Self-Invention and Deviance: Philibert de l'Orme's Role in the Creation of the Savant Professional Architect

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On entering the dark, tunnel-like passage at 8 Rue Juiverie, which leads to the court of Philibert de l'Orme's Hotel Bullioud (1536) in Lyons, it is first necessary to pass the entrance to a more ancient court with rib vaults supporting balconies in the Gothic manner.

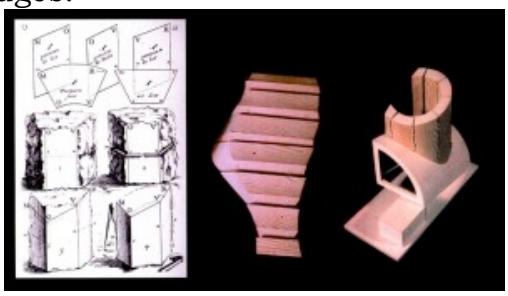
Philibert de l'Orme, Hotel Bullioud, Lyons 1536: ribbed vaults (left); entry passage (center); conical trompe (right).

If one takes the time to negotiate this winding passage with the care it demands, it will be realized that to do so is literally to recapitulate, at one of the places where it first occurred in France, the transition from the outlook of the medieval master mason to the viewpoint of the modern architect. From this experience, one might easily imagine that the architecture of the French Renaissance had its origin in some new and unprecedented artistic intention, but consulting de l'Orme's treatises, the *Nouvelles Inventions pour bien bastir et à petits* fraiz *(New Inventions for Building Well at Little Cost)* (1561) and the *Premier Tome de l'Architecture (First Volume on Architecture),* (1567), provides startling evidence to the contrary.[1] The son of an ambitious master mason, de l'Orme had been well prepared to revolt against

the traditional authority of the masonic guilds by his father who had him schooled in Latin so that he might obtain a better position by entering the church where, indeed, he eventually became an abbé.

Portrait of Philibert de l'Orme from *Oeuvre entiere,* (1647) unnumbered sig. 5v.

One of the chief weapons of de l'Orme's assault upon the masonry of the guilds was the publication for the first time anywhere of the major projective techniques of stereotomy, the art/science of finding the true shapes of complex *voussoirs* (vault stones). Previously, this information was largely the secret property of the masonic lodges.



Stereotomy: (left) Plate 53 from Abraham Bosse's *La pratique du trait a preuves de Mr. Desargues* of 1643 illustrating the use of templates to cut a voussoir; (center and right) model of the intersection of two cylinders after Guarino Guarini*'s Architettura Civile del padre Guarino Guarini, opera postuma* of 1737

This paper examines the architecture, politics and philosophy of this crucial step in the development of the concept of the modern architect as an inventor with absolute authority over the workers who executed his ideas. It will be shown how Philibert de l'Orme played a major and perhaps defining role in this development in France.

To understand the origins of de l'Orme's contributions to the development of the modern authority of the architect, it is necessary to become familiar with the social and political environment in which he grew to maturity. In 1514, the probable year of de l'Orme's birth, Lyons France was very much a merchant's town and a free city; so much so, in fact, that local artisans were prohibited from forming guilds to regulate their trades.[2] This meant that they could neither fix prices for the works they produced nor impose standards of craftsmanship or skill upon their fellow artisans as was the universal custom where guilds were permitted. Thus the masons of Lyons were, for example, unable to require that someone who wanted to call himself a master mason submit a master piece for evaluation by masons who had achieved master status by working their way up through the ranks of a masonic guild. Masons were also enjoined from the common guild practice of restricting master status to the sons of guild masons.[3] On 25-27 April 1529, this conflict between merchants and artisans reached an impasse known as the Great Rebellion in which de l'Orme's mason father, Jean de l'Orme, played a major role. In effect, artisans, who were expected to serve in the local militia, declared that if the town council refused to protect their interests by allowing them to form guilds, they would refuse to defend the town against civil insurrections brought on by the increasingly desperate situation of the poor who were frequently near starvation due to chronic grain shortages and the high cost of bread.[4] De l'Orme thus learned, firsthand, of the tremendous political power artisans could command when they organized in defense of their own interests. This was a power de l'Orme would have to oppose in implementing his concept of the independent professional architect.

At the time of the Great Rebellion, Philibert de l'Orme was fifteen-years-old and able to boast that he already had three hundred workers under his supervision engaged in fortifying the

town.[5] The fortification of Lyons was apparently undertaken at this time at least in part to prevent revolt by employing the masses in an extensive public works project. As we shall see, this social use of architecture was not lost on a young man who was later to write that he would ask "what greater good one could find or what greater charity and pity one might exercise than to win over, by building, a myriad of poor people who would otherwise have to go begging for their bread. What profit could be greater in a kingdom, a province, or a town than to employ, put to work, and occupy an infinity of men, women, and young people who would otherwise be vagabonds, idlers, and perhaps thieves and robbers to the great detriment…of a whole country…Are there circumstances other than building in which one could employ a greater number of persons of both sexes?"[6] In effect, de l'Orme had already discovered that one key to destroying guild power lay in demonstrating that, by zealously promoting their own interests, guilds tended to provoke public insurrections.

This then was the social and political environment to which de l'Orme was exposed as he learned masonry under his father's tutelage. Surely by this time, too, it must have been possible to see that the old feudal guild structure of France was crumbling as King Francis I (1494-1547) continued an ambitious program of strengthening the central government. Indeed, the deterioration of the guild system could well have been one of the factors that led de l'Orme's father to have him learn Latin so that he would be able enter the world of those educated in the liberal arts and perhaps obtain a position in the church. It is possible that prior to his departure for Rome in 1533 at age nineteen, de l'Orme had already obtained his baccalaureate in theology.[7] In Italy, de L'Orme worked as a fortifications engineer for the pope and availed himself of the opportunity to study the work of the leading artists and architects of the time, including Michelangelo, Raphael, and Giulio Romano. He also made the discovery that architects such as Brunelleschi, who had engineered and supervised the construction of the huge dome of Santa Maria della Fiore in Florence, enjoyed a new kind of authority at the building site by virtue their independence from both the masonic guilds on the one hand, and the *signore* of the town council on the other.[8] It was not lost on the astute young de l'Orme that Brunelleschi achieved this independence by knowing more about all aspects of the building

project than anybody else, including the master masons who took orders from him and co-director, Lorenzo Ghiberti, who had been appointed against Brunelleschi's wishes.

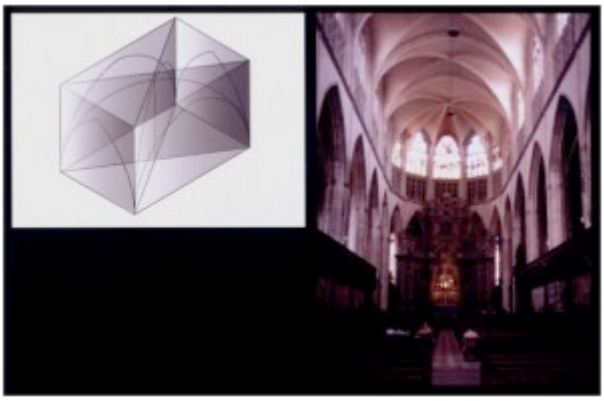
Upon returning from Italy in 1636, de l'Orme built the first *trompes* (ribless, conical vaults) in Lyons at the Hotel Bullioud. Up until this time, a gallery of this sort would have been supported by one or more large, ribbed, *ogival* (pointed) vaults in the Gothic manner.

Philibert de l'Orme's Hotel Bullioud *trompes*: (left) conical and (right) flat, with the gallery above them.

Instead, de l'Orme creates the illusion that the gallery is suspended between two turrets supported by trompes. The use of the term *trompe* is, in itself, perhaps indicative of a new way of thinking about architecture. De l'Orme explains that "the term *trompe* came from or has been derived from its similitude to the structure of the horn, called in many places 'trompe.' For, both of them being large in their front part, get narrower at the other end in the shape of a vault."[9] The word *trompe* in French is also associated with the verb *tromper* meaning to fool or deceive.[10] Indeed, the architectural trompe has always been associated in some degree with the idea of architectural deception, for it can easily be used to create architectural forms that appear to defy gravity.[11] This is already evident in the trompe supporting the right turret of the Bullioud gallery, which, although sloped at an angle or *rampant*, is, nevertheless, flat rather than arched like the trompe on the left.

De l'Orme did not invent the trompe, but he did devise and publish a system of working variations on it and the flat trompe is, indeed, his own invention.[12] As such, it represents for the first time in France the same sort of skill and audacity Brunelleschi demonstrated in designing and supervising the construction of the huge dome for the cathedral in Florence. The origin of the trompe cannot be attributed to any known architect. As a structural form, it is related to the squinch, one of several forms first used to carry circular and octagonal domes over the corners of a square base. By the seventh century true-cut-stone trompes supporting domes appear in Armenian churches such as St. Hrip'simé at Vagharshapat (618 AD). By the second half of the eleventh century the trompe squinch was fairly common throughout Europe as a means of resolving the junction between a dome and the square bay of the crossing in Romanesque basilicas. Thus, while de l'Orme is far removed in time and place from the historic origin of the trompe, he is, nevertheless, the first Renaissance architect to focus upon it as a basis for significant further invention. In so doing he turns the trompe into what amounts to a national symbol of France. In this he is entirely consistent with another of his projects, which was to develop a distinctly French column to add to the five orders of Classical architecture (Tuscan, Doric, Ionic, Corinthian, and Composite).

Thus, too, it is not difficult to see the defiance of gravity inherent in the trompe as an expression of the defiance of medieval masonic tradition to which de l'Orme opposed his new idea of the architect as a specialist in what he calls *precogitation*. By *pecogitation* de l'Orme meant *anticipation* or what we, today, would perhaps call *design*, when understood as an activity prior to and distinct from construction.[13] For de l'Orme, the modern architect creates by engaging in imaginative precogitation, whereas the medieval master mason worked largely by trial and error and made few drawings. For de l'Orme the difference between the medieval and the Renaissance approaches to building are nowhere more evident than in the contrast between the ribbed groin vault of the Gothic cathedral and the conical vault or trompe of the Renaissance.



Geometry of the Four-Part Gothic Ribbed Groin Vaults at Toulouse Cathedral (1219). All of the Toulouse ribs lie in flat planes, as shown in the diagram at left.

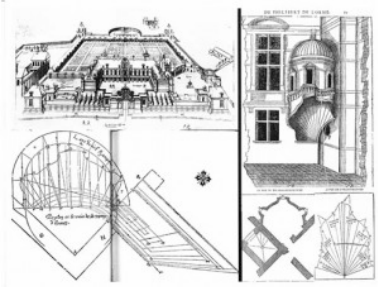
The arch voussoirs for the ribs of a Gothic vault (see figure above) are easily drawn in a plane parallel to their side surfaces. This was usually accomplished by laying them out full size on the tracing floor at the building site, a process which simply and more or less automatically, produced an orthogonal projection of the desired rib. Under these conditions, no special projective techniques were required in order to make the templates needed for cutting the voussoirs to their basic size and shape. Furthermore, since the web or infill stones of a Gothic vault were fitted entirely by trial and error cutting, they too required no special projective techniques.[14] Each such web stone would fit in only one place in the entire vault. In the case of a trompe, however, matters are more complex because all of the planes of the voussoirs (sides, ends, top, and bottom) are oblique to the plan and elevations (if any) in which the trompe is initially conceived and represented.[15] For this reason, the voussoirs of a trompe cannot be shaped without a system of projection or stereotomy. Thus, for de l'Orme, precogitation means being able to work through beforehand on paper a series of specified procedures which will determine the form of the object to be produced and thus the instructions which the architect will give to the artisans (in this case masons) responsible for implementing them.

Furthermore, de l'Orme did not by any means wish to limit precogitation just to those aspects of construction involving masonry. Rather, precogitation was to become the standard

working procedure for the architect on all aspects of a building project. For de l'Orme, precogitation is anticipation. Thus he tells us that it

> "…becomes a great fault to misunderstand [the lord's] enterprise which often is very large, and so expensive that the lord is unable to meet the cost and is thus forced to leave the work incomplete or progress interrupted or suspended so that it becomes necessary [for him] to either sell some land or else to mortgage and borrow…all for want of having anticipated in time and consulted beforehand with learned architects."[16]

As we examine further the development of de l'Orme's program for the precogitating architect, it needs to be emphasized that in the "official" statements in his writings, de l'Orme rationalizes the use of stereotomy entirely in economical terms. However, as we shall see, de l'Orme was as at least as much a product of the stone yard as he was of the academic erudition associated with of the Church. From the story he invents to justify building the king's cabinet on a trompe at Anet, the chateau of the king's mistress, Diane du Poitiers, one gathers that he would resort to almost any convenient fiction in order to create yet another opportunity to build a variant of what was clearly his favorite structure, the conical vault or trompe.[17]



De l'Orme's Chateau of Anet at Eure-et-Loire for Diane du Poitiers; top left, air view from Jacques Androuet du Cerceau's *Les plus excellents bastiments de France* of 1576-9. The remaining illustrations are from de l'Orme's *Le premier tombe de l'architecture* of 1567.

In this case the rationalization was that there was no room for a cabinet in the existing structure, and in any event, the king really required a conference room where he could discuss affairs of State with trusted associates without being overheard. This, mind you, in a building which already had solid, structural stone walls typically two-to-six feet thick!

Given that de l'Orme has no tradition or precedent to which he can appeal in redefining the role and concept of the architect as a kind of commander who gives orders to workers on the basis of imaginative precogitation and knowledge of all the factors which will be involved in construction from costs to building techniques, one might well wonder from what sources he drew his authority for this radical revision of medieval practice. To be sure, one source is nothing but the power of knowledge itself. Thus he tells us that "if the architect or superior who issues orders to master masons and other workers is not well equipped and does not quickly understand the theory and practice [of working drawings] not only what he orders done, but what he most often undertakes will be deformed and ridiculous, as will likewise be his reputation as a slave of the master mason or any worker to whom he will attempt to explain what he desires to correct, or what has been done badly."[18] For this reason, too, de l'Orme insists upon publishing all of the techniques which had hitherto been kept secret by the various guilds associated with building. By contrast, a medieval craftsman was taught to hold even his professional vocabulary closely so he would not be understood by his colleagues in other crafts whose specialized language he likewise never succeeded in decrypting.[19] Indeed, an apprentice could not freely adopt knowledge of which his own masters were ignorant, for that would make the masters appear less competent than the apprentice and thus demonstrate a lack of respect for the masters on the part of the apprentice.

Still, because the power of knowledge could so obviously do violence to the traditional guild/ apprentice system, de l'Orme must have felt the need for a higher justification which, indeed, he found in what might almost be termed a cosmological argument based on what he claimed to have learned from the Renaissance Neoplatonist philosopher, Marcilio Ficino, about the Neoplatonic conception of the Universal Harmony.[20] In the "*Epistre aux lecteurs*" (Epistle to Readers) with which *Le premier tome* opens, de

l'Orme argues that in the ideal world, as opposed to the practical world, command and hierarchy become voluntary alliance and consensual unity of the same sort that is supposed to exist between God and His church. De l'Orme argues his point by resorting to Neoplatonic numerology. Just as there are seven things without which a building could not exist: walls, portals, chimneys, windows, floors, rooms, and roofs, so too there are seven errant stars called planets by means of which God prefigured this architectural truth to us.[21] As de l'Orme develops his argument, the systematic nature of his analogy becomes evident. God is to the world as the sun is to the planets, as the king is to his country and, of course, as the architect is to the artisans who carry out his commands. Likewise, the right angle of the architect's drawing gets its ultimate authority from the Cross. De L'Orme grandiosely summarizes his thesis in the following words:

> Oh grand and wise kindness of God toward man! Oh magnificent and supernatural architect who so much wants to honor architecture and show favor to the architect that you send him the high heavens and pronounce form your sacred mouth the true measures and proportions he should use.[22]

Thus the architect receives his power and authority from God like kings and priests. Ultimately, then, de L'Orme is arguing that the role of the architect as he is defining it is as much a part of the natural order of things as the place of God in the heavens and the sun among the planets. De l'Orme had planned a third book dealing just with architectural proportion and numerology in which these ideas would, no doubt, have been further developed, but he died in 1570 before he was able undertake this project.

Thus we see that, in a certain sense, modern architecture begins with the Renaissance redefinition of the architect as a designer whose anticipatory activities are fundamentally distinct from those involved in construction.

Arles Town Hall Vault by J. H. Mansart. This vault, completed in 1678, demonstrates the virtuosity achieved with stereotomy in seventeenth-century France where it became something of a national symbol. Each vault stone was pre-shaped from drawings to fit the curves of the ceiling.

Up to this point in time, imaginative anticipation was largely limited to the planning of military tactics and indeed many of the first treatises to be published were works dealing with military strategy.[23] It is really with the development of stereotomy, an ongoing process not completed until the publication of Gaspard Monge's work on descriptive geometry at the beginning of the nineteeth century, that architecture embarks upon a technological adventure which has persisted to the present day.[24] At the end of the seventeenth century, the perfection of the science of statics that made it possible for the first time to calculate structural loads constituted the second major contribution to this technicization process. And yet it would not really be correct to think of de l'Orme as a technician in the modern sense because, following his death, there was a period lasting perhaps two hundred years during which stereotomy remained a truly imaginative enterprise and a site for continued architectural invention.

Notes

1. Philibert de L'Orme, *Nouvelles Inventions pour bien bastir et à petits fraiz* (Paris, Federic Morel, 1561) and *Le premier tome de l'architecture* (Paris: Federic Morel, 1567). Both works have been reproduced in facsimile, for which see Pérouse de Montclos, *Philibert De l'Orme Traités d' architecture*. Page references in this

essay are to this edition. To date only a few short fragments of de l'Orme's works have been published in English.

2. De L'Orme's birth date, subject of a long debate, has now been established as being between 3 and 9 June, 1514, partly on the basis of the position of the zodiac in the emblems in his treatises. See Pérouse de Montclos (2000) 19.

3. Potié 16.

4. Potié 15. See also Baumgartner 163ff.

5. de l'Orme, *Nouvelles Inventions,* sig. 35. In all probability, de l'Orme was at this tender age only in charge of general site preparations for the building of fortifications rather than for the construction of ramparts or buildings.

6. de l'Orme, "Epistre dedicatorie" *Le premier tome*, [un-numbered pages 4 and 5]. All translations of de l'Orme from the French are mine.

7. Pérouse de Montclos maintains that this information, which derives from a remark made by de l'Orme, himself, should not be taken as a particularly telling sign of de l'Orme's vanity, as it commonly is. See Pérouse de Montclos (2000) 22.

8. On Brunelleschi's role in the development of Renaissance architecture, see King.

9. de l'Orme, *Le premier tome* Sig. 89v.

10. For example: "*Les apparences sont trompeuses*" (Appearances are deceiving). Randal Cotgrave also gives a number of examples of this use in his 1611 *A Dictionarie of the French and English Tongues*, of which the most interesting is undoubtedly "*Il n'a pas le fouët pour mener cette trompe*" ("He doesn't have the whip to lead this 'trick.'" or, in the terms Cotgrave uses, "He is too weak for such a wench").

11. "One might well disapprove of stairs suspended in the air which are so popular in Paris…They are as solid as the other, but they transgress against the appearance of solidity. It is necessary to be very circumspect about their appearance, because while theory gives us assurance against their apparent lightness, it is prudent for the architect to preserve the verisimilitude of solidity in this type of construction otherwise one is likely to ascend such stairs with uneasiness." See Michel 82. The passage is on page 8 of Cochin's original text, which was published in Paris by Ant. Jombert.

12. The origin of the trompe cannot be attributed to any known architect. As a structural form, it is related to the squinch, one of several architectural forms used to carry circular and octagonal domes over the corners of a square base. The earliest extant squinches, little more than massive stone slabs used as lintels, are found in tombs in the vicinity of the Black Sea and date from Hellenistic times. By the seventh century, cut stone trompes supporting domes already appear in Armenian churches such as St. Hrip'simé at Vagharshapat (618 AD). By the twelfth century the trompe squinch with cut voussoirs is already quite common throughout Europe as a means of resolving the junction between a dome and the square bay of the crossing in Romanesque basilicas. Thus, while de l'Orme is far removed in time and place from the historic origin of the trompe, he is, nevertheless, the first Renaissance architect to focus upon it as a basis for further invention. In so doing he turns the trompe into what amounts to a national symbol of France. In this he is entirely consistent with another of his projects, which was to develop a distinctly French column to add to the five orders of Classical architecture, the Tuscan, Doric, Ionic, Corinthian, and Composite.

13. "Precogitation," my translation of de l'Orme's *précogiter*, is little used today but is still listed in larger dictionaries. It is also one of the translations Cotgrave gives in his *Dictionarie*. De l'Orme also uses the word *prévoir*, meaning to foresee, to forecast.

14. This is proved by the mason's marks on each individual vault stone indicating the quadrant, and neighboring stones with which a given stone was to be placed. Especially in the early Gothic

period, it was normal to use irregularly shaped stones for the webs. This would mean that each web stone could fit in only one place in the entire cathedral, thus making the use of templates derived by stereotomy quite useless, since a different set of templates would be required for cutting each stone!

15. In terms of actual sixteenth century practice, it should be noted that generally the elevations of a trompe were not drawn. This was due, at least in part, to the fact that the geometry of orthogonal projection was not yet sufficiently developed to permit the accurate representation of such complex shapes. Similar difficulties were encountered in trying to draw perspective representations of trompes, as the illustration of de l'Orme's trompe at Anet from his *Premier tome* indicates. The fifteenth and sixteenth centuries thus represented a unique period in the history of European architecture during which it was possible to design and build structures that exceeded the powers of the architect's visual imagination.

16. de l'Orme, *Le premier tome* sig. 7.

17. de l'Orme, *Le premier tome* sig. 88 ff.

18. de l'Orme, *Nouvelles Inventions* sig. 37v.

19. Potié 60.

20. As Wittkower explains, the Florentine Renaissance revived the Greek mathematical understanding of the relationship between God and the world. This was elaborated by the Christian idea that man, as the image of God, embodied the harmonies of the Universe, thus demonstrating the mathematical sympathy between microcosm and macrocosm. See Wittkower16. Frances Yates has pointed out that the movement which is loosely called Renaissance Neoplatonism included a Hermetic and magical core to which Marsilio Ficino (1433-99) gave expression in his *Libri de vita* and to which Pico della Mirandola added Cabalist magic. See Yates 9ff. It is the analogical aspect of this Neoplatonic understanding of the relation between microcosm and macrocosm in Ficino's thought that appears to have been most interesting to de l'Orme. For

example, de l'Orme explains that the crossed lines with which the architect necessarily begins a drawing derive from the Christian cross which is also the first figure God, architect of all, drew upon the world during the Creation:

"Nous disons donc que les Architectes & maistres macons ne scavroient bien comme[n]çer un oeuvre, soit pour faire un plan anise qu'ils le desirent, ou pour faire modelles, ou pour comme[n]çer à trasser & marquer les fondements, que premier ils ne tirent sur une ligne droicte, un autre perpendiculaire, ou traict d'equierre (comme l'appellent les ouvriers) soit simplement, ou dedans la circonference d'yn cercle…il fault tousiours commencer par une ligne perpendiculairement tirée sur une droicte: laquelle represente & figure un character de croix, que est si admirable, que ie ne puis passer outré sans escrire ce que I'en ay appris de Marsile Ficin, & autres excellent philosophes: qui dissent que la figure de deux lignes droictes que s'entrecouppent par le milieu a angles droicts, & representent le character de la croix, a tant esté honoree & estimée des anciens (voire long temps au parava[n]t l'adveneme[n]t de Iesus Christ)…" de l'Orme, *Le premier tome*, sig. 31v. ff.

(Thus we say that architects and master masons will find no better way to begin a work, whether they are drawing a plan of what is desired, making models, or drawing and making foundations, than if at the start they first draw a horizontal line and then a second line perpendicular to it (the draught of the square, as the workers call it) either by itself or within the circumference of a circle…It is always necessary to begin with one line drawn perpendicular to another that is horizontal—a circumstance so miraculous that I cannot pass further without writing what I have learned of it from Marsilio Ficino and other excellent philosophers who say that the figure consisting of two straight lines intersecting at right angles representing the form of a cross was honored and esteemed by the ancients (recognized a long time before the advent of Jesus Christ.) (My translation).

21. de l'Orme, *Le premier tome de l'architecture*, sig. 2-2v reads:

"*Bref l'Architecture est un art & science tres admirable, contenant & embrassant en soi autant de disciplines & artifices que les*

bastiments qu'elle monstre à construire contiennent & reçoiuent en eux de matieres, members & parties. Qui sont en nombre, sept: sçavoir est, Murailles, sans lesquelles le bastiment ne peult estre, ne la seureté des habitans: Portes, pour y entrer: Chiminées, pour le chauffer: Fenestres pour y donner clarté: L'aire & paué, pour le soustenir & cheminer: Plancher ou sont les pouters & soliues, pour fermer & serer les salles, chambers & autres lieux, à fin d'y ester plus chaudement: & pour la derniere & septisme partie, les Couvvertures de charpenterie tuille, ou ardoise, pour couvrir tout les logis & defender les habitans contre les iniures de l'air & des larrons….Il ne fault trouver ce propos estrange, touchant les sept choses necessaries pour la construction & conservation d'un corps de logis, veu que ce grand Architecte de l'univers, Dieu trout puissant, le nous a figure & mostré quad il creé les sept estoilles errates appellées Planettes…"

(In brief, architecture is a most admirable art and science containing and embracing within itself as many disciplines and artifices as the materials, members and parts of the buildings which it shows how to construct. These are seven in number: to wit, walls, without which the building would not exist nor the security of the inhabitants, portals for entry, chimneys for heating, windows for light and air, pavements for support and walking, planks which are the beams and trusses to close and clench the rooms, chambers and other spaces to make them warmer, and for the seventh and last part, the tiled or slate roofs to cover the whole building and to protect the inhabitants against harm from the air and thieves…this remark touching the seven things necessary for the construction and preservation of a dwelling will not seem strange because the grand Architect of the universe, God, all-powerful, figured and showed it to us when he created the seven errant stars called planets.)(My translation).

22. de l'Orme, *Le premier tome*, sig. 4-4v.

23. Potié 55.

24. See Monge. While Monge codified the projection principles of stereotomy, it should not be inferred that his system of descriptive geometry in some sense replaced stereotomy. The projections

required to make the templates used in stereotomy have always been closely related to the practical aspects of stone cutting. As such they require a system of highly complex drawings *("traits"*) which a person knowing only Mongean descriptive geometry would have to devise on his own in order to do stereotomy efficiently. To see why this would be rather impractical, the interested reader might wish to consult Frezier's work of approximately 1200 pages in three volumes which is probably the most complete text on stereotomy ever published. Detailed discussions of Monge's descriptive geometry will be found in Sakarovitch and Taton

Works Cited

Baumgartner, Frederic J. *France in the Sixteenth Century*. New York: Saint Martin's P, 1995.

Cotgrave, Randal. *A Dictionarie of the French and English Tongues*. 1611.

De L'Orme, Philibert. *Nouvelles Inventions pour bien bastir et à petits fraiz,* Paris: Federic Morel, 1561.

_____. *Le premier tome de l'architecture*, Paris: Federic Morel, 1567.

Frezier, Amedee Francois *La theorie et la pratique de la Coupe des pierres et des bois*. Paris: L. H. Guerin, 1737-39.

King, Ross. *Brunelleschi's Dome: How a Renaissance Genius Reinvented Architecture*. New York: Penguin, 2000.

Michel, Christian. *Le voyage d'Italie de Charles-Nicolas Cochin (1758) édité en fac-simile avec une introduction et des notes*. Rome: Ecole Francaise de Rome, 1991.

Monge, Gaspard. *Géométrie descriptive*. Paris: Baudouin, 1800.

Pérouse de Montclos, Jean-Marie. *Philibert De l'Orme: Architecte du Roi (1514-1570)*. Paris: Éditions Mengés, 2000.

_____. *Philibert De l'Orme Traités d' architecture*. Paris: Léonce Laget, 1988.

Potié, Philippe. *Philibert de l'Orme: Figures de la pensée constructive*. Marseille: Editions Parenthèses, 1996.

Sakarovitch, Joël. J*Épures d'architecture: De la coupe des Pierres à la géométrie descriptive XVI—XIX siècles*. Boston: Burkhaüser Verlag, 1998.

Taton, René. *L'oeuvre scientifique de Monge*. Paris: Presses Universitaires de France, 1951.

Wittkower, Rudolph. *Architectural Principles in the Age of Humanism*. New York: W.W. Norton & Company, 1971.

Yates, Frances A. *Theater of the World*. Chicago: U of Chicago P, 1969.