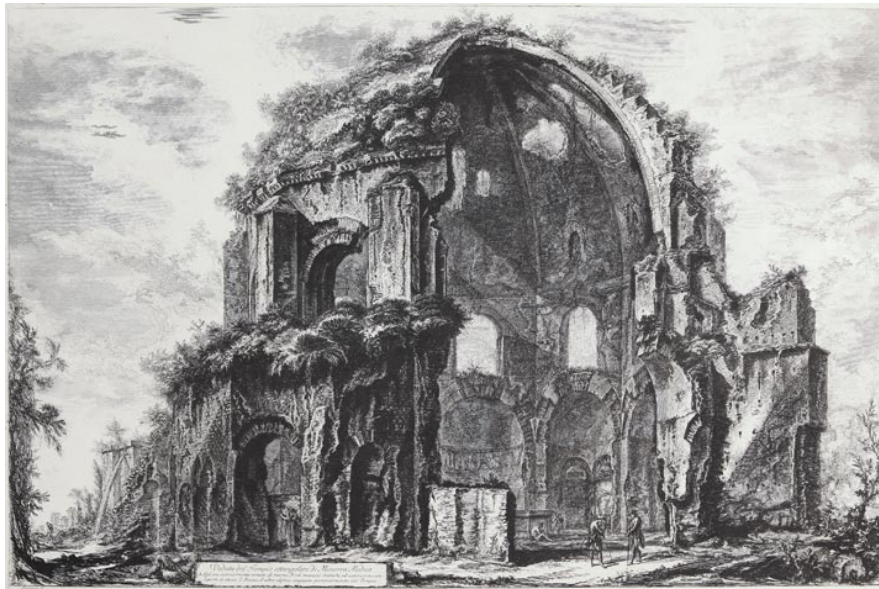


Figure 33 Temple of Minerva Medica, 4<sup>th</sup> cen. CE, Piranesi drawing of 1756

Brunelleschi may well have seen this edifice when he was in Rome, but a study of Santa Maria degli Angeli in close relationship to his earlier buildings and their precedents points to more complex conditions. The Oratory's radiating chapels, their barrel vaults included, read as if they were cut from a pre-existing mass, subtractively, leaving just the residual spaces in their wake. The space of the chapels seems to push into the building's mass as opposed to being assembled by walls at right angles. If it is true that no entablature wrapped along the interior of the chapels, then the blank walls inside enhanced the subtractive method Brunelleschi was exploring. The "missing" entablature along the chapel walls shows him deploying his precedents to create modern contrasts between expectations and reality.

Both the Old Sacristy and the Oratory were originally designed as stand-alone buildings connected to larger complexes, but the Oratory's plan shows that Brunelleschi was now paying attention not only to how the interior design would be articulated but the exterior as well. In the Oratory, he includes niches carved from the exterior wall, removing mass to create a deeply pocked wall (Fig. 34). For the Old Sacristy, he paid little attention to how the exterior would have been experienced; it lacks a door to the

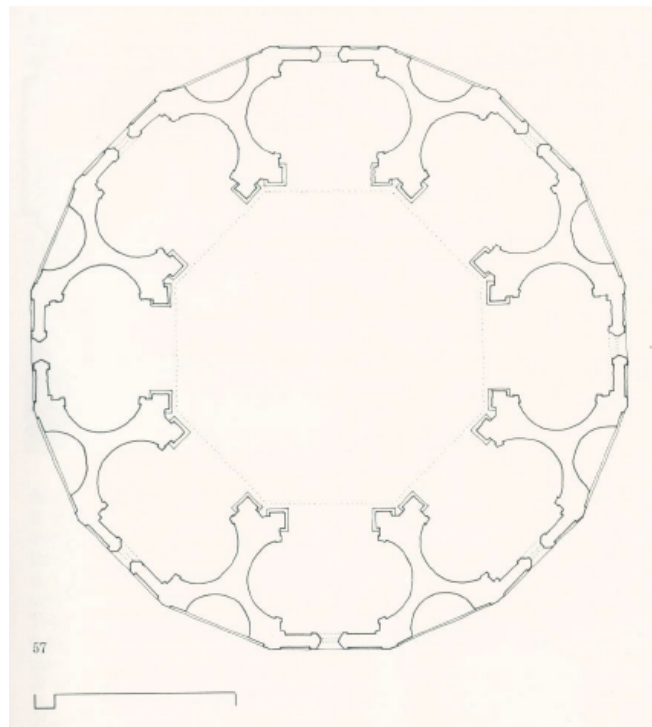


Figure 34 Santa Maria degli Angeli, Plan depicting inner and outer sculptural qualities outside entirely. Its exterior was assembled to delineate the boundaries of the interior architecture and nothing more, resulting in an uncalculated aesthetic on the outer shell. The Oratory, however, not only has a public exterior, it goes so far as to suggest an intimate relationship between the exterior and interior design.

All of the architectural elements that Brunelleschi regularly included in his earlier designs (e.g., pilasters, wall, and niche) are combined in ways to accentuate Santa Maria degli Angeli's new three-dimensionality. Its novel three-footed solid pier, for

instance, is a carved out triangle in plan, which, again, forms the interior space and defines the exterior shape (Fig. 35). This new pier form is primarily responsible for the sculptural qualities of the Oratory, perhaps more so than any particular Roman model



Figure 35 Santa Maria degli Angeli, Diagram of three-footed solid pier

yet proposed as a precedent. A close look at the chancel in the Old Sacristy already foreshadows this conception of design as a process of sculpting a solid (Fig. 36).

According to Trachtenberg's analysis, Brunelleschi superimposed a circle on the square plan of the chancel using the diagonal of the square as the diameter of the circle rather

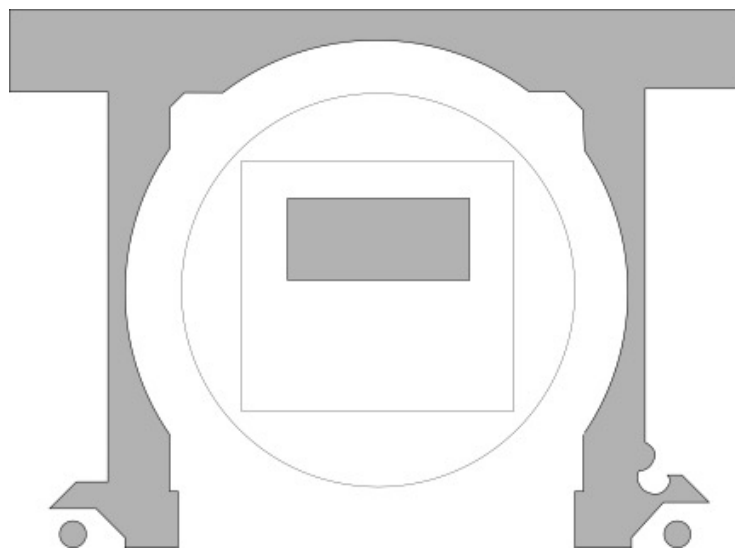


Figure 36 Old Sacristy, Chancel

than the side of the square (Fig. 37). In this manner, the circle exceeded the sides of the square in four segmental arcs which provided the exact depth of shallow niches which Brunelleschi then “carved out” of the chancel side walls. This method is precisely that used for creating pendentive or sail vaults, a type used extensively in Brunelleschi’s linear designs like the Loggia degli Innocent or the aisles of church of Santo Spirito (begun in 1436). The hollows of these niches in the Old Sacristy’s chancel are slight to the point of being easy to overlook, especially when compared to the Oratory’s plan. Hence, whereas the Old Sacristy’s walls (excluding the hollowed walls in its chancel) read as non-structural infill between “structural” pilasters, the walls in the Oratory form the building’s essential structural components.

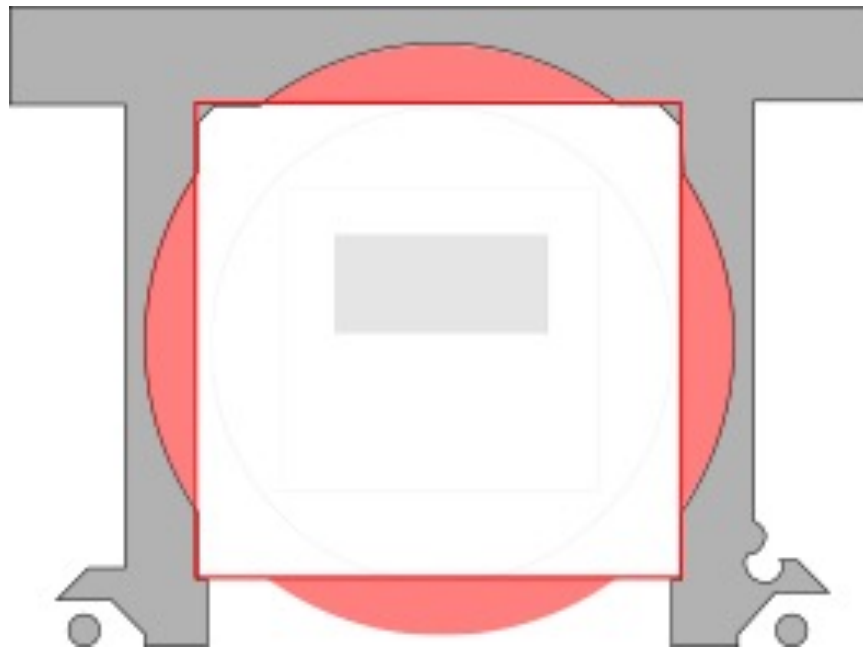


Figure 37 Diagram showing “carving” of the Old Sacristy’s chancel side walls

In geometrical terms, however, Brunelleschi remained faithful to his older methods. In plan, each radiating chapel space is a square with two half circles flanking its opposite sides, the carved circle with a diameter of 3.95 braccia and the square having a width of 4.80 braccia (Fig. 38).<sup>46</sup> These basic geometries show that while Brunelleschi was experimenting with a more monolithically conceived, molded mass as a form-giver, he had not entirely abandoned the square-based proportional system he had used his entire life. But, here in Santa Maria degli Angeli, he created a harmonic

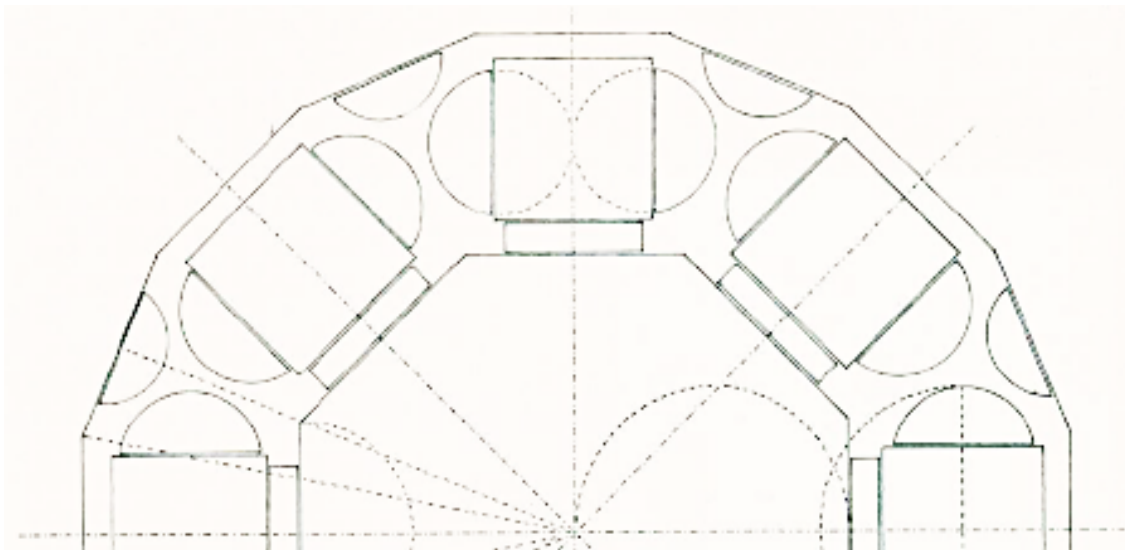


Figure 38 Santa Maria degli Angeli radiating chapels' underlying geometries

relationship of voids as opposed to a relationship between decorative elements of a structural frame assembled to create a whole. The Oratory plan is therefore a marriage between space, structure, and the definition of volume. Santa Maria degli Angeli may have been inspired by imperial Roman precedents, but the debt it owed to Brunelleschi's geometry and his willingness to drop some of his relentless grey membering fashioned a modernity that surpassed antique models.<sup>47</sup>

## *Line*

Although many of the original intended decorative elements for the Oratory were lost or never built, traces survive which permit an analysis of the changes in Brunelleschi's later work. The current reconstruction of Santa Maria degli Angeli dating to 1973 butchers Brunelleschi's design ideas (at least based on what the surviving drawings depict), so to study the building in its current state would be of little help in this analysis. An interior detail of Santa Maria degli Angeli in its pre-restoration condition in a photograph of 1934 shows the building to be in a total state of deterioration (Fig. 39). Nevertheless, the detail, though limited in content and done in black and white, gives some clue to the original intention behind Brunelleschi's use of line to articulate the interior through the use of grey pilasters and moldings.



Figure 39 Photograph of Santa Maria degli Angeli in its pre-restoration condition, 1934

Brunelleschi's acute attention to the pilasters' fluting in the Old Sacristy was not disregarded in Santa Maria degli Angeli. A close look at the Sangallo plan shows that, as done in the Old Sacristy, Brunelleschi is giving the pilasters here one full flute on the sides. Where the Oratory differs from the Old Sacristy, though, is in the rotation of the pilasters away from the strict 90-degree axis to which he had limited himself in his earlier buildings. But the plans of older buildings were based on a square rather than an octagon. In Santa Maria degli Angeli, each of the eight chapels on the octagonal plan is framed by two pilasters, neither of which can stand at a 90-degree angle to each other. Had Brunelleschi used a single pilaster to do double-duty in framing two adjacent chapels, as he did at the juncture of the Old Sacristy's main room and chancel, the result would have been an oddly-angled, trapezoidal, pilastered pier. Instead, each chapel got its own set of canonically squared pilasters to frame the entry (Fig. 40). The full-flute detail here enhanced the understanding that, while the overall composition read as a carved mass with flowing spaces, his design once again preserved the integrity of correct classical elements throughout the building. Even though evidence is limited, this



Figure 40 Pilasters as they are designed (left); Hypothetical use of a single pilaster to frame adjacent chapels (right)

analysis demonstrates that the way he used the grey pietra serena membering in the Old Sacristy remained essential to his conceptions of architecture despite the influence of new precedents, which, admittedly, probably did not preserve their original interior cladding, decorative pilasters, or columns into the fifteenth century.

While his design of the Oratory's pilasters was consistent with his practice in the Old Sacristy, Brunelleschi's use of other moldings in conjunction with the pilasters was novel. In Santa Maria degli Angeli, he decided not to wrap the entablature around the inside of the radiating chapels as he had done in the chancel of the Old Sacristy, as mentioned above. Several reasons may have contributed to his decision to omit this horizontal feature. Certainly, to have an entablature would follow classical "rules," but he had already omitted it in some of his previous buildings such as the church of Santo Spirito (1428). He would have had to curve the entablature into the chapel's niches in order for it to be continuous, and he did not use an entablature inside the similarly curved chapels in S. Spirito (Fig. 41). But lack of any columns—engaged or free-standing—in

Santa Maria degli Angeli created major problems for Brunelleschi's membering rules. In S. Spirito, columns and half-columns carry a full entablature, consisting of an impost block (a stand-in for the architrave), frieze, and cornice, both in the nave and aisles (Fig. 42). The openings of the side chapels onto the aisles are articulated by a continuous molding standing adjacent to, but not bonded with, the half-columns; hence, the side chapels are conceived to appear structurally independent of the columnar system. But in Santa Maria degli Angeli Brunelleschi seems to have interlocked the chapel moldings with the pilasters (not half columns in this case), so that the chapels and the octagonal center are conceived as interdependent spaces.



Figure 41 Santo Spirito, curved chapels in the aisles



Figure 42 Santo Spirito column with a full entablature

While the design of Santa Maria degli Angeli is similar to S. Spirito's solution for chapels opening onto larger spaces, Brunelleschi's decision to use pilasters combined with sculpted walls in the former (instead of columns on a grid plan) rendered the precedents in his own oeuvre somewhat obsolete. Instead, for the first time, he might have taken the idea of the impost block from his columnar system (S. Spirito) and flattened it so that it could work with the pilasters. His new system of articulation with pilasters allowed him to reconcile the two semi-circular niches each chapel had with the main octagonal nave. In this way, Brunelleschi no longer used the pilaster to hold up a continuous entablature, as he did in the more canonically classical Old Sacristy but rather he deployed it to support the arches framing the chapels. In other instances, he would have simply used a column, but because this space was designed to be read as a carved mass, bolder forms (half-columns) that referenced free-standing columns would have detracted from the overall composition of the mural-based design he pursued in the oratory. Hence, Brunelleschi used his own previous designs as a precedent to articulate a pseudo-structural skeleton in grey *pietra serena*, adapting them to fit more smoothly the aesthetic of a building inspired by complex imperial Roman forerunners.

#### *Roman paradigms for Brunelleschi's late work*

Brunelleschi's clear difference in style between his early and late work calls for a consideration of what new precedents—or combination of familiar exemplars—he would have been using later in his career. His first trip to Rome (if there indeed was a trip to Rome) took place in or around 1407, a point which predates his first architectural

commission. Some historians, however, speculate that the architect visited Rome a second time in 1430, less than five years before the commission of the Oratory. Peter Gärtner is among these, and he argues that had Brunelleschi's design come to fruition it would have had "unmistakable Roman characteristics."<sup>48</sup> Of course, these Roman characteristics are precisely the massive, solid wall construction, the double-pilaster (as opposed to his signature single pilaster carefully folded around the corner), and the spaces conceived as interacting with mass. Gärtner and other historians such as Saalman and Furnari have specific Roman precedents in mind from the Pantheon to the Temple of Minerva Medica. The Pantheon offers a model for the particular form of the pilasters inside the building and for the intended dome, while the ruined decagonal structure of the temple presents a complex interplay of deep chapels opening off of a circular, domed interior. When Brunelleschi shifted his attention from the acute details of the individual elements to the conception of the space as a whole, as he did in Santa Maria degli Angeli, he also shifted his attention from precedents that focused on the assembly of elements to those that read more sculptural.

The Pantheon's influence makes little appearance in the projected spatial form of design of Santa Maria degli Angeli because, while there was opportunity for Brunelleschi to study the niches in the circular space, the Pantheon read too much as a neat assemblage of parts. The Temple of Minerva Medica, as noted above, shows many more similarities to the plan of Brunelleschi's Oratory in that its deep, recessed niches radiate around a centrally planned domed space (Fig. 43). On his first trip to Rome, as discussed above, he seems to have viewed the architecture of Rome through

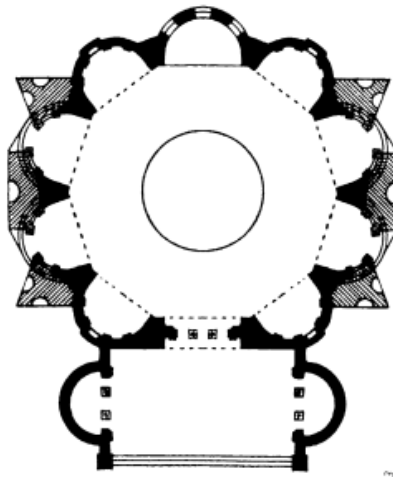


Figure 43 Temple of Minerva Medica, plan

a lens that directed his focus to the structural elements used to make space. The idea of sculpted qualities of architectural form had obviously been present in his mind throughout much of his life—as seen in the shallow niches in the Old Sacristy and the series of semi-circular family chapels surrounding the entire church of Santo Spirito (Fig. 44)—but it is not until the design for Santa Maria degli Angeli that Brunelleschi saw the space as a void rather than space built from masses. The contrast raises the question of what was different about this second trip to Rome or his second mental look at Roman buildings in his memory.

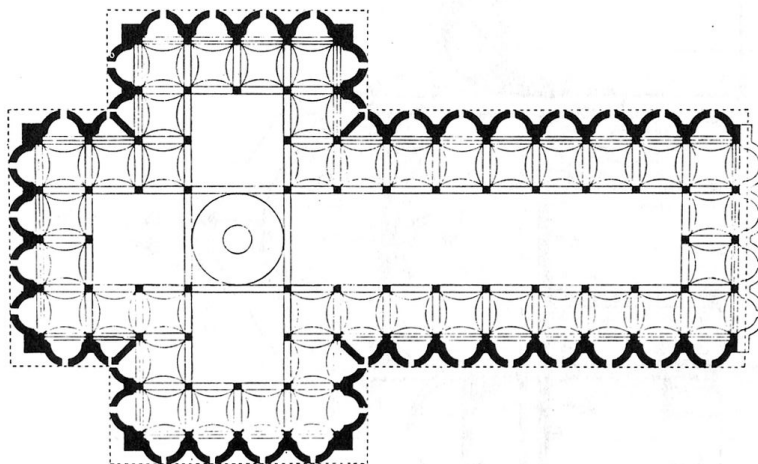


Figure 44 Santo Spirito, plan

The buildings of the city of Rome proper would not have been the only antiquities Brunelleschi might have known. Although overlooked by other historians, structures in Hadrian's Villa (completed ca. AD 138) offer compact examples of greater spatial complexity than found in the capital itself. One that may have informed his decisions on the volumetric qualities of the space is the entrance pavilion to the Piazza d'Oro in Hadrian's Villa (Fig. 45). This pavilion has an octagonal layout of eight large-scale niches radiating about a centralized plan covered by a dome much like Santa Maria degli Angeli. Moreover, the dome is supported by a secondary set of arches above the arches of the main space. This gives the effect of a masonry cloth somehow elegantly draped over an invisible set of ribs that is then tacked down at the points of intersections in the arches. Indeed, Brunelleschi would have had to use a new method when

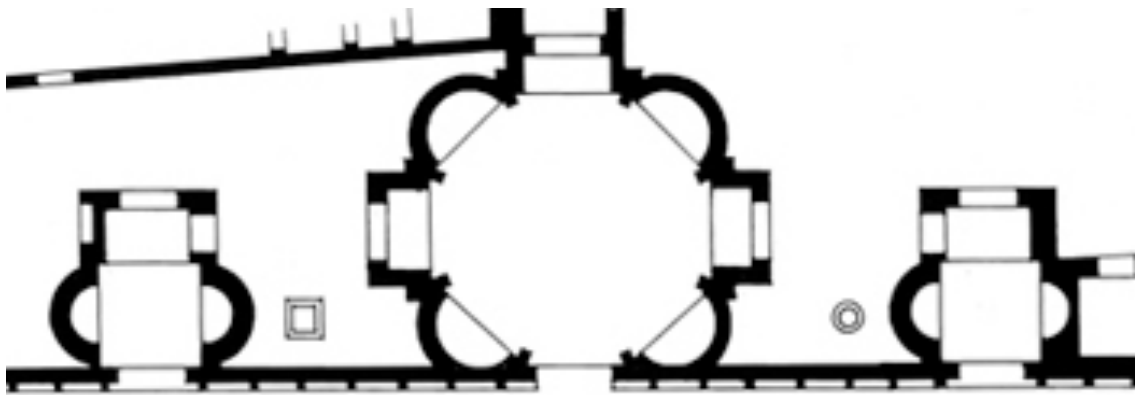


Figure 45 Hadrian's Villa, Piazza d'Oro entry pavilion

designing the drum of the octagonal Santa Maria degli Angeli compared to his previous buildings based on square plans. Possible reconstructions of this drum recall the impression of superimposed vaulting seen in the entrance pavilion at Hadrian's Villa, even if none of them consider the villa as a possible precedent. The design depicted in the interior sketch (Fig. 26) and elevation "C" (Fig. 32) both reconstruct a secondary set

of arches atop the primary arches framing the chapels below. The use of doubled arches would have avoided having pilasters in the drum, which, in Brunelleschi's more traditional way of thinking, might have been seen as necessary to support a secondary entablature separating the dome from the drum. Even if the drum of the Oratory was quite novel, the Old Sacristy still holds some early signs of its future inception. If the Old Sacristy were based on an octagonal plan rather than a square, it would have had eight pendentives much like the design of the entrance pavilion. The pendentives used in the Old Sacristy, if applied in the octagonal space of Santa Maria degli Angeli, would produce a dome very similar in style to the one in the entry pavilion. Although out of proportion in terms of height, elevation "A" gives a hint of the way this marriage between the Old Sacristy and the entry pavilion could have created the novel interior of Santa Maria degli Angeli. Hence, based on his previous designs in addition to the use of Hadrian's Villa as a precedent (perhaps already in the back of his mind in his earlier works), Brunelleschi would have given the upper part of this design a much different character than two of the hypothetical reconstructions suggest.

The entry pavilion in Piazza d'Oro at Hadrian's Villa was also an important precedent in Brunelleschi's design of Santa Maria degli Angeli in terms of its exterior and plan. From the outside, the massing of the imperial pavilion is a direct representation of the space on the interior; the walls of building have a rather uniform thickness throughout which allows the underlying geometries to surface (Fig. 46). Brunelleschi clearly did not overlook these geometries; the similarities to his own design are proof of this. While the entry pavilion's radiating niches alternate from a rectangle to



Figure 46 Hadrian's Villa, Piazza d'Oro entry pavilion, view of interior and exterior massing

a half circle as they rotate around the octagonal center (unlike Santa Maria degli Angeli's chapels), on either side of the pavilion are two small supporting spaces composed geometrically of a square flanked with two semi-circles (Fig. 47). The plan of these two units is very close indeed to the plan of the radiating chapels in Brunelleschi's design. Brunelleschi's square-based chapels could thus be seen as a borrowing from the two side recesses of the entry pavilion combined with the pavilion's rotation around an octagonal base (Fig. 48). He then went a step further than his ancient models by including carved niches on the exterior of the building as well as the interior. These niches are not at ground level but rather begin at a height of around eighteen feet. This step took the design from a uniformly thick wall responding to geometries in plan (as seen in the entry pavilion as well as his own church design of S. Spirito) to recesses deeply carved above eye-level into the expected smooth extrusion from the plan. The innovative sculptural result was the three-footed structural piers, hollowed out on the interior and exterior to create the unique space of Santa Maria degli Angeli.

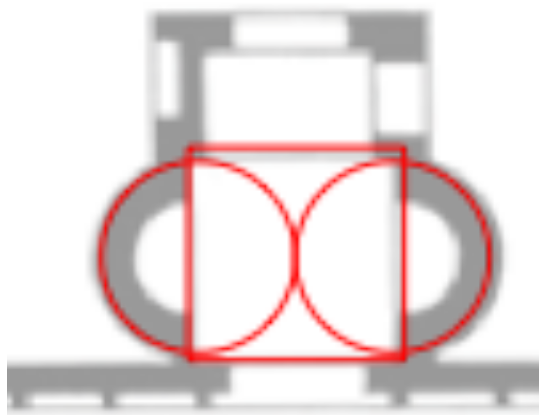


Figure 47 Plan of the side rooms flanking the Hadrian's Villa Entry Pavilion

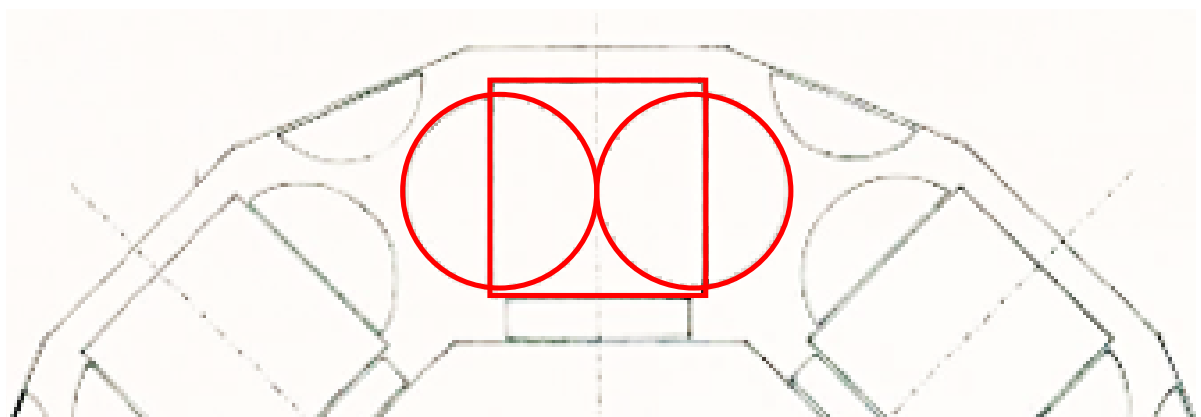


Figure 48 Geometry of chapels in Santa Maria degli Angeli compared to the side rooms of the Entry Pavilion

If Brunelleschi studied ancient imperial structures as carved masses, as I am convinced he did, he found a way to apply his structural rational, i.e., the grey pietra serena membering, used in all of his previous designs. As in the Old Sacristy, for instance, when he used the precedent of classical orders and planarity to enhance the overall structural clarity, in his later work he again used an observed ancient method of design—the intense plasticity of imperial architecture—to intensify the structural effect in Santa Maria degli Angeli. The combination of working with geometric shapes produced a building not only easily at home in Brunelleschi's oeuvre but also infused with the

imperial Roman architectural qualities architects of the high Renaissance would admire and build upon.

These formal analyses of the Old Sacristy and Santa Maria degli Angeli allow us to begin to understand how one successful architect came to understand and utilize precedents. Brunelleschi's contemporaries could not capture the same effect that the structural membering had in his buildings because they did not value precedent in the way that he did. Other, lesser-known, quattrocento architects used precedent similarly to the way 21<sup>st</sup> century designers do now. They applied Classical architectural elements in a purely decorative manner without any further implications behind the structural applique. This, in consequence, led to many buildings that have been forgotten or deemed as a copy of what Brunelleschi so successfully mastered in his buildings. In order to achieve the success that he did, Brunelleschi experienced precedent research as a lifelong endeavor that was always changing and adapting according to the surroundings and a modern desire for formal experimentation.

### Chapter 3: Le Corbusier: The Precedents Behind a Paradigm Shift in Architectural Style

Le Corbusier provides an excellent parallel to Brunelleschi in regards to an analysis on precedent present in the architecture. Both influential men were considered “fathers” of their respective historical architectural movements, and by studying them in a comparative manner, I will show how two very successful architects used precedent as a design tool essential to the formation of their signature styles. This chapter analyzes the formal qualities of an early and late building in Le Corbusier’s architectural career in order to understand what buildings or ideas he could have been using as precedents when fostering the Modern period of architecture. It begins with the Villa Savoye (1929), one of Le Corbusier’s most famous buildings and the best example to describe his early signature architectural style, and ends with the Maisons Jaoul (1951), a set of residences that depict the radical change in his architectural style after World War II.

#### **The Villa Savoye Formal Analysis**

Le Corbusier designed the Villa Savoye in 1929 in Poissy, France as a summer retreat for the Savoye family. The villa is widely known as the first and best of Le Corbusier’s buildings to embody the principles espoused by his manifesto, “Five Points of a New Architecture” co-authored with his cousin Pierre Jeanneret and first published in the avant-garde review *L’Esprit Nouveau* in 1926. It contains the five of the essential

components of his architectural theory, which still has aesthetic implications for today's architects. The five points are: 1.) pilotis, slender supports that replace the load bearing walls of conventional architecture with a grid of concrete columns; 2.) a free ground floor plan design made possible by the lack of solid load bearing walls creating an unrestricted interior; 3.) a free design of the façade made possible by removing the structural burden from the building's wrapper and the constraints previously associated with it; 4.) the long uninterrupted horizontal window that split the façade into a lower part and an apparently free and unsupported top half; 5.) a roof garden—used for both domestic purposes as well as essential technical functions—that replaced the ground-level garden which had become the domain of the automobile.<sup>49</sup> Similar ideas had already appeared in his 1923 book *Towards an Architecture*, now commonly called *Towards a New Architecture* even if “new” does not appear in the original French title *Vers un architecture*. The pilotis and the free-floor plan and free façade they imply had



Figure 49 Villa Savoye, Poissy, France, 1929

already appeared in his house prototype, the Maison Dom-ino in 1914-15 (Fig. 50). Each of the five elements of his manifesto are dependent on one another, and, while they add up to create an unprecedented architectural aesthetic, the individual principles are based upon his early education as well as the influence ancient Greek and Roman architectural ruins had on him. As these five elements are the defining characteristics of the Villa Savoye, it was the poster-child for Maison Dom-ino, and, in consequence, the face of Modern architecture. The formal analysis presented here not only examines the potential precedents for the villa, but, as a result, also uncovers precedents for the architectural principles themselves.

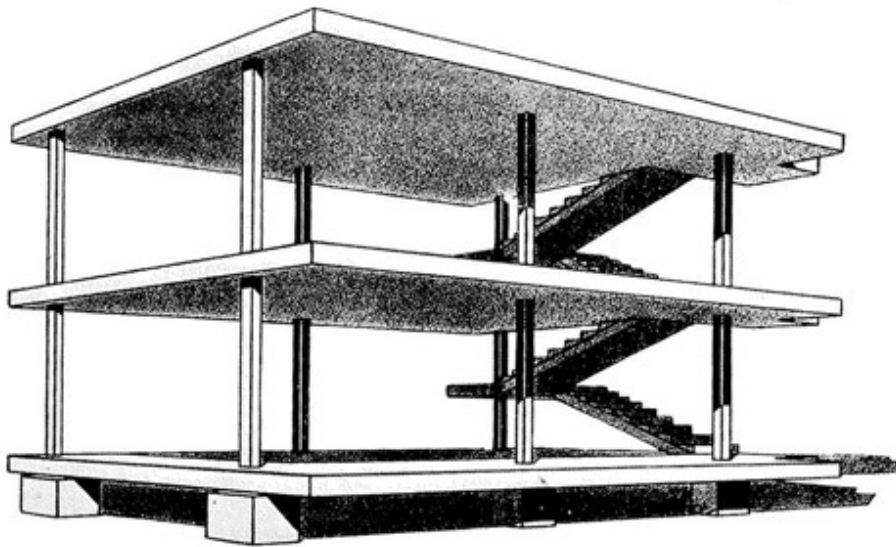


Figure 50 Le Corbusier's Maison Domino building prototype

### *Pilotis*

Le Corbusier's decision to remove the bearing wall structure, which had dominated European architecture with the exception of Gothic designs, and replace it with a grid of slender concrete columns was revolutionary and an extreme contrast to other architecture being produced in that time. But it was not entirely without precedent even in modern architecture. Just seventeen years prior Antoni Gaudí had produced the

epitome of the free-form naturalistic Art Nouveau architectural style in his Casa Milà (Fig. 6) by using a system of iron columns and brick vaulting as a structural skeleton which also freed the walls from their traditional load-bearing purpose. Gaudi's columns are not laid out in a grid, as Le Corbusier's would be, but the Casa Milà nonetheless anticipates the free plan described in the Five Points (i.e., a structural system independent of the façade and interior partitions). While "we must start again from zero," was a mantra of the Modernist movement, often attributed to Walter Gropius and sometimes to Le Corbusier, no architect really starts from zero.<sup>50</sup> But the notion clearly expresses the architects' clear awareness of their modernity. As for Le Corbusier, he used a basic design element, the column, and created a distillation and abstraction of this Classical form and its method of use. His particular solution responded to his conviction that the house is a machine for living in.<sup>51</sup> He was inspired by geometric purity of forms known from ocean liners (their smoke stacks and railings) as well as American grain elevators.<sup>52</sup> It was the combination of this abstracted method with a rational underlying grid system that formed one leg of his revolutionary architectural style, founded in his belief that "machine-driven" designs could rebuild a broken continent after the World War I ended.

It may be ironic, for an architect who envisioned buildings as machines, but nonetheless undeniable, that one of the most influential buildings Le Corbusier encountered in his travels was the Parthenon (447-432 BC) in Athens, Greece (Fig. 51). In his writings, Le Corbusier often recalls his visit to the Parthenon and writes about how important the building was in shaping his early theory of architecture (as noted in chapter 1 above), but this fact is often overlooked or underappreciated in studies of the



Figure 51, Parthenon, Athens, Greece, 447-432 BC

Villa Savoye. Historians prefer to focus on the villa's manufactured aesthetic—its clean lines, lack of ornament, and whiteness—because it is more characteristic of the Modern era than Classical influence would be. In spite of the radical differences in scale, material, and form between the Villa Savoye and Greek temples, architectural historians frequently cite the Classical Doric columns of the Parthenon as a precedent for the pilotis Le Corbusier used in the Villa Savoye. Jenifer Neils even goes so far as to refer to the Villa Savoye as the “Modern Parthenon.”<sup>53</sup> Of course, historians are referring to the theoretical use of the column in the Villa Savoye as inspired by the Parthenon, not any direct and literal imitation. One thing that historians who attempt to connect Le Corbusier's Modernist design with classical architecture overlook is the intentional deviations from regularity or “optical refinements” in the Parthenon, such as its swelling stylobate or irregular column spacing. Classicist Jerome Jordan Pollitt proposed three explanations for the intentional irregularities one of which held that they corrected an anticipated visual effect of the Parthenon appearing to sag on account of its unprecedented scale.<sup>54</sup> Hence, they were present in the Parthenon's temple front in order to ground the temple to the site and create a visual clarity. Le Corbusier broke this

essential link to the ground in the Villa Savoye by floating a pristine white box on tenuous pilotis. So, while the observation that Le Corbusier relied heavily on the Parthenon as a precedent is widely accepted as true, the Parthenon's role should not end abruptly as simply a precedent for the individual elements in the Villa Savoye. The Parthenon became Le Corbusier's go-to model to inform any uncertainties he had in his designs. The pilotis in Le Corbusier's design of the villa became the central element of his architectural language in his endeavor to produce an architectural style that was worthy of the new Modern period of design.<sup>55</sup>

Le Corbusier designed the piloti in the Villa Savoye based on his 1914 universal building system, the Maison Dom-ino (Fig. 50). This prototype was intended to be malleable enough to be used in designing buildings on any scale for any function by changing the dimension of the underlying structural column grid. The formal and spatial manipulation inherent in this system paid homage to the notion of context-less buildings that Le Corbusier described in his section on mass-production housings in *Towards a New Architecture*.<sup>56</sup> Situated on a grassy knoll in the French countryside, the Villa Savoye was not designed in response to the context of its site or place but rather as a functional, mechanically reproducible design that could be placed virtually anywhere and thrive off the given surroundings. To structure this building, Le Corbusier used 4x4 bays (4.75 m wide) of pilotis as his grid. This dimension intentionally left room for automobiles to maneuver comfortably at the ground level, an important defining characteristic of the Maison Dom-ino. In a time when mass-production was thriving, the importance of giving the vehicle the appropriate amount of attention as well as providing space for the person, so as to not have to interfere with the automobile, was essential.

While seemingly without context, the dimensions of the pilotis responded to the mobility of the dawning age of the automobile. The pilotis were necessary, not only as the structural base for the Villa Savoye but also for the remaining four of Le Corbusier's "Five Points of a New Architecture."

### *Free ground floor plan*

The "free plan," as pioneered by Le Corbusier in the Maison Dom-ino system as well as in his five points, freed the Villa Savoye from the need for load-bearing walls that would have divided up the space in a manner shackled to the building's structure. The essential pilotis carry the structure of the entire space which allowed Le Corbusier to have freedom in the design of the interior space and exterior façade as separate entities. The uniform grid of pilotis in the villa allowed theoretically for unlimited aesthetic possibilities in his façade and interior partitions. In fact, in the plan he goes so far as to make a visual point of modern architectural freedom by exaggerating the separation of the structure and the unimpeded interior wall partitions. In many instances throughout the building a structural column could have been ensconced in a nearby wall to conceal it, but instead Le Corbusier created almost awkwardly tight interactions between the two elements to avoid the perception that the partition wall is at all structural. Occasionally the columns shifted off the rigid grid to allow for a more seamless flow for the space. The ground level contains instances of both functional and rhetorical priorities. He inserted a smaller grid inside the overall four by four grid not only to accommodate the necessary structure for a stair but also to avoid having a column in the middle of the entrance (Fig. 52). There, the natural placement of this column in the original four by

four grid would cause the column to be imbedded in an interior wall, so, in order to make an avoidable rhetorical point about the modernity of his free plan and its arbitrary partitions, he bumps the column into the middle of the bathroom so it absolutely cannot go unnoticed by the room's occupant. The way Le Corbusier manipulated the structural elements to ensure clarity of the system in the Villa Savoye is similar to the way Brunelleschi detailed the Old Sacristy in such a way as to inform viewers about its virtual structure, such as the fluting detail on the pilasters discussed earlier (Fig. 19). Both novel forms derive ultimately from ancient/modern dialogues with classical architecture.

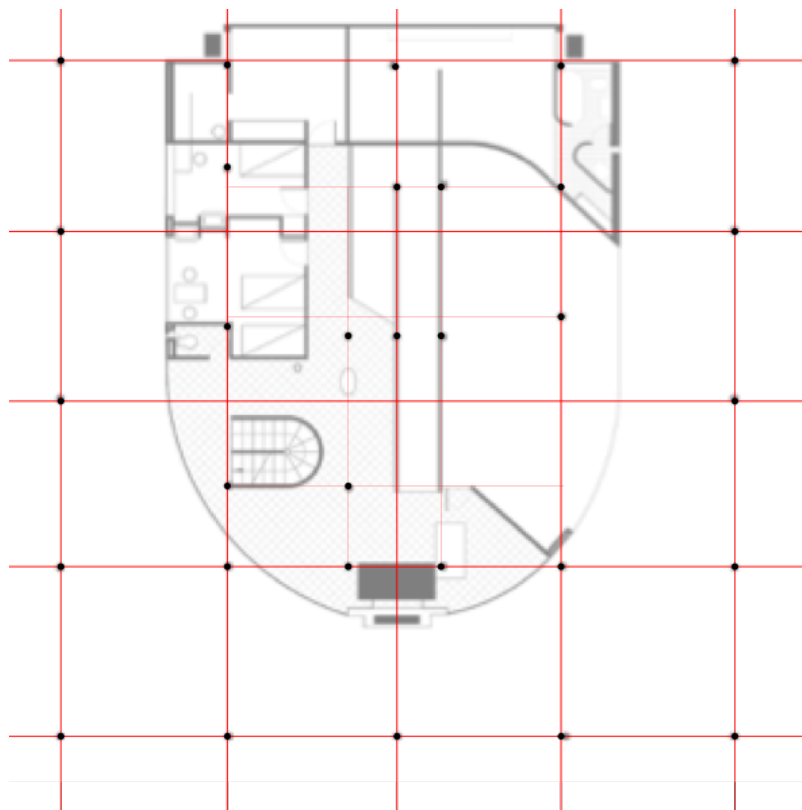


Figure 52 Villa Savoye, ground floor plan with columnar grid

Le Corbusier studied more than just the frontal and spatial aesthetic of the column in the Parthenon; he also took the lessons he observed from the temple's peristyle (i.e., the columns wrapping around the exterior of the temple) and implemented

them into the design of the ground floor of the Villa Savoye. The columnar grid Le Corbusier used in the villa morphed into a condition more similar to the ancient peristyle when he designed the enclosing glass wall in the middle of the grid. This design decision changed the aesthetic of the plan into one that privileged the column, or piloti in this case, over the program of functions (dining, sleeping, relaxing, etc.) contained inside, which happens to be the opposite of the recommended ranking that the Maison Dom-ino suggests. The supports are laid out in a grid so that structure avoids being the focus of the design and allows other, more important, elements like the façade and interior partitions to be object of one's gaze. Hence, the free ground plan of the Villa Savoye demonstrates that Classical architecture, while not fashionable in modernist thinking, was a key precedent in the implementation of the second of his five points.

#### *Free façade design and long horizontal windows*

Just as the pilotis were essential in the configuration of the free ground floor plan, they are similarly just as necessary for the third point: the free façade. The phrase free façade refers to the ability to design the exterior of the building so that the windows can be related to the interior requirements. This freedom is made possible by extending the floor plate past the structural piloti grid (especially in the second floor plan (Fig. 53)), essentially cantilevering it, and allowing the façade to be attached as “nothing but [a] light skin of insulating walls or windows”.<sup>57</sup> This is yet another expression for the architectural and spatial freedom achieved by the budding modern technology of the 20<sup>th</sup> century. In the case of the Villa Savoye, since Le Corbusier employed the use of pilotis divorced from the building's envelope to structure the space, the façade was

designed with a language unique to itself without any relationship to the interior conditions. This free façade design then allowed for continuous, uninterrupted, long horizontal windows that are so characteristic of the villa's design, as well as the fourth point in Le Corbusier's "Five Points of a New Architecture." The windows, made possible by the use of reinforced concrete and the free façade design, were likewise an example of the new technology coming from a machine-driven era which would seem entirely divorced from the overbuilt, load-bearing architecture of the classical past.

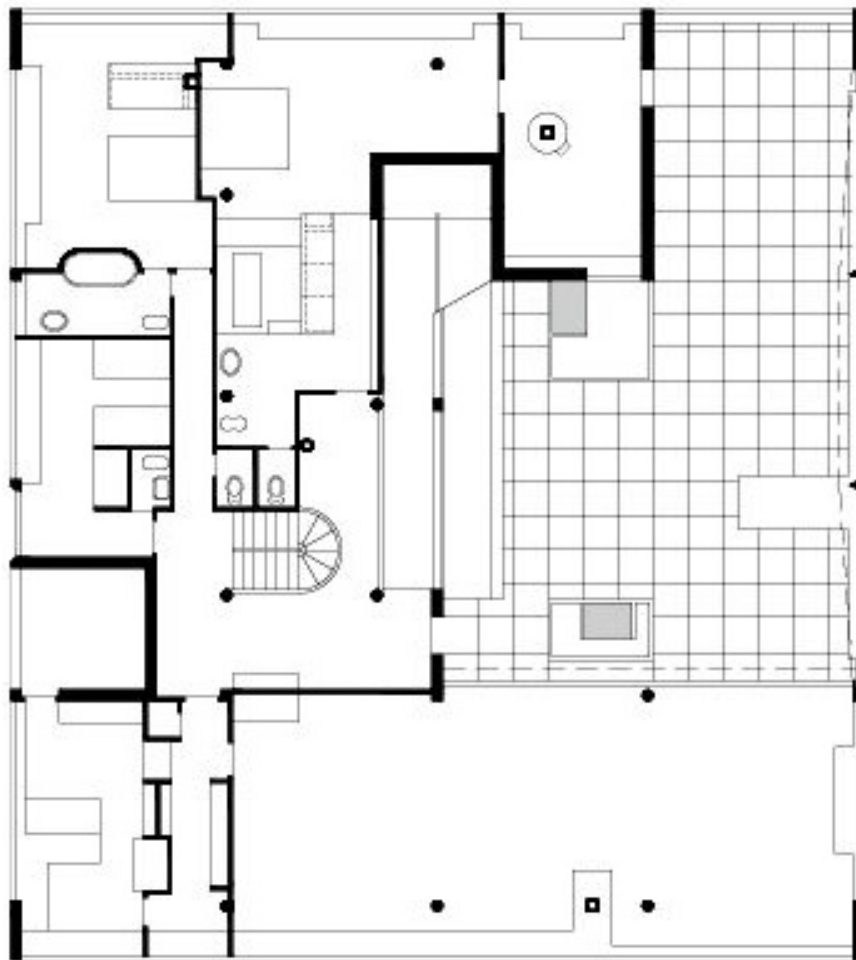


Figure 53 Villa Savoye, 2<sup>nd</sup> floor plan

But Le Corbusier had a keen eye in his surveying of the Parthenon. As shown above, he was aware of the beauty in the plan of this ancient temple and its austere Doric order, but his study did not stop there. As the product of an Art Nouveau education, Le Corbusier was trained to view buildings and sculpture as much through the lens of a painter as an architect. Because he encountered the Parthenon in 1911, very much in the early years of his architectural career, his Art Nouveau education was still highly present in his mind. This is born out in the sketches he produced on his visit to Athens (Fig. 54) which are more artistic and impressionistic in nature than analytical. They do not seem remotely to anticipate his *Maison Dom-ino* of 1914 much less the *Villa Savoye*. But these sketches, as well as his photographs, of the Parthenon reappear in his *Vers une Architecture* of 1923, testifying to his aim at establishing “ultimate” rules of architecture: the supremacy of the ground plan; the necessity of standards; the nature of architectural artwork as a “pure creation of the mind”; “austerity,” which in practice lead to a kind of modernist recycling of the 18<sup>th</sup> century “ruin” aesthetic; and architecture as an “abstract” art.<sup>58</sup> In his synthetic treatise, Le



Figure 54 Le Corbusier's sketch of the Acropolis, 1911

Corbusier joined other revolutionary architects from the past in reviving the glory of antiquity through a new architectural language, but because he referred to the ancient past in a way recognizable to his audience, which in 1923 still mainly comprised of products of an Art Nouveau educational mission, he was able to do this without contradicting his call for a *tabula rasa* (Latin for “blank slate”), which would suggest an architecture free from any architectural precedent.

Although seemingly impossible, even the exterior design of the Villa Savoye and the temple front of the Parthenon have remarkable compositional similarities (Fig. 55). The Doric columns of the Parthenon rise to support a full entablature as well as a pediment now in ruin. This, is the abstracted way of Le Corbusier’s thought and design process, is comparable to the way in which the pilotis in the Villa Savoye support a pristine white box with a sculptural element on the roof. Moreover, the horizontal ribbon windows in the Villa Savoye give the same effect as the frieze adorned with triglyphs and metopes in the Parthenon; both visually dominant elements give the composition of their respective elevations a strong horizontal component to contrast the repetitive verticality of the columns below. This observation, albeit not based on the writings of Le Corbusier, is one that is clearly suggestive even to the untrained eye once explained. His use of the Parthenon for so many other design decisions in the Villa Savoye validates this observation so it is logical that it would inform his design of the elevation of the villa just as it did the plan.



Figure 55 Relationship between Parthenon temple front (left) and the Villa Savoye front façade (right)

### *Roof garden*

The plan of the Villa Savoye gave high priority to the automobile, as noted above, as a way to recognize the advancements in technology in the 20<sup>th</sup> century, which resulted in the garden being elevated to the level of the roof (number five of the “Five Points”) leaving just a lawn around the building at ground level. Even the curved glass enclosure of the ground floor catered to the needs of the car in that the radius of the curve was based on the turning radius of a vehicle (Fig. 56 and 57). Le Corbusier was adamant about giving the machine hierarchy in his designs, but this is not to say he forgot the occupant in the process. The roof garden is surrounded by a sculptural curved wall that presents itself as the biggest anomaly in the predominantly orthogonally designed building (Fig. 58). This wall not only constitutes a focal point as an interesting non-symmetrical element when viewing from a distance but it also acts as a privacy screen for leisure activities taking place on the roof (Fig. 59). This is yet another example of how Le Corbusier gave the building’s architecture its own personality aside from the program that it housed in that the connectivity of the program in the villa is entirely internalized. A second-level courtyard is visible from inside the roof-top

sculpture. These visually connected spaces communicate the openness of the design inside the envelope, not only in plan but in section as well.

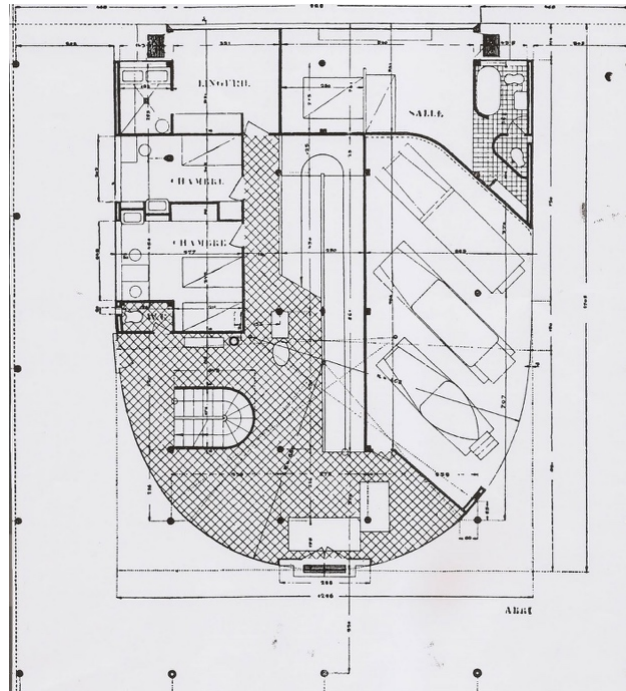


Figure 56, Villa Savoye, Ground floor plan with car dimensions



Figure 57, Car inside the "U-shaped" driveway of Villa Savoye

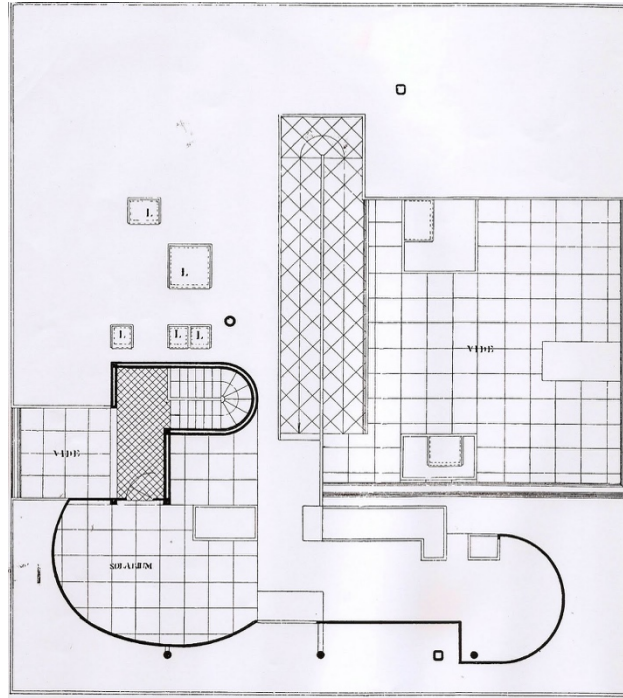


Figure 58, Villa Savoye roof garden plan



Figure 59, Villa Savoye, Front façade with roof garden sculptural wall

To reach the roof garden, one walks along a playful winding ramp or a spiraling staircase that slowly ascends from the ground level to the roof, pausing on the second floor on the way. As the ramp moves up, more and more of the space inside reveals itself. This motion is one that Le Corbusier had a kinetic memory of from his climb to the

top of the Acropolis in Athens. He later wrote about this in Towards a New Architecture.<sup>59</sup> The winding paths leading to the top of the Acropolis are a series of ramp equivalents that Le Corbusier embodied on a much smaller scale in the Villa Savoye. In both the ancient ascent to the top of the Acropolis as well as modern path to the roof of the Villa Savoye, the idea of removing yourself from busy every-day life and entering a place of ritualized calm and relaxation is present.

Le Corbusier was adept at extracting the essential data from a given experience in ancient architecture and applying them to his machine-driven designs. He found a way to create a cutting-edge design in the Villa Savoye that balanced the advancing technology of the 20<sup>th</sup> century with the emotional clarity of ancient Classical architecture without ever directly making reference to formal qualities of the Classical orders. While Brunelleschi did privilege the Corinthian order in his design, these two revolutionaries both brought back the preeminence of the ancient Classical model while also paving the way for architectural styles that would influence generations to come. This was especially true for Le Corbusier who confidently proposed a style of architecture that should be the model for all of his contemporaries and future architects to follow.

### **The Maisons Jaoul Formal Analyses**

When World War II broke out (1939-1945), it caused people, including Le Corbusier of course, to question the validity of utopic Modernist visions like his. Le Corbusier eventually responded to the existential crisis of the war's aftermath with architectural solutions that would please the masses aesthetically and functionally, while still holding true to many of the views he espoused earlier in his career. Le Corbusier's

Maisons Jaoul are the perfect vehicle by which to compare the early Modernist aesthetic of his Villa Savoye to the new post-war style. The Maisons Jaoul were a set of two houses designed by Le Corbusier and built in 1954-1956 in Neuilly-sur-Seine, France, an upscale suburb outside of Paris (Fig 60). He originally drafted a rudimentary



Figure 60, Maisons Jaoul, exterior view

plan for these houses in 1937, but it was not until 1951 that Andre Jaoul and his son Michel Jaoul commissioned Le Corbusier for the job.

Although less well-known than some of his other post-war masterpieces like Notre-Dame-du-Haut at Ronchamp (1953-55) or Unité d'Habitation in Marseilles (1947-52), the Maisons Jaoul were among the most important of these buildings in that they already fully embodied his late style. The post-war aesthetic developed by Le Corbusier as well as many of his contemporaries had a very aggressive, straight-forward manner. It abandoned the refinement of the machine aesthetic in its use of massive, heavy forms

and exposed concrete, this style responded to the call for an architecture that was reassuring and steady after a period of destruction and ruin. As a leader in this movement, Le Corbusier reevaluated his thinking about the house as a machine and he helped drive the Modern architecture movement in a new direction. But he did not abandon his method of using precedents; he just looked elsewhere. This analysis of the Maisons Jaoul considers both the provocation for the dramatic changes to Le Corbusier's design style after World War II and the buildings or objects he looked to as precedents in generating a new post-war style. Unlike Brunelleschi, then, the tumult of World War II caused a major shift in design methods and principles from the early to the later stages of his career.

It is easy to understand why Le Corbusier would need to update his thinking after the war; the key architectural components of his pre-war buildings evoked ideas of a mechanistic, efficient, and regimented structure that too closely recalled the country's defeat at the hands of modern warfare. The post-war style was essentially the antithesis of the modern utopic design, aesthetic, and materials that Le Corbusier used in his early 20<sup>th</sup> century villas such as the Villa Savoye with its pure ideal form, clean lines, and forward-thinking design approach. The most characteristic materials of many post-war buildings, including Le Corbusier's, consisted of *béton brut* (unfinished concrete that shows the impression from the mold used to form it) and roughly detailed brickwork.<sup>60</sup> After the war, Le Corbusier practiced less rigor in the use of his five points, although he did not abandon them entirely. His later buildings, instead, became an opportunity to explore new ideas, as well as, create an extension of the earlier ones. The Maisons Jaoul used a new theory of proportions invented by Le Corbusier in 1943 called Le

Modulor (Fig. 61). It proposed a humanistic, anthropomorphic scale for determining the proportions of rooms and buildings that visually bridged the otherwise incompatible

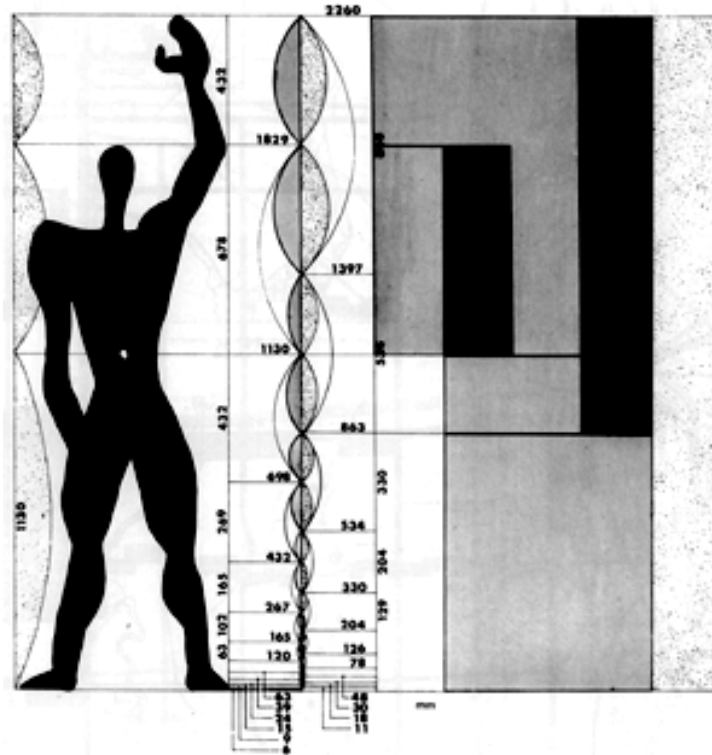


Figure 61 Le Corbusier's Le Modulor, 1943

imperial and metric units of measure.<sup>61</sup> The scale was based on the height of a man with his arm raised, the medieval Fibonacci numbers, and the ancient golden ratio.<sup>62</sup> Le Corbusier had developed Le Modulor in the long tradition of previous proportional systems based on human measurement done by Vitruvius, Leonardo da Vinci, and Alberti, most famously Leonardo's version of the Vitruvian Man of 1490 (Fig. 62). The Maisons Jaoul show exaggerated examples of the way Le Corbusier could apply the Le Modulor proportioning system in his designs.

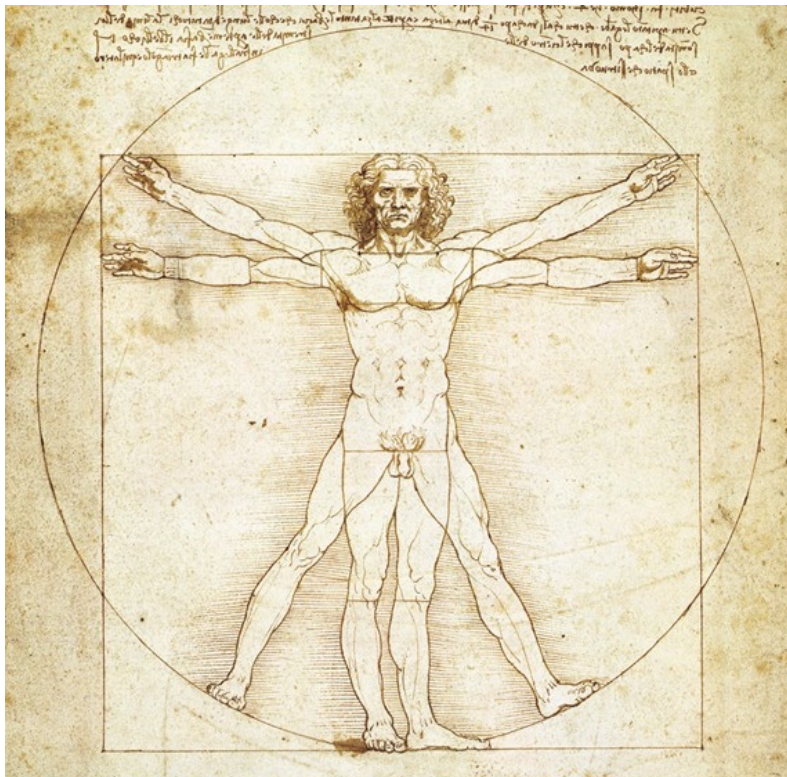


Figure 62 Leonardo DaVinci's Vitruvian Man, 1490

### *Vaulting*

The vaulting Le Corbusier used in the design of the Maisons Jaoul was undeniably the most drastic deviation from his 1920's machine driven aesthetic. This immediate and dramatic change was not simply an architect searching for a new and exciting look, but rather a direct response to many influential factors in the world around him, including more recent precedents. In 1951, when the Jaoul family sought out an architect for their houses, Le Corbusier was not the family's first choice; they instead attempted to hire English modernist Clive Entwistle (1916-1976).<sup>63</sup> Andre Jaoul understood that Le Corbusier was involved in many other projects and was convinced he would be too busy for the job. Indeed, Le Corbusier was involved in multiple projects at the time including the Unite d'Habitation in Marseilles, as well as projects in India and

some urban design projects.<sup>64</sup> Entwistle had proposed that the two dwellings be combined into a single three-story building. Andre Jaoul asked Le Corbusier to review the design when they coincidentally met up in New York in June 1951. Le Corbusier found Entwistle's project uneconomical, and he was surprised, to say the least. He criticized his English colleague by saying "For this price, you could make two houses out of it! And you could have some vaults [as well]!"<sup>65</sup> After this critique, Le Corbusier quickly took over the project and proposed the design of two juxtaposed houses that radically contrasted Entwistle's unified design proposal.<sup>66</sup>

The mention of vaults in the conversation between Le Corbusier and Andre Jaoul suggested that there were some predetermining factors which led vaulting to enter the architect's vocabulary. Up until this time, Le Corbusier had always used flat roofs help up by posts—very much the Greek standard in architecture—whereas curves and vaulting were synonymous with Roman architecture. He had been to Rome, but the city's ancient architecture had not made itself felt in his designs until the post-war period. In the 1940's, during the war, Le Corbusier committed himself to focus on the sensual material substance of objects; for example, in 1946 he created a series of sand-cast plaster sculptures with his Sardinian friend, the sculptor Costantino Nivola (1911-68). It was during this time period that he began to reconsider the formal purity of his previous buildings and, according to historian Richard Ingersoll, "From that moment on, sculpture and art were to enter, literally, into his architecture."<sup>67</sup> The post-war style Le Corbusier generated was, as mentioned earlier, the antithesis of his early 20<sup>th</sup> century modern designs, and vaulting became a way for him to express the essence of a more sculptural aesthetic that would come to characterize his later work.

Le Corbusier created two other housing models soon after the creation of the Maison Domino of 1914-15, the Monol-type (1919) and Maison Citrohan. Although the latter was the lesser known of the three, it made use of vernacular materials and expanded his machine aesthetic to include a broader range of industrial forms and historically-based vaulting. The Monol-type used Catalanian vaults, segmented load bearing walls (in place of pilotis), and a cellular plan (in place of bays of pilotis) capable of responding to the surrounding context of the building rather than the flexible, expandable grid made for any landscape.<sup>68</sup> This housing type was similar to the Maison Domino in prescribing a set of rules, but it was less determinative and left much more up for interpretation and adaptation. Vaulting emerged not only as a design solution for covering a span but also as an easel for deploying traditional building materials. Moreover, the dimensions of the cell-based plan were determined by the size of a vault. The Monol-type created a ubiquitous module for every house type from peasant to upper-middle class, but it was not until the post-war years that Le Corbusier began to explore this housing type in his architecture.<sup>69</sup>

The Catalan vaults in Jaoul houses were intended to recall the family's roots in the mountainous region of the Cevennes.<sup>70</sup> Maisons Jaoul embodied the elements of the Monol-type and, in consequence, thrived as a set of houses specifically designed for the Jaoul family. Le Corbusier had discovered the Catalan vaulting type (Figs. 63-65) in his first encounter with Antoni Gaudí's work in Barcelona, but staying true to his previous method of using precedents, he did not simply copy the vaults he saw but instead used



Figure 63 Antoni Gaudí, School for Sagrada Família, Barcelona, Spain



Figure 64 Antoni Gaudí, Roof of the school for Sagrada Família, Barcelona, Spain



Figure 65 Antoni Gaudí, Ceiling inside the schools for Sagrada Família, Barcelona, Spain

a wide range of eclectic sources on which to base his own design. Le Corbusier's vault design was a combination of the monumentality of the Roman vault and the technology of the Catalan vault. Le Corbusier created an original synthesis of the two precedents in that his vaults in the Maisons Jaoul were inspired by structural generation of the Catalan vaults, but still have the visual dominance, certainly on the exterior, of a Roman vault (Fig. 66).<sup>71</sup>

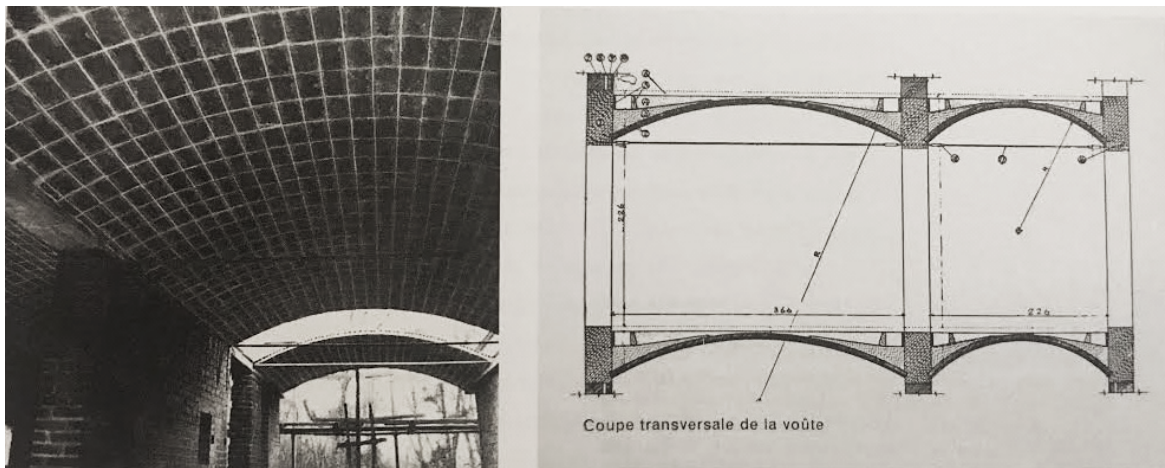


Figure 66 Maisons Jaoul structural vaulting technique

Other precedents in Le Corbusier's post-war architecture were once again found in the industrial landscape, not in the sleek automobile but vehicles of mass transportation. A modern precedent for Le Corbusier's vaulting style was the low barrel-arch profile of a railway freight car (Fig. 67) the sleeper cars, and the couchettes with buffet cars, all of which, according to Le Corbusier, were successful in accommodating numbers of travelers using a minimal space to encompass the maximum amount of activities possible. In a letter to Swiss mathematics professor Rudolf Fueter (1880-1950) in March of 1950, Le Corbusier requested the young Catalan architect, Domenec Escorsa, who had once worked for him, to draft measured drawings of the restaurant

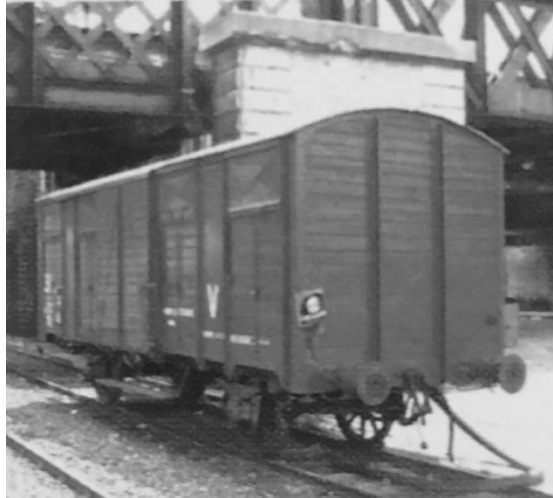


Figure 67 Railway freight car Le Corbusier may have looked to as a precedent

carriages and luxurious sleeping cars of the overnight French express locomotive, the Train Bleu.<sup>72</sup> The curved ceilings of the train cars sheltered moveable apartments, and hence were apt precedents for new housing types since they accommodated eating, sleeping, and daily activities. The vaulting in the Maisons Jaoul was inventive in its function in the new Monol prototype, and, like the train cars, it was also decisive for the remaining layout of the dwellings. Similar to the way Le Corbusier was inspired by the intercolumniation of the Greek temple peristyle to create his pilotis and their distinctive bay width which, in turn, determined the proportion the design of the Villa Savoye, in the Maisons Jaoul the proportions of Romano-Catalan vaults were the driving factor in determining the post-war house's plan.

#### *Load bearing walls / windows / facade*

One of the most significant changes in the Monol-housing typology compared to the Maison Domino was the use of segments of load-bearing walls in place of the pilotis. Hints of the shift in Le Corbusier's design thinking from the machine-driven to the sculptural aesthetic can be discerned in an early design for the Maisons Jaoul dating to

1937 (Figs. 68 and 69). This design followed the Maison Dom-ino prototype in that it was based on a system of bays demarcated with pilotis that allowed for a free façade design. In the later design for the Maisons Jaoul, however, his new examination of

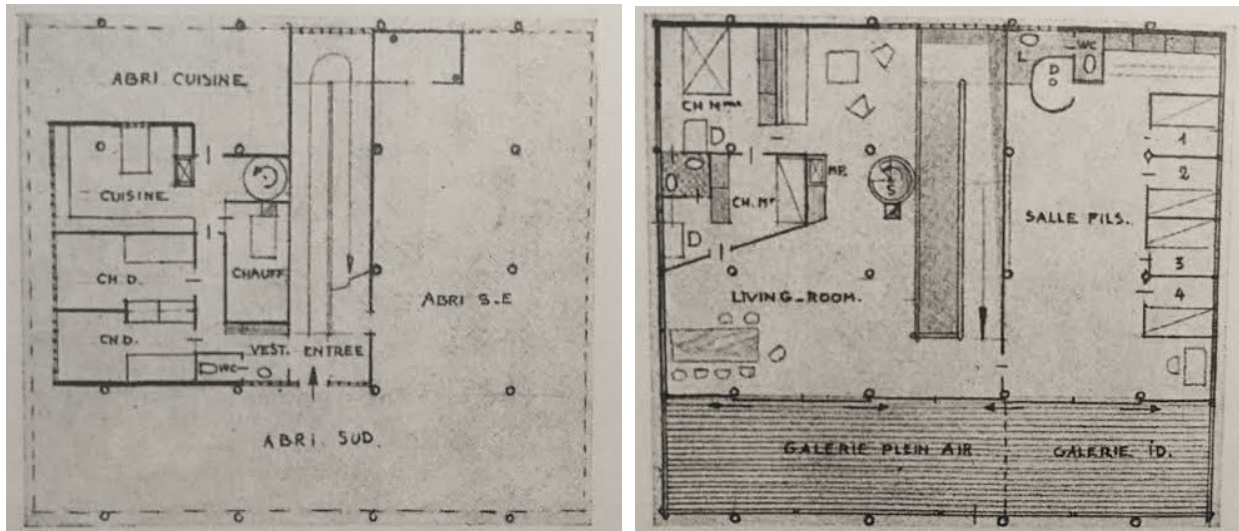


Figure 68 Ground floor (left) and 2<sup>nd</sup> floor (right) of Le Corbusier's 1937 design of the Maisons Jaoul



Figure 69 Le Corbusier's sketch of the 1937 design of the Maisons Jaoul

precedents from Rome rather than Greece, and from a more common run of industrial structures in addition to state-of-the-art architectures like ocean liners, found its objects. Le Corbusier relied less on the vertical supporting structure and the freedom of an open floor plan it afforded and turned instead to the horizontal floor slabs/vaulted ceilings

which prescribed a set dimension to determine in part how the space would be laid out. The vaulted forms carved into the floor slabs required more solid structural support than pilotis offered, so Le Corbusier used three segmented load-bearing walls running the full length of the space. He eliminated the wall only when necessary to open connections between rooms or to make larger spaces. With the three primary structural walls of the

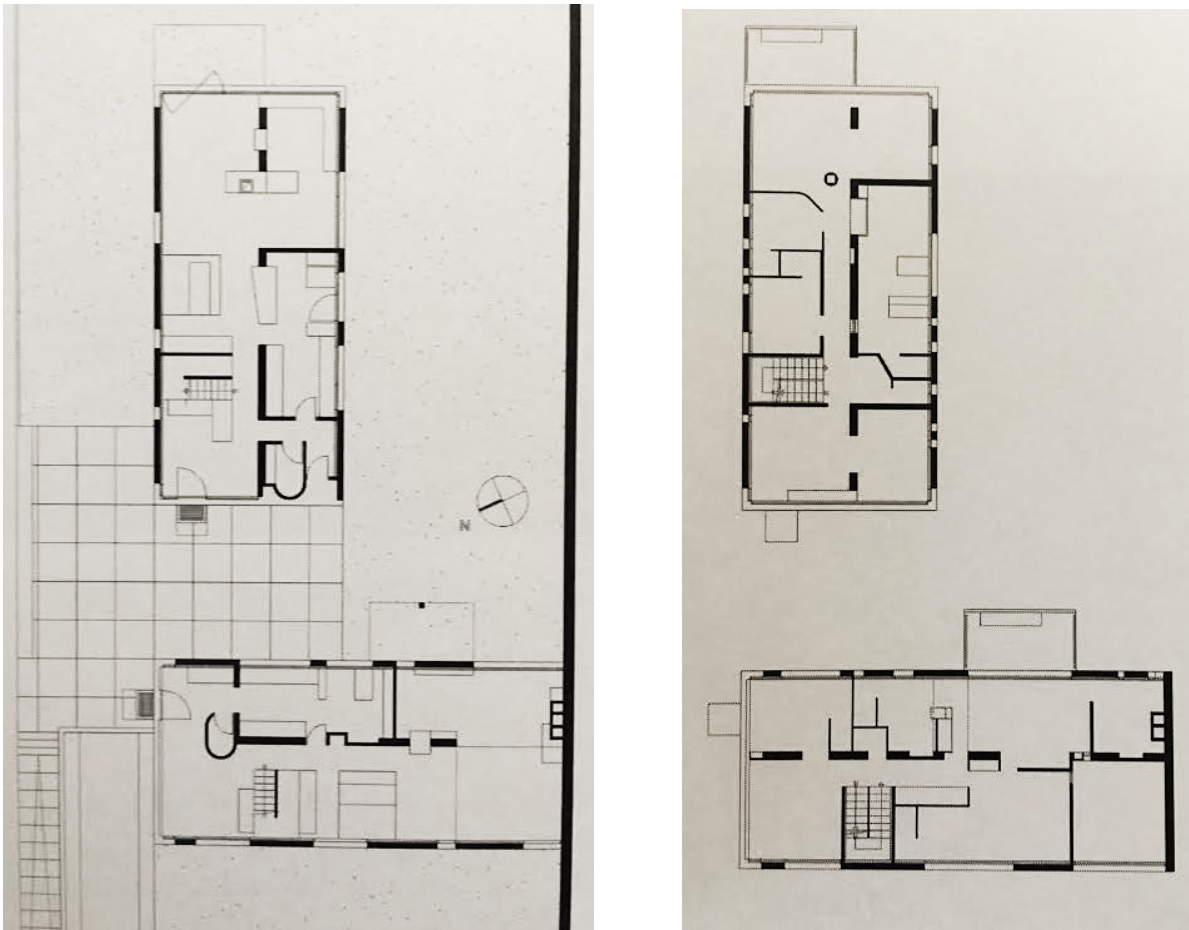


Figure 70 Maisons Jaoul ground floor plan (left), Figure 71 Maisons Jaoul first floor plan (right)

Maisons Jaoul in position, Le Corbusier did not enjoy the freedom he had had in the interior partitioning walls of his Maison Domino-based designs, but neither did he resign himself to long, unbroken cave-like dwelling spaces. Instead, he made use of some basic interior partitions to break up the linearity of the spaces at unpredictable intervals (Figs. 70 and 71). Hence, the load-bearing wall in Le Corbusier's work played two roles:

first, it acted as the primary support for a vault ceiling, and, second, it partitioned the interior space. The outer walls had a secondary role in addition to their primary structural purpose which was to allow focused light and ventilation to enter the space through strategically placed openings. In contrast to the way the Maison Domino design encouraged a full flood of light into the space through long horizontal windows, the Monol-based Maisons Jaoul had a much more directed lighting strategy coming from strategically placed openings “punched” into the outer walls (Fig. 72). From the interior, these apertures read as functional and necessary to the space, but on the exterior they appear random and unintentional in their planning. Just three years later in



Figure 72 Example of focused lighting inside the Maisons Jaoul

1954 Le Corbusier would repeat this new method of aperture placement in Notre Dame du Haut in Ronchamp, giving the interior of the chapel a spectacularly orchestrated light show with variously sized punctures in its massively thick wall while the exterior reads as a blank surface peppered with random holes (Fig. 73). The outer wall or façades of the Maisons Jaoul were therefore not “free” in terms of planning strategies, instead, they

were very much correlated to the priorities of interior functions and therefore more contextual. Hence, Le Corbusier's design conception here is almost exactly opposite of how he designed the Villa Savoye. The long uninterrupted horizontal windows of the villa created ambiguity in the function of the interior space and led the exterior to be read as its own entity, while the inside seemed to exist passively behind it. The Maisons Jaoul's exteriors were a direct reflection of the interior and consequentially engaged viewers with the program of the houses, that is, the different purpose each space served in the life of the household.



Figure 73 Notre Dame du Haut, variously sized punctures in its thick wall

The new load bearing structural system in Le Corbusier's later work is often simply attributed to his decision to use vaults, but Le Corbusier was extremely influenced by the events of contemporary history taking place around him. The critical question is rather why he turned to vaulting at this point in his career. As historians often note, he changed the entire direction of his architectural design not only after World War II, but, quite probably, given the devastation the combat wrought, *because* of the war.

So to approach the question of the load bearing walls exclusively as an engineering issue would essentially remove Le Corbusier from the cultural and social milieu of post-war Europe and the modern precedents it offered. During the long, annihilating course of the conflict, Le Corbusier encountered the necessary functional architecture of the war such as bunkers and underground tunnels meant to keep people safe during bombardments. The Maisons Jaoul are strongly reminiscent of bunker-style structures in many ways. They are purposeful and practical in every aspect of their design. Their low arches and thick solid walls offer the same cave-like security as the underground tunnels used as shelters. Like the bunkers that inspired them, the essential qualities of the Maisons Jaoul were experienced from the inside, so the need for an elaborately planned-out façade design was unnecessary.

The recent precedent of the bunker extended to the roofs of the Maisons Jaoul which were covered with grass (Fig. 74). Whereas the Villa Savoye's roof-top garden consisted of an artificial manicured landscape used solely for entertaining the occupant (Fig. 75), the Maisons Jaouls' turf-topped crowns appeared to be camouflaged as if they were shelters on a battlefield. Of course, they served functional purposes as a natural drainage system, but memories of the theater of war with its repertory of temporary shelters offering anxiety-ridden calm moved Le Corbusier away from the luxuries of the Villa Savoye era to search for domestic designs that combined new economies of beauty and function.

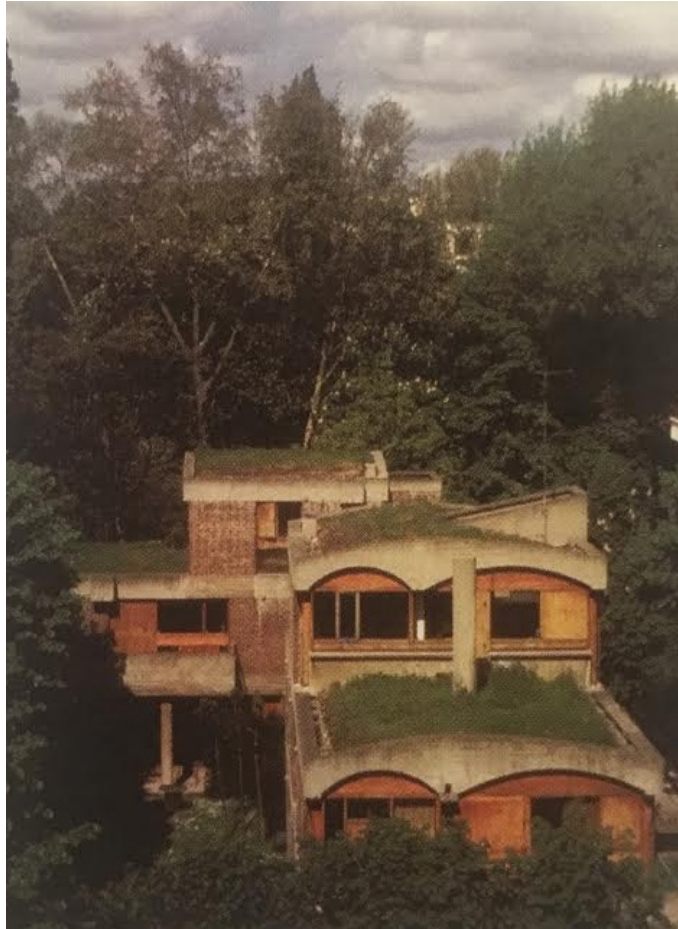


Figure 74 Turf covered roofs of the Maisons Jaoul



Figure 75 Manicured roof-top garden in the Villa Savoye

Like other European survivors, World War II had an incalculable impact on Le Corbusier. It caused him to reevaluate the way he had designed architecture up to that point in his life, but he did not entirely recreate himself or his working methods. As my analyses demonstrate, Le Corbusier did not start over again from zero, no matter how often he used this expression in his writings. No architect ever could truly begin on a completely clean slate. From the very beginning of his career Le Corbusier used ancient Greek and Roman architecture as a precedent in his designs. Similar to the way Brunelleschi reinterpreted Classical architecture to fit the nature of his varying designs, Le Corbusier adapted the way he used the ancient precedents in his early career to relate to, and be relevant in, the rapidly-changing context in which he lived.

## Conclusion

These two revolutionary architects are only meant to act as a vehicle to help the reader arrive at the same conclusions I myself have come to. By analyzing Brunelleschi and Le Corbusier in a comparative format, using precedent types similarly shared by the two of them with complete knowledge of the exclusion of many other precedents in both of their repertoires, this thesis uncovered overlooked trends in the ways in which two architects viewed as pioneering used precedents. Specifically, and perhaps counter-intuitively, it has shown how important ancient classical models were to these architects whose work is situated at critical turning points in history. All of the major architectural turning points from history can be characterized as having been pulled between the old and the new, tradition and innovation.<sup>73</sup> The categories are unstable, changing to suit the enterprise of history as it evolves. “Early modernity,” for instance, is a catch-all phrase that describes a period for our own period’s discomfort about earlier efforts at periodization such as “Renaissance” or the “Classical Age for later 17<sup>th</sup>- and 18<sup>th</sup>-century northern Europe.”<sup>74</sup> Ironically, perhaps for historians more than practitioners, one of the essential defining characteristic for seminal works of architecture in both the Renaissance period and the Modern movement, or International Style, was the return to classical models as precedents to produce an architecture fraught with the same, obviously successful, strategies that the ancients used in their designs at the time. Currently, we are, again, caught in a state where, as historian Lee Patterson would say, “... no one seems to have a good word for periodization...” and perhaps there is good reason for such skepticism.<sup>75</sup>

It is extremely important for the present-day architectural community to study nuanced uses of precedent in design, as seen in Brunelleschi's Old Sacristy and Santa Maria degli Angeli. Architects need not use his buildings as precedents, but they should consider how he was able to fuse two time periods together to create something so prescient that sparked a new architectural movement. More importantly still, they should learn how he studied precedents. By doing this, we can begin to transform precedent research from merely an interstitial phase of design in which we search for similar built work upon which to base our designs off of into something much more genuine and significant. Studying precedents cannot be done in a short time period; it should be a lifelong study that never ends. Just as Brunelleschi used so much of his knowledge from his travels to Rome to inform his designs, today's designers should be using real life experiences to direct their decision-making process, not a broad Google search of similar building types. To return importance to the use of precedent in design, we must study and understand how the architects who shaped history were using precedent; Brunelleschi, Le Corbusier, and a plethora of other influential members would be of great importance to learn from.

Le Corbusier, ever known as the "Father of Modernism", infused the lessons from his artistic past with his revolutionary ideas about a mass-produced, machine-driven architecture meant to shape a new architectural era thus giving his architectural theory a historical basis, as many architects, including Brunelleschi, had done in the past when radically shifting the mode of architectural thought. This is seen in the analysis of the ground floor plan of the Villa Savoye, which according to the Maison Dom-ino prototype was to be based on a grid and give way to the interior partitions. Le Corbusier proved

that along with the desire to fashion a mass-producible model applicable to any building conceived in the 20<sup>th</sup> century, he needed the underpinnings of Classical architecture which were so important to his multivalent architectural thought.

Whether post-modern or a continuation of the modern, much of today's built environment, compared to these two architecture periods of the past, could be characterized as superficial and non-permanent, not only for the lack of quality behind the building process, but also for the lack of a deeper meaning and historical grounding in the design itself.<sup>76</sup> I am convinced that the roots of the current plight of architecture, which future generations may well refer to as the non-existent 21<sup>st</sup> century, is the scant respect accorded to historical precedents in contemporary designs. Whereas Brunelleschi and Le Corbusier learned to look at past models as part of their education, current pedagogy in today's schools of architecture suggests that students hang their architecture history hat at the design studio door, and pay lip service, if that, to historical models as a design tool. Design professors attempt to foster a studio environment, especially in the early education of an architect, in which the students can formulate personal ideas devoid of any model for the fear that they will simply copy the model for the lack of knowing any better, and, rightfully so. Students in the beginning stages of their education are not capable of designing a building because they have yet to establish any guidelines or base principles. But, when students are asked to design their first building, professors often instruct them to look to other buildings to begin the project. It is at this point that architecture schools need to reconsider the effects of the ways in which they teach students to study precedent.

Too often precedent research in design school, and, even more detrimental to today's architecture, in practice, is reduced to searching for a similar building type upon which to model a design or to recreate its successful portions. In theory, this makes sense: take all the successful parts of the surrounding buildings and compile them together into one building, but the reality of the situation is that this only creates a puzzle where all the pieces do not actually fit but are rather forced into place to create the illusion of a whole. If Brunelleschi were to approach precedent research in this way, much like his lesser-known contemporaries did, then his architecture would lack the structural validity that is laced into the Classical elements he used to depict structure. From his very first trip to Rome, he was compiling, not a list of ancient buildings to copy, but a mental catalogue of the techniques used to build them as well as the decorative nature to then infuse into his own architecture. Precedent research cannot be one afternoon spent looking for a building to copy. Honestly, the terminology itself, "precedent research," is suggestive of a long-term endeavor, an ongoing, continuous practice from which a seemingly never-ending catalogue of precedents is formed. But in today's academy, "research" indicates a short amount of time in the library or at the computer gathering material. In order to truly learn from great buildings and architects from the past as an influence in design, architects must overcome the limitations of their circumstances. Being geographically distant from important architectural sites of the past is not an excuse, because Le Corbusier found inspiration in "non-architectural" artifacts (e.g., train cars) in his immediate surroundings. Students, professors, and professionals alike must understand significant architectural history beyond just knowing the name, date, and style of the buildings. A greater

emphasis on history in architecture school curriculums would increase the students' ability to draw references from buildings that have withstood the tests of time like Brunelleschi did with ancient Roman architecture or Romanesque buildings. The next step for students would be to take the underlying principles of past models and incorporate them into their own designs, or, as Le Corbusier claims to have done in his architecture, reject the past models which would still give a certain level of validity to the final product. Studio culture, as it has been termed since ca. 2000, tends to chastise students who attempt to use any building earlier than the 1900's as a design reference.<sup>77</sup> As discussed in chapter one, simply cutting and pasting Classical elements such as a column or a Corinthian capital in a contemporary design would be design studio suicide. But, as proven through the analysis of the way Brunelleschi reinterpreted Classical elements, it is quite possible understand the precedent in such a way as to enhance one's ability to create a novel structural aesthetic. Alternatively, the way in which Le Corbusier adapted the inherent DNA of the classical model to fit a design without any Classical ordering system demonstrates that it is naïve to suggest that one cannot utilize ancient architecture to produce wholly modern buildings for today's architecture. If two of history's most influential architects both reflected and shaped their own modern times through work based largely on Classical architecture, then to say that we, as 21<sup>st</sup> century designers, are too far "advanced" for this, may well condemn our architectural period to be termed the Ephemeral period, or worse, not to be referred to at all, furnishing precedents for no future generations of architects.



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<sup>68</sup> Rabia Masud, "Languages Spoken Around the World: Lessons from Le Corbusier" (MA Thesis, Georgia Institute of Technology, 2010).

<sup>69</sup> Willy Boesiger, *Le Corbusier*, vol. 5 (Basel, Switzerland: Birkhäuser Verlag, 1994), 158.

<sup>70</sup> Benton, "In Search of Authenticity," 43.

<sup>71</sup> Gans, *The Le Corbusier Guide*, 56.

<sup>72</sup> Benton, "In Search of Authenticity," 41.

<sup>73</sup> Randolph Starn, "The Early Modern Muddle," *Journal of Early Modern History* 6, no. 3 (2002): 296-307.

<sup>74</sup> Starn, *Early Modern Muddle*, 296.

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<sup>75</sup> Lee Patterson, "The Place of the Modern in the Late Middle Ages," in *The Challenge of Periodization: Old Paradigms and New Perspectives* ed. Lawrence L. Besserman (New York: Psychology Press, 1996), 51.

<sup>76</sup> Travis Price, *The Archaeology of Tomorrow: Architecture and the Spirit of Place* (San Rafael, CA: Earth Aware, 2006).

<sup>77</sup> The notion of studio culture came to the fore on the initiative of students who constitute the American Institute of Architecture Students (AIAS) in 2000 when it established the first Studio Culture Task force. In 2002, it published "The Redesign of Studio Culture" available at [http://archdesign.vt.edu/students/images/Studio\\_Culture\\_Report\\_2002.pdf](http://archdesign.vt.edu/students/images/Studio_Culture_Report_2002.pdf)