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# Durand and the Science of Architecture

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**This essay addresses some critical issues concerning the systematization of architectural knowledge. The work of Jean-Nicolas-Louis Durand provides a context within which to discuss the degree to which architecture can be subjected to a process of systematization. Durand's work is analyzed by reconstructing the logical steps in the development of his theoretical system. As a result of this reconstruction, some of the key issues of his theory are unveiled. Thus, for example, it will be shown that an idea of type emerges progressively as his theory matures. The examination of Durand's ideas is based not only on his writings, but also on the drawings that illustrate his books. Indeed, an idea that runs through the whole essay is that graphic representations play a crucial role in the systematization of architectural knowledge.**

THE QUEST TO DETERMINE THE SCIENTIFIC NATURE of the discipline of architecture has been a permanent goal in the architectural tradition. During the fifteenth century, Renaissance theorists, under the direct influence of Vitruvius, strove to build a scientific basis for architecture. The complete unity that art and science enjoyed during the Renaissance, began to break down during the course of the following centuries. The seventeenth and eighteenth centuries saw the creation of new scientific disciplines, each one having its own object of knowledge and methods. Knowledge progressed rapidly in the newly created branches of science, and the results of this progress could be seen in the succession of technological achievements that quickly transformed the built environment and life itself.

By the end of the eighteenth century, there was a growing concern that architecture was falling behind the new sciences in terms of progress. As a result, attempts began to be made to construct *a science of architecture*. The work of Jean-Nicolas-Louis Durand (1760–1834) epitomizes this effort to achieve a systematization of architectural

knowledge. The task he set for himself was to discover the generic principles that are implicit in works of architecture. In pursuing that goal, Durand necessarily touched upon some of the dilemmas that are inherent to architecture: particular *versus* general, abstract *versus* physical, subjectivity *versus* objectivity, and art *versus* science. Because of this, his theoretical work transcends the limits of a particular historical period; it has a timeless value that makes it a necessary reference in any discussion about the systematization of architectural knowledge.<sup>1</sup>

## The General Principles of Architecture

Durand's contribution to architecture stems from his activity as a teacher and theoretician. In 1796, he became a professor of architecture at the École Polytechnique. The school had been founded two years earlier with the goal of bringing scientific knowledge closer to practical life. Some of the most prestigious scientific minds of the time, like Monge, Lagrange, and Laplace, were also professors of the Polytechnique. The students of Durand were not architects but rather engineers. Little time was allotted for their architectural training.<sup>2</sup>

Confronted with the task of teaching architecture under these conditions, Durand found it necessary to develop a theory of architecture that could form the basis of his lessons. His theoretical work is summed up in two books: the *Recueil et Parallèle des édifices de tout genre, anciens et modernes*, published between 1799 and 1801, and *Précis des leçons d'architecture données à l'École polytechnique*, published for the first time between 1802 and 1805.

Durand believed that architectural education should not be based on the study of particular buildings or styles: "*It is*

*not in such a manner that one should study architecture.*"<sup>3</sup> For him, the study of any subject, whether scientific or artistic, had to be based on the study of general principles: "*A man who plans a career as a playwright does not learn how to do this or that tragedy; a musician this or that opera; a painter this or that painting. Before composing, in whatever genre, one must know what one composes with.*"<sup>4</sup>

To identify the general principles of architecture, Durand followed a logical path that started by verifying that which confirms unquestionably the existence of architecture itself, that is to say, by recognizing the existence of the buildings of the past. This first step is exemplified by the *Recueil*, in which the buildings from the past are collected and classified. In a second step, the analysis of past buildings revealed their common features, that is, the general principles of architecture.<sup>5</sup>

## General Principles and Classification

During the eighteenth century, an intensive collection and classification of data took place in different disciplines, especially in the natural sciences. Linnaeus's *Species Plantarum* (1753) and Buffon's *Histoire Naturelle* (1749) are the most significant examples of this spirit of classification that dominated the epoch. In both books, drawings of plants and animals appear organized in tables according to different criteria. Linnaeus's classification was based on the reproductive organs of plants, while Buffon used the historical evolution of animals as the basis of his classification system.<sup>6</sup>

Classification and systematics also influenced architecture. Some of the architecture books of the time show buildings organized in tables in much the same way that animals or plants were shown in biology books. A significant example of this

kind of work is the book *Ruines des plus beaux monuments de la Grèce* by Julien-David Leroy, first published in 1758. In a table that appeared in the 1770 edition of the book, Leroy showed the temples of the past drawn in plan view and at the same scale<sup>7</sup> (Figure 1).

In their quest for systematization, both the biologist and the architectural theorist were using similar conceptual categories; the *species* of the natural sciences corresponding to *type* in architecture. By means of these categories, it was possible to transcend the study of separate individual examples and to discover more generic principles that lay behind them. Classification, therefore, was a technique for extracting general principles from particular cases.<sup>8</sup>

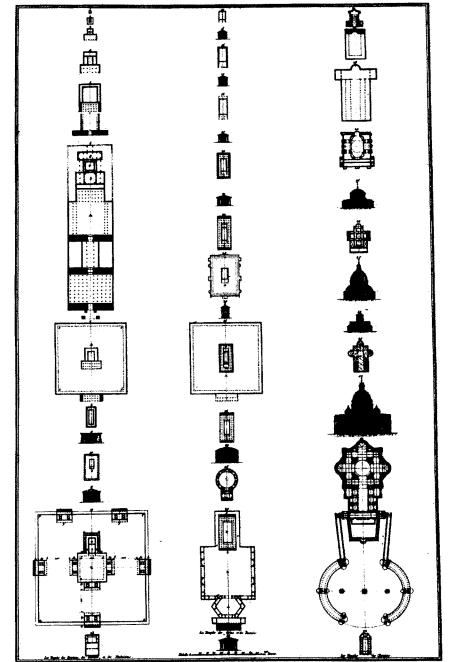
### Durand's *Recueil*: History versus Theory

Similar to Leroy's book, Durand's *Recueil* also shows the buildings of the past grouped according to certain classes. The categories Durand used generally fall within two major groups: historical (Egyptian temples, Roman palaces, Moorish details) and functional (theaters, markets, hospitals). There is, however, one plate in the book that falls outside these two main categories. The title of the third plate is: "Round temples" (Figure 2). This is not a historical or functional classification, but rather one that considers form as a distinctive feature of a building.<sup>9</sup> This significant exception among the plates of the *Recueil* opens a new path of theoretical development and anticipates the direction that Durand took in his next book, the *Précis des leçons*.

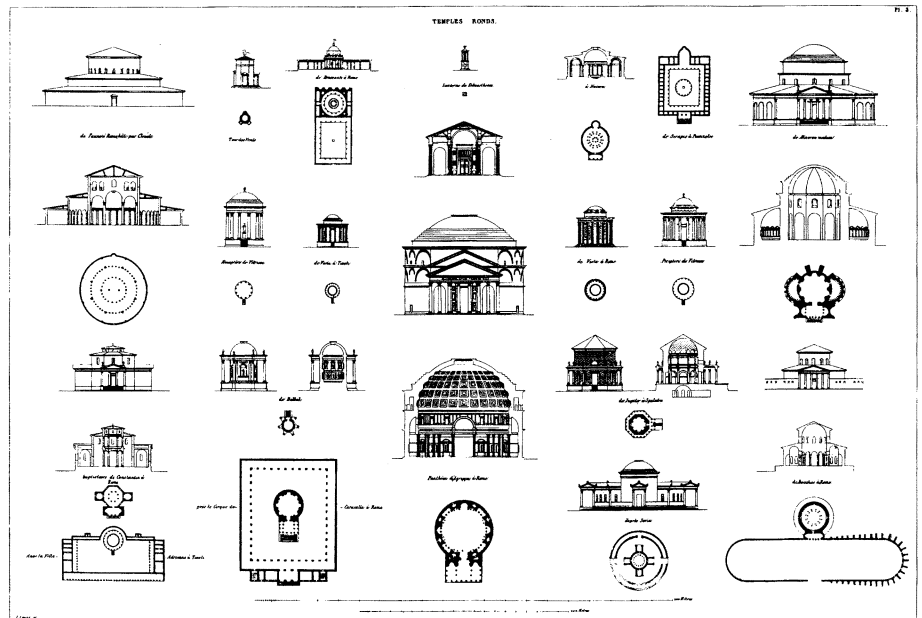
What the classification of buildings according to form also indicates is that in spite of its appearance, the *Recueil* cannot be considered a purely descriptive archaeo-

logical survey. This suspicion is further confirmed by the fact that Durand consciously modified some of the plans to make them appear more regular and geometric than they actually were. In the plates that correspond to the Roman ruins, for example, it can be seen that the drawings are not so much a faithful description of some old buildings as idealized images of them. His justification for this was that the drawings of the Roman ruins made by other authors before him, like those made by Palladio or Piranesi, could also not be considered authentic.<sup>10</sup>

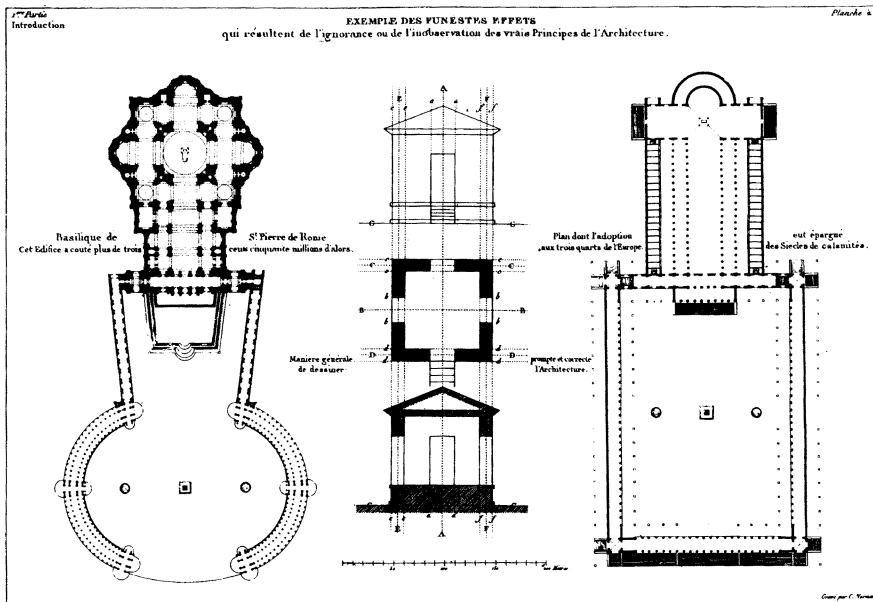
It can be asserted that what Durand was intending with the simplification and regularization of the drawings was to use the individual buildings to illustrate some generic principles of architecture. This is the reason he found it necessary to eliminate individual or accidental traits by subjecting the representations of buildings to a process or regularization. In this context,



1. J.-D. Leroy, comparative analysis of temples and churches, 1770.



2. J.N.L. Durand, *Temples ronds*, *Recueil et Parallèle des édifices*, 1801.



3. J.N.L. Durand, *Exemple des funestes effets qui résultent de l'ignorance ou de l'inobservation des vrais Principes de l'Architecture*, *Précis des leçons*, 1819.

antique buildings provide the ground material for Durand from which he made a case about the systematization of architectural knowledge.

With the *Recueil*, Durand initiated a dialectic relationship between past and present that would continue in his next book, the *Précis des leçons*. The second plate of the *Précis* shows the plan of Saint Peter's and next to it, another plan that is an invention of Durand's. It is based on the original basilica that once stood on the same spot where the Basilica of Saint Peter's was built (Figure 3).

In accordance with the tendency to simplify existing buildings, as demonstrated in the *Recueil*, a different interpretation of the relationship between the two plans depicted in the plate can be made. The plan proposed by Durand could also be understood as a simplification created after the existing plan of Saint Peter's, the purpose being to reveal the true principles

that underlie the complex forms of the actual design. Thus, the plan that Durand proposed is the illustration of those principles that, according to him, were neglected by the architects of Saint Peter's. These principles are based on the economy of means exemplified by the use of grids, simple geometric figures, and simple building types.

According to Durand's interpretation of the history of architecture, even though true principles had existed in the past, a progressive distancing from those original principles had occurred as architecture evolved. The complex forms of the existing temple of Saint Peter's, therefore, were to him nothing more than a derivation of some original and simple forms.

Behind Durand's interpretation of history lies a concept of type that, as will be shown in the following pages, constitutes one of the main pillars of his theoretical construct. This concept of type is

based on the distinction between, on the one side, simple, geometric forms and, on the other, complex and more architectural ones. According to this distinction, a type corresponds to a simple, geometric form, from which more elaborate forms can be derived. It is this concept of type that epitomizes the genuine principles of architecture that Durand pretended to find.

### The Elements of Architecture

To determine the fundamental principles of architecture, it was first necessary to establish the basic elements that characterize it as a discipline. Effectively, just as Euclidean geometry begins with the definition of the point and the line, architecture also needed to have its own axiomatic elements.

The fundamental elements of a building and, by extension, of architecture were for Durand those that can be found in any building, regardless of its style or epoch. Thus, he argued, the simplest elements that can be found in most buildings include walls and openings, columns and the parts to which they give support, slabs and roofs, and vaults. These are the *éléments des édifices* (Figure 4). Porches, lobbies, stairs, lounges, and courts are those parts of the buildings, or *parties*, which result from the combination of the simplest elements. Finally, the last step is the *ensemble des édifices*, which means to combine the *parties* to produce a building.<sup>11</sup>

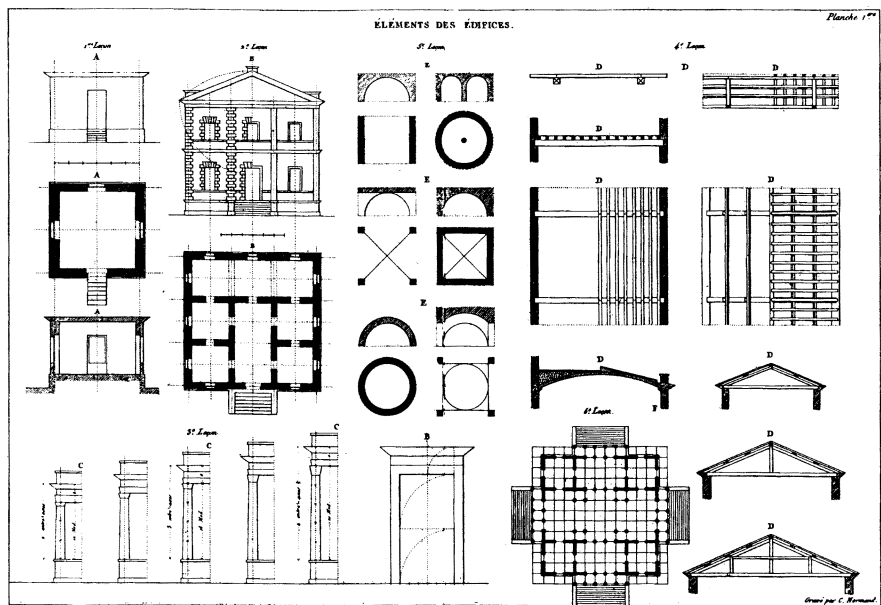
Durand considers the *éléments des édifices* to be "that which words are to discourse, and notes are to music."<sup>12</sup> However, the comparison of language or music with architecture is not completely justified in this case because words and notes are purely abstract symbols, whereas Durand's *éléments des édifices* (walls, columns, and vaults) are not abstractions, but rather physical components that make up a building.

At this point in his theoretical discourse, Durand ran across one of the permanent dilemmas of architecture: the separation between the *abstract* and the *physical* realms.<sup>13</sup> He responded to this dilemma immediately after defining the *éléments*, when he wrote that the study of those elements will be considered from two points of view: first, with regard to materials and construction, and, second, form and proportions.

The illustration of the elements reflects this separation of the abstract and physical realms (Figure 4). Some elements, like the pitched roofs and slabs, are depicted in much the same way as they would appear in a construction manual. The drawings of vaults, on the other hand, are more conceptual and schematic. They are reduced to geometric figures and symbols.

In the light of Durand's elements, a distinction between building and architecture has to be made. As the title of the plate properly indicates, Durand's elements are in fact the elements of buildings, but they could barely become the elements of architecture. Hence, walls and vaults, considered as physical components, could constitute the elements of a *building science* but not of a *science of architecture*. To establish a science of architecture, its basic elements should be abstract rather than physical.<sup>14</sup>

Apart from the separation between abstract and physical realms, Durand faced a second issue in his attempt to define the elements common to all buildings; that of the classical orders. Because Durand had previously acknowledged in the *Recueil* that there are buildings in the past that do not derive from the Greek classical model, considering the parts of the classical order as fundamental elements would contradict the basic premise that the elements should pertain to *any* building. However, a look at the illustration shows that, together with



4. J.N.L. Durand, *Les éléments des édifices*, Partie Graphique, 1821.

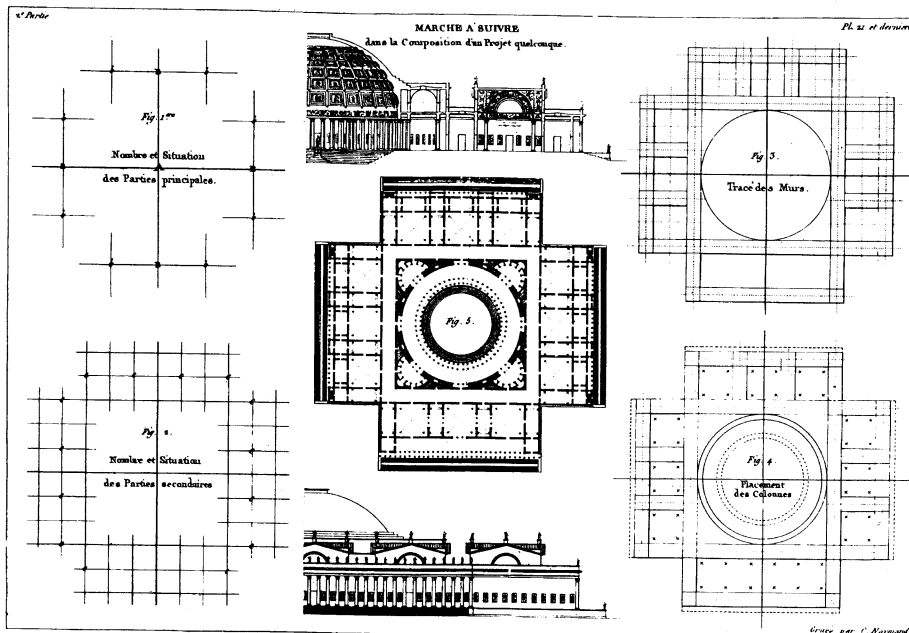
the schematic representations of vaults and the more detailed ones of other building components, the drawings of columns appear, which still carry connotations of the classical language. In this case, the illustration reveals some unresolved issues in Durand's theoretical construct.

The conflictive issues that are implicit in the definition of elements adopted by Durand are revealed in the next step of the development of his theoretical construct, namely at the moment that he introduces a generic method of composition to produce buildings. As we will see in the next section, faced with the difficulty of defining abstractions that are specific to architecture, Durand turned to geometry to borrow its abstractions. Only then was it possible for architecture to exist in the realm of abstraction, making attempts to convert it into a scientific discipline meaningful. The price for borrowing these abstractions, however, may be that some of the essential character-

istics of architecture are lost when architecture is represented through the abstractions of another discipline.

### The Method of Composition

Once the elements of architecture have been defined, the next logical step, according to Durand's strategy, is to define a method of composition by which the most primitive elements may be combined, in a logical fashion, into more complex ones to produce a building. The definition of architecture at the beginning of the *Précis* is consistent with this principle of composition: "Architecture is the art of composing and executing all public and private buildings."<sup>15</sup> To design, then, is to compose, that is to say, to combine some previously determined elements according to certain procedures that can be made explicit.<sup>16</sup>



5. J.N.L. Durand, *Marché à suivre dans la composition d'un Projet quelconque*, Précis des leçons, 1813.

*Method to Follow in the Composition of Any Project*

In the didactic manner that characterizes his whole work, Durand describes the method graphically as a step-by-step process. This method is illustrated in the last plate of the first volume under the title “*Marché à suivre dans la composition d'un Projet quelconque.*”

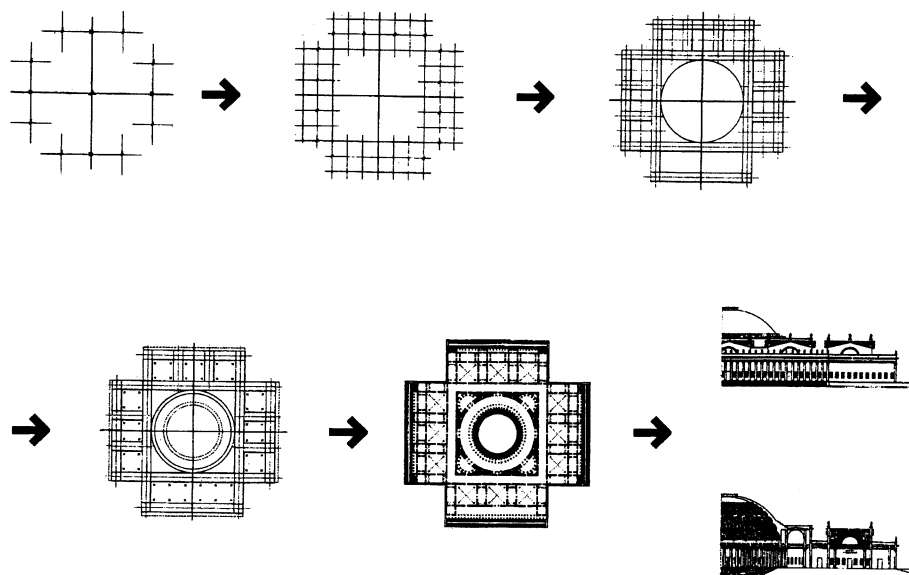
At first sight, it looks as if the purpose of the method is to produce a neo-classical building in a logical way. This is not the case, however, because the goal that Durand is pursuing with his method is independent of stylistic considerations.

The process described in the plate is based on six stages (Figure 5). The first stage consists of the layout of the main axes of the composition (*nombre et situation des parties principales*). In the second stage, a new grid of secondary axes complements the primary ones (*nombre et situation des parties secondaires*). Then, walls are laid out along the axes (*tracé des murs*), and columns are placed within the areas bounded by walls (*placement des colonnes*). In the fifth stage, the walls, porticoes, stairs, and other architectural elements are drawn in plan view. Finally, the elevation and the section are generated from the plan.

A fundamental aspect of the method is the fact that it can be described by means of a graphic. The graphic, in this case, is much more than a mere illustration of a procedure that could be described by other means; it is the expression of an architectural concept by means that are exclusively architectural. Because of this, a detailed analysis of the illustration is not only pertinent, but also necessary to assess the scope of the method proposed by Durand.

*Analysis of the Illustrated Method*

Although Durand's previous taxonomy (*éléments des édifices-parties-ensemble des*



6. Method of composition in the order proposed by Durand.

*édifices*) might suggest that a method of composition should start with the selection of a set of architectural elements, his method does not reflect this. The illustrated method does not start with a selection of walls and vaults, for example. Rather, it starts with a geometric scheme made up of lines in plan view. Moreover, the idea of a method being a set of rules for combining simple elements into more complex ones cannot be derived from the illustration either. Durand's method does not explain how to combine walls and domes into lobbies or porches.<sup>17</sup>

What Durand actually described is a step-by-step transformation of a rough scheme into a detailed representation of a building, that is to say, a transformation of geometry into architecture (Figure 6). At the beginning of the process, the basic features of the design are determined by means of geometric elements in plan view. Then the points and lines of the scheme are replaced by representations of architectural elements, such as columns and walls. At the end of the process, a reference to some architectural form and style is made through the explicit representations of architectural elements in section and elevation.<sup>18</sup>

To be consistent with the idea of a composition being a combination of elements and rules, Durand's method should

have started with a set of architectural elements rather than with geometric lines. However, those architectural elements would have inevitably carried connotations of a certain architectural form or style. This is precisely what Durand tried to avoid because the purpose of his method is to exemplify some fundamental principles of architecture. As the title of the illustration claims, the method needs to be universal; it cannot be specific to a particular style.

Geometric elements, unlike representations of architectural form, are not tied to a particular style; they underlie all architectural forms regardless of style or epoch. It is because of this that the method starts with lines rather than with representations of walls, columns, or vaults. Therefore, geometric lines, rather than walls and domes, constitute the fundamental elements of the discipline of architecture.

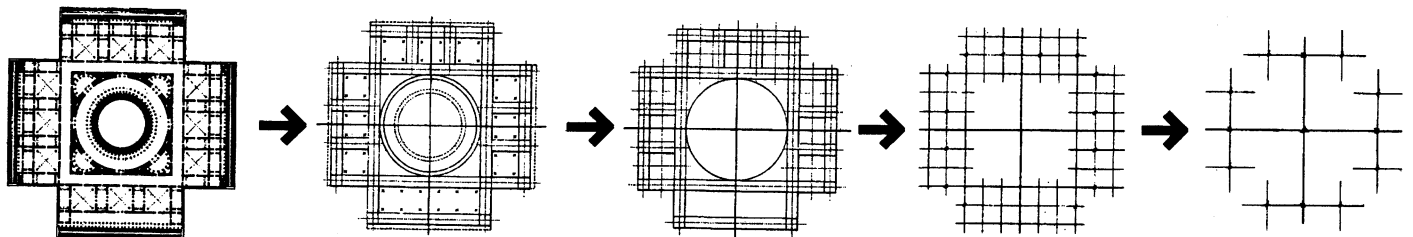
Effectively, this means that, in much the same way that mathematical operations rely on the existence of numbers as abstractions, a method for designing a building also needs a set of fundamental abstractions that are specific to the discipline of architecture. In the absence of those abstractions, Durand turns to geometry to borrow from it, the fundamental elements of architecture. However, by doing that, Durand raises some doubts about whether

it is possible for a genuine “science of architecture” to exist.

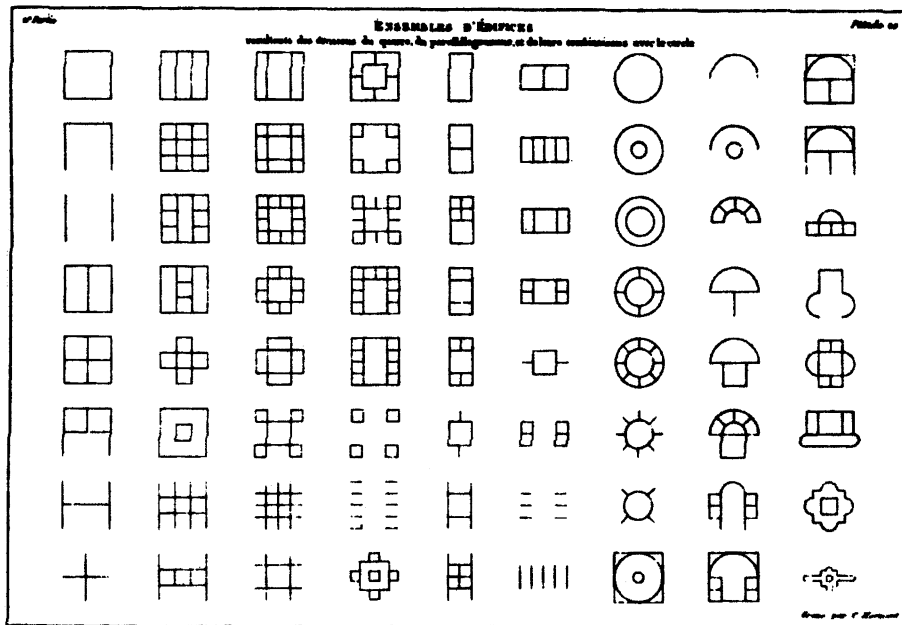
More than anything else, Durand's illustration of the method of composition should be taken as an expression of his perception of the relationship between architecture and geometry—one of the constant issues of debate in the architectural tradition. The question that the illustration raises is where and how the boundary between architecture and geometry can be defined, or in other words, where geometry stops and architecture begins in the process of design.

#### *Looking at the Process in Reverse*

Because, as Durand maintained, geometric elements underlie all architectural forms, they can be considered the fundamental elements of architecture. Geometric schemes, therefore, are the result of a process of abstraction of architectural forms. This relationship between architecture and geometry is manifested more clearly when the order of the transformations in Durand's method is reversed (Figure 7). This is, in fact, a more accurate way to read the illustration because the process does not *conclude* with the creation of the final design, as Durand pretends, but rather *starts* from the design of an existing project made by the architect Percier.<sup>19</sup>



7. Durand's method of composition reversed.



8. J.N.L. Durand, *Ensembles d'édifices résultants des divisions du carré, du parallélogramme et de leurs combinaisons avec le cercle*, *Précis des leçons*, 1802.

When the order of the transformations is reversed, the plan based on the existing design becomes the first stage in the process. The next step is to minimize any references to a particular style so the design is reduced to a plan made up of basic architectural elements, such as walls and columns. It is possible to create an even more abstract representation of a building by replacing the walls and columns with pure geometric elements, for example, a set of axes and an orthogonal grid. By continuing with the process of abstraction, the essential characteristics of the design are revealed when all references to architectural form have been eliminated, leaving only the geometric scheme.

### The Discovery of the Type

In his article, "On the Typology of Architecture," Giulio Carlo Argan writes that "in

the process of comparing and superimposing individual forms so as to determine the 'type,' particular characteristics of each individual building are eliminated and only those remain which are common to every unit of the series. The 'type' therefore, is formed through a process of reducing a complex of formal variants to a common root form. [The type] has to be understood as the interior structure of a form or as a principle which contains the possibility of infinite formal variation and further structural modification of the type itself."<sup>20</sup>

According to the method described by Durand, the fundamental properties of a design are already present in the geometric scheme of the plan. In the illustration of the method of composition (Figure 5), the cross shape is one of the fundamental properties of the design. In spite of the formal transformations that take place in the process of composition, the characteristic cross shape can be recognized in every

stage of that process. This suggests that the initial geometric scheme can be considered the *type*, according to Argan's definition.

As was discussed earlier, Durand's initial intent was to present geometric figures as an abstraction of architectural form; that is, the geometric scheme is the result of "reducing a complex of formal variants to a common root form," using Argan's terms. In the illustrations of the later editions of the *Précis*, however, the geometric scheme becomes the generator of the architectural form, rather than a by-product of it. At that point, the geometric figure becomes the "principle which contains the possibility of infinite formal variation and further structural modification of the type itself," as Argan contends. This change in the relationship between geometric figure and architectural form can be traced through the evolution of the plates of the successive editions of the *Précis*.

### Type and Geometric Figures

The first edition of the *Précis* in 1802 includes a plate named *Ensembles d'édifices résultants des divisions du carré, du parallélogramme et de leurs combinaisons avec le cercle* (Figure 8). In spite of the title, there are no buildings represented in this illustration; only geometric figures. It can be assumed, however, that each one of the figures is the abstraction of one or more buildings, as it is the case with the illustration of the *marche à suivre* (Figure 5).

In a new edition of the *Précis*, the so-called *Nouveau Précis* that appeared in 1813, the former plate is replaced by a new one (Figure 9), which shows geometric elements and buildings together.<sup>21</sup> The correspondence between geometric figures and buildings is made explicit. In most of the illustrations, this correspondence is univocal; that is, for every building, there is one geometric figure assigned to it. In a

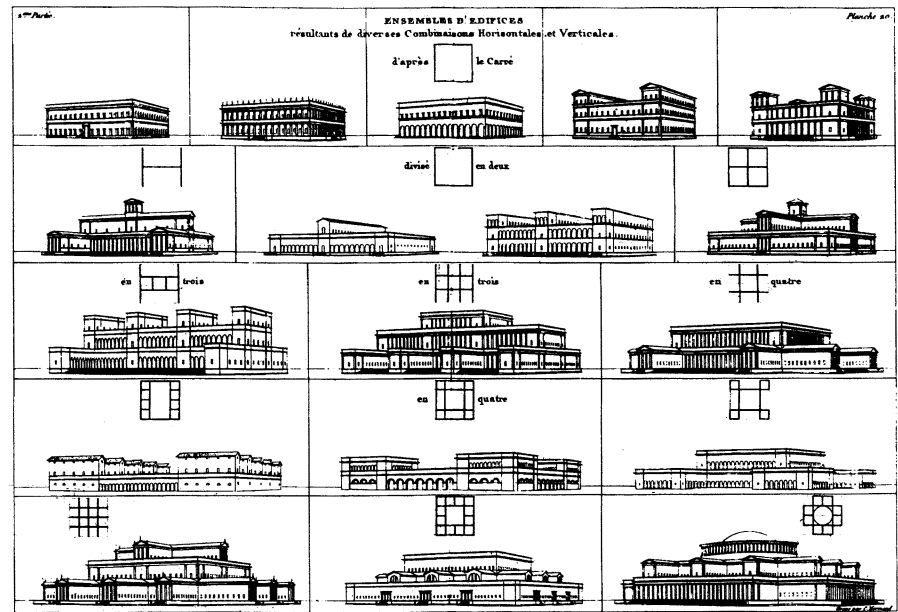


few other examples, several buildings correspond to only one geometric figure.

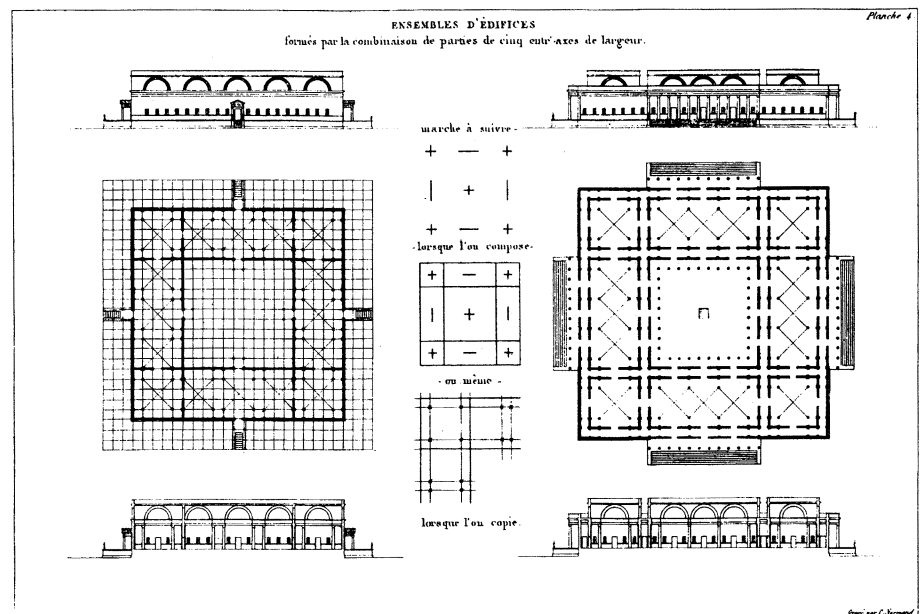
A step further in the changing relationship between buildings and geometric figures is taken in the drawings of the *Partie Graphique des cours d'architecture*, which appeared in 1821. In the plate titled *Ensembles d'édifices formés par la combinaison de parties de cinq entr'-axes de largeur* (Figure 10), the geometric schemes are drawn in the center of the illustration. Two different buildings are represented in plan, section, and elevation on either side of the schema. In much the same fashion that is illustrated in the plate of the *marche à suivre*, this plate also describes a process for arriving at architectural form from an initial geometric scheme. The starting point, in this case, is represented by a scheme made up of five points, one placed at each of the four corners and the center of the square. The corners are, in turn, connected by lines. Two more abstract schemes follow the first one, suggesting a step-by-step progression toward the final architectural plan. However, unlike the illustration of the previous method of composition, the process results in *two* different architectural plans, rather than one.

In summary, while in the first edition of the *Précis* the geometric scheme is just the abstraction of the architectural form (Figure 11), in the later editions, this process is inverted. The geometric figure is no longer a simplification of an existing architectural form, but rather the starting point for the creation process of a design (Figure 12). Therefore, it can be affirmed that an idea of type, in the terms expressed by Argan, is implicit in Durand theories, even though he did not use the term in his writings.<sup>22</sup>

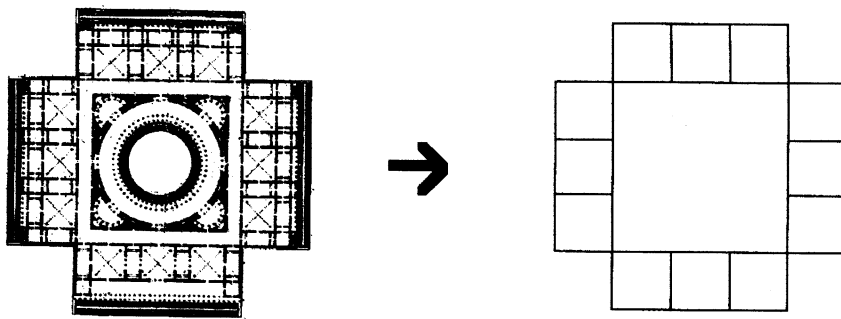
For Argan, the concept of type conveys a distinction between objectivity and subjectivity in the design process. The objective part of the design process is repre-



9. J.N.L. Durand, *Ensembles d'édifices, Précis des leçons*, 1813.

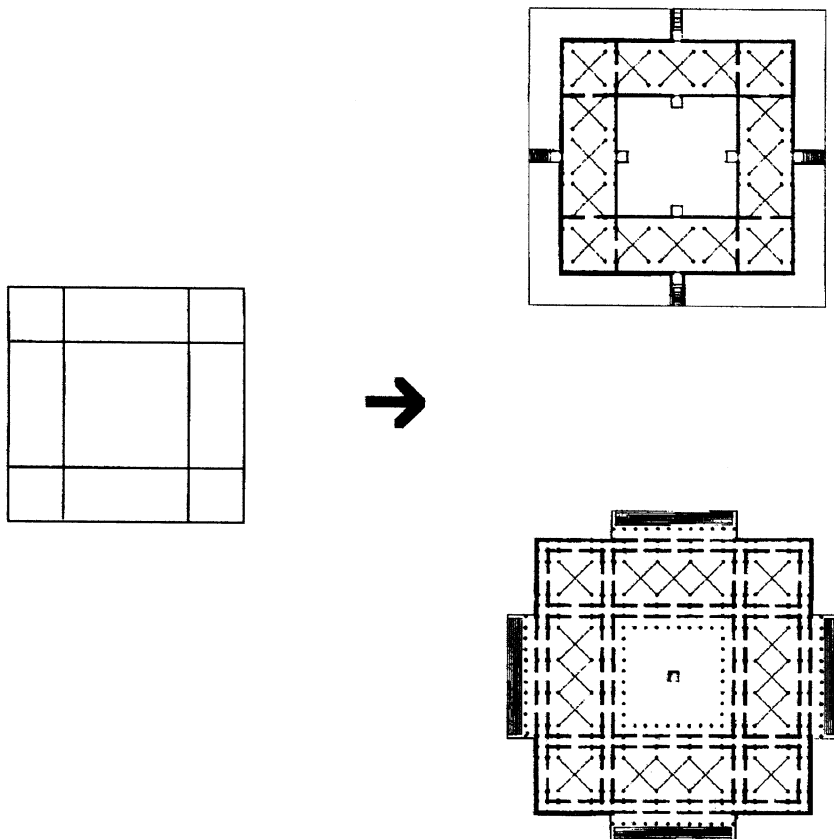


10. J.N.L. Durand, *Ensembles d'édifices, Partie Graphique*, 1821.



11. The geometric scheme is the result of the abstraction of architectural form.

sented by the selection of a type. The subjective part corresponds to the creation of formal variations that can be derived from the type. A similar separation between objective and subjective process is implicit in Durand's plate of the *Ensemble d'édifices* (Figure 10). The process of composition starts by selecting a geometric figure, in this case the square. This is the objective part of the process. The subjective part is exemplified by the two formal variations that, among many others, can be created from the initial geometric figure type.



12. Different architectural forms derived from the same geometric scheme.

### Architecture: Art and Science

In a passage of the *Précis*, Durand reflects on the double artistic and scientific nature of architecture:<sup>23</sup> *Architecture is a science and an art all at the same time: like a science, architecture demands knowledge; like art, it requires talent. Talent is none other than the just and easy application of knowledge. This correctness and facility cannot be acquired except by sustained exercise and multiple applications. In the sciences, one can know something perfectly after having done it a single time. But in the arts, one cannot know how to execute something well without having done so a considerable number of times.*<sup>24</sup>

The division between objective and subjective components in architecture is expressed here as an opposition between science and art. For Durand, science is based on generic principles: those that, like the Pythagorean theorem in geometry, need only be defined once.<sup>25</sup> However, in architecture, unlike the sciences, the accumulation of individual works over time does not result in an objective body of knowledge. There is also an artistic component in architecture, which is based on particular applications rather than generic principles.

Even though Durand admits to the double nature of architecture, artistic and scientific, he cannot mask his predilection for generic principles. In effect, he maintains that the architect should first learn the fundamental principles and then apply them many times “with talent.” These fundamental principles are precisely what Durand is searching for architecture. Architectural knowledge, Durand seems to reason, is inseparable from the individual works and their authors. He attempted to formalize that knowledge, that is, to make it generic and explicit.

One way to prove that architectural knowledge can be made objective is by defining methods for creating buildings. After a method or methods have been created, architectural knowledge is no longer embedded in the buildings themselves, but rather in the procedures used to create them. By codifying architectural knowledge in the form of a method, it becomes objective: it can be transmitted to and be applied by other architects; in other words, it becomes scientific. As a result, architects would not need to learn architecture by studying the works of the past, but rather by learning and practicing abstract methods of design. According to Durand, only then could architecture be taught properly in the schools of architecture.

The idea of method can be considered the cornerstone of Durand’s theories and his main contribution to the architectural debate. In effect, the idea that the design of a building is the result of a rational procedure had not been suggested in such a bold manner by anybody before Durand. In a broader cultural context, Durand’s theoretical system expresses the changes that science in general and architecture in particular underwent between the fifteenth and eighteenth centuries. By the beginning of the nineteenth century, architecture could no longer stand as a link between the

world of nature and the artificial world of human-made creations. Architecture became part of a system of abstract ideas and concepts, self-sufficient and detached from the natural world, its ultimate purpose to replace nature itself.<sup>26</sup>

### Architecture: Buildings or Methods

Durand’s attempt to systematize architecture had a notable precedent in the work carried out by Palladio in the *Quattro Libri*. Both Durand and Palladio attempted to arrive at some generic principles of architecture that transcended individual works, and both attempted to express those principles by graphic means.<sup>27</sup>

Palladio showed most of his designs for villas together in the second book of his *Quattro Libri*. The different villas were redrawn in a consistent manner, emphasizing the aspects that were common to all of them and eliminating some of the irregularities, just as Durand did later in his books. Also, as was the case with Durand, Palladio was not interested in showing the particularities of his designs, but rather in using them as a vehicle for expressing some of what he believed to be the fundamental principles of architecture.

In spite of their different backgrounds, Palladio being a practical architect and Durand a theorist, the ultimate goal of both texts, the *Quattro Libri* and the *Précis*, was identical: to determine some general principles of architecture. To achieve that goal, Palladio began with the particular cases and finished, eventually, with the definition of some generic principles. Durand, on the other hand, did the opposite: his primary goal was to define generic principles that embody the procedures for, in a second step, creating a building.

Therefore, even though the underlying motivation of both works might be identical, Durand and Palladio’s approaches can be considered antithetical in another regard because, in contrast to Durand, Palladio searches first for the general principles through experimentation with his own designs. At a certain point in this process he was able to design a building, the Villa Rotonda, which embodies his whole architectural theory. Expressing generic principles with a single building, as Palladio does with the Villa Rotonda, is totally alien to Durand’s approach, which is based on the predominance of the generic procedure over the individual building. The application of the sort of composition mechanism that is proposed by Durand can lead to endless variations of a single theme. However, a generic procedure cannot guarantee the sort of singular building that stands as a symbol of a whole culture, as is the case with Palladio’s Villa Rotonda.<sup>28</sup>

### Conclusion

The underlying motivations that led Durand to develop his theoretical system were not exclusive to his time; they are an active part of our culture. Few areas of knowledge have escaped the process of scientification that has occurred over the last two hundred years. In the last thirty years alone, attempts to achieve a formalization of architectural knowledge have intensified. Although the motivations have been different, the common denominator behind these attempts has been to replace individual and subjective works with generic and objective procedures.<sup>29</sup> Surprisingly, *architecture* has shown some resistance against such attempts. The result of these formalizations has not necessarily been better architecture, but rather no architecture at all. Therefore, what we can

still learn from Durand is that the existence of architecture might depend on the permanence of those unsolvable dilemmas he touched on in the process of building up his theory. If this is so, we might as well acknowledge that the ultimate consequence of making architectural knowledge objective and explicit is to consummate the death of architecture.

### Acknowledgments

In the summer of 1991, Professor Werner Oechslin and Professor Gerhard Schmitt, from the Department of Architecture at the Swiss Federal Institute of Technology (ETH), Zurich, organized an exhibition under the title of *Lineamenta-CAAD: Instrumente einer Architekturwissenschaft*. At that time, I had been involved in the development and implementation of a theoretical framework for a course at the ETH Zurich aimed at bringing together design and computers. The course was built on the concept of type.

As a result of seeing the plate of Durand's method of composition that Werner Oechslin displayed in the historical section of the exhibition, I "discovered" Durand and became interested in studying his work. I am therefore thankful to Professor Oechslin for having reintroduced me to Durand's work and for the subsequent opportunities of discussing various aspects of the work presented here. I would like to thank Gerhard Schmitt for providing an atmosphere conducive to work and study. My special thanks to Sharon Refvem for her comments in reference to this text.

### Notes

1. Interests in method and systematization seem to be symptomatic of a moment of crisis. Faced with a conflictive situation, the reaction from the architectural discipline shows an introspection directed at identifying the origin of the problem in order to solve it. It is precisely the sense of crisis that explains the interest in method, in *how* to make architecture. This sense of crisis was present at the end of the eighteenth century, as classical language started to lose its exclusivity as the only possible model for architecture. Also, around 1970, after the great masters of the Modern Movement had disappeared, architecture entered a new period and again the method, rather than the buildings, became the center of attention.

2. Werner Szambien, *Jean-Nicolas-Louis Durand, 1760–1834. De l'imitation à la norme* (Paris: Picard, 1984), p. 69. Engineering students at the École Polytechnique spent one in seven lecture hours in Durand's course.

3. Jean-Nicolas-Louis Durand, *Précis des leçons d'architecture données à l'École Royale Polytechnique*, vol. 1 (Paris, 1819), p. 28.

4. *Ibid.*, p. 28.

5. Durand's overall strategy to define the fundamental principles of the discipline of architecture, from the most simple elements to the methods to operate on them, is still a reflection of the rationalism that dominated European culture in the preceding centuries and, particularly, of the ideas developed by Descartes in the domain of philosophy. In the *Discours de la méthode*, published in 1637, Descartes set up his four basic rules that should serve as a guide for the mind to solve any kind of problem:

- The first rule was never to accept anything as true that I did not know evidently to be so. . . .
- The second, to divide each of the difficulties I was examining into as many parts as possible and as is required to solve them best (*rule of analysis*).
- The third, to conduct my thoughts in an orderly fashion, commencing with the simplest and the easiest to know objects, to rise gradually, as by degrees, to the knowledge of the most composite things (*rule of synthesis*).
- And last, everywhere to make enumerations so complete and reviews so general that I would be sure of having omitted nothing (*rule of enumeration*).

Durand seems to follow these four rules in his attempt to determine the fundamental principles

of architecture. According to the first rule, the first step is to recognize what defines architecture in a way that cannot be denied, that is to say, to start with the study of the existing buildings. It is for that reason that the theoretical work of Durand must start with the *Recueil*. Then, it is possible to define the fundamental elements of architecture by *analyzing* the buildings of the past. The method of composition that Durand introduces later, aims at *synthesizing* those elements in order to create a building. Finally, the possible combinations that can be achieved by applying the method of composition are *enumerated* in the engravings of the *Précis*.

6. Peter Collins, *Changing Ideals in Modern Architecture* (Montreal: McGill-Queen's University Press, 1965), p. 149.

7. Szambien, *J.N.L. Durand*, p. 28. Szambien shows some illustrations that preceded the one by Leroy—Most notably, an illustration by J.-A. Meissonnier that showed temples at the same scale but in elevation view. Leroy is the first to show temples from different periods of the past in the same scale and in plan view. Collins, *Changing Ideals in Modern Architecture*, p. 82, writes, "Being an architect by training, Leroy was faced with a dilemma, new to the age, of deciding whether the ruins of antiquity were to be studied as architectural history or architectural theory; for he had the perspicacity to see that the two were not the same thing. He therefore divided his book in two parts, and in the second dealing with theory, he suggested that the whole question of the proportions of the Orders might require renewed study in the light of his own research." For Collins, Leroy's illustration made it necessary to distinguish, for the first time in modern history, between the history and the theory of architecture.

8. Philip Steadman, *The Evolution of Designs* (Cambridge: Cambridge University Press, 1979), p. 29, has contended, "The practical purpose of classification in architecture, beyond historical description and scientific analysis, lies in the hope that out of an ordering of the variety of buildings of the past will come theoretical principles, which may be applied in designing new buildings, of new forms, to answer new programmes and new circumstances."

9. A significant precedent in classifying buildings according to their form was established by Sebastiano Serlio, *The Five Books of Architecture* (New York: Dover, 1982; reprint of the English edition of 1611). In the fifth book, Serlio showed a selection of temples and churches that starts with the ideal form of the Renaissance, the circle.

10. Szambien, *J.N.L. Durand*, p. 96.

11. In 1902, almost a century later than Durand, Julien Guadet made a distinction between the *elements of architecture* and the *elements of composition*. Walls, roofs, and domes, for example, are elements of architecture. Rooms, lobbies, and stairs are elements of composition. Translated and quoted in Reyner Banham, *Theory and Design in the First Machine Age* (New York: Praeger, 1960), p. 20.

12. Durand, *Précis*, vol. 1, p. 29. It does not seem reasonable to conclude from his reference to words and notes that Durand's theory is based on a sophisticated linguistic model. What Durand tried to express by means of this analogy to language and music was the idea of *composition* in its most intuitive form, that is, as the process by which complex parts are created from simple ones.

13. The discussion regarding the division of architecture into physical and conceptual realms has a long tradition in French theory and is directly related to the debate about the scientific nature of architecture. Claude Perrault, in his *Ordonnance des cinq espèces de colonnes selon la méthode des Anciens*, published in 1683, wrote that "one must suppose two kinds of beauty in architecture and know which beauties are based on convincing reasons and which depend only on prejudice. . . . Against the beauties I call positive and convincing, I set those I call arbitrary." For the English translation, see Claude Perrault, *Ordonnance for the Five Kinds of Columns after the Method of the Ancients*, trans. Indra Kagis McEwen (Santa Monica, CA: The Getty Center, 1993), pp. 50, 51. Perrault's distinction between positive and arbitrary beauty conveyed a separation between physical and abstract components in architecture. At the turn of the eighteenth century, André Felibien, Michel de Frémin, and Abbé Cordemoy coincided in considering architecture mainly as an *art de bâtir*. Marc-Antoine Laugier also considered the basic elements of architecture to belong to the physical realm. In his *Essai sur l'architecture*, first published in 1753, he writes that "the parts of an architectural Order are the very components of the building; they must therefore be employed in such a way as not only to decorate a building but to constitute it, whereby if a single element is removed, the whole building will collapse." Translated and quoted in Collins, *Changing Ideals*, pp. 200–201. Still, by the end of the eighteenth century, there were voices that rejected the idea of an architecture considered mainly as the art of building. Among them was Etienne-Louis Boullée, who had a direct influence on Durand. He held the opinion that physical aspects were secondary to conceptual ones. In his *Essai sur l'art* (Paris: Hermann, 1968), p. 49, he writes:

"Qu'est-ce que l'architecture? La définirai-je avec Vitruve l'art de bâtir? Non. Il y a dans cette définition une erreur grossière. Vitruve prend l'effet pour la cause. Il faut concevoir pour effectuer. Nos premiers pères n'ont bâti leurs cabanes qu'après en avoir conçu l'image. C'est cette production de l'esprit, c'est cette création qui constitue l'architecture, que nous pouvons en conséquence, définir l'art de produire et de porter à la perfection tout édifice quelconque. L'art de bâtir n'est donc qu'un art secondaire, qu'il nous paraît convenable de nommer la partie scientifique de l'architecture."

14. Christian Norberg-Schulz, *Intentions in Architecture* (Oslo: Universitetsforlaget, 1963), pp. 133–140, has proposed a theory of architecture consisting of *elements and relations*. Following Paul Frankl, who had previously introduced the concepts of "space-cells" (Raumzellen) and "mass-forms" (Körperformen), Norberg-Schulz proposes three kind of elements: mass, space, and surface. Although he considers these elements to be physical and measurable entities, his systematization is more generic and comprehensive than those based on the idea of physical components and the like.

15. Durand, *Précis*, vol. 1, p. 1.

16. Durand's concept of composition had a lasting effect on the education of architects. Already in the twentieth century, Julien Guadet stated in his *Éléments et Théories de l'Architecture* that "to compose is to make use of what is known (*ce qu'on sait*). Composition has materials just as construction has, and these materials are, precisely, the Elements of Architecture." Translated and quoted in Banham, *Theory and Design in the First Machine Age* (New York: Praeger, 1960), p. 20.

17. There are plates in the *Précis* where Durand shows how the *ensembles* can be produced from the horizontal (in plan) and vertical (in elevation) combination of the *parties*. However, these pure combinatorial exercises do not necessarily result in the creation of a building understood as a complete unity, that is to say, as something more than the mere combination of parts. In the plate of the *marche à suivre*, on the other hand, Durand addresses the description of a procedure whose goal is the creation of a complete formal structure.

18. As Collins explains in *Changing Ideals in Modern Architecture*, p. 226, at a certain point the word *composition* could be applied equally in both architecture and painting. Somehow, the association between architecture and painting still persists in the method of composition proposed by Durand. The method, rather than being specifically architectural, resembles the way a painter might work, starting from a very rough scheme that is later refined.

19. Werner Szambien, "Durand and the Continuity of Tradition," in Robin Middleton, ed., *The Beaux Arts and Nineteenth Century French Architecture* (London: Thames and Hudson, 1982), p. 21, shows the project for an Academy of Arts made in 1786 by Charles Percier, which Durand used in the plate of the method of composition.

20. Giulio Carlo Argan, "On the Typology of Architecture," *Architectural Design* 12 (1963): 564–565.

21. Werner Oechslin, "Premises for the Resumption of the Discussion of Typology," *Assemblage* 1 (1986): 37–54. The substitution of one plate by another is noted by Oechslin in this article. Oechslin contends that Durand replaced one for the other to make his ideas clearer. He also comments on the fact that buildings are absent from the first plate, whereas in the second, buildings and geometric figures are shown together.

22. Durand does not use the word *type* in his text. Instead he uses *genre* to refer to buildings with different functions, private or public. It was Quatremère de Quincy, a contemporary of Durand, who introduced the concept of type in architecture in an explicit way. For Quatremère's distinction between type and model, see the article on "Type" in the third volume of his *Encyclopédie Méthodique*, Paris, 1825. Argan's article builds upon Quatremère's definition of type. After this article had been written, Sylvia Lavin's book, *Quatremère de Quincy and the Invention of a Modern Language of Architecture* (Cambridge: MIT Press, 1992) came to my attention, specifically her point that Durand never used the term *type*. I have not been able to consult this text, but it appears that we have independently come to the same conclusion.

23. The split between subjectivity and objectivity represents another of the permanent dilemmas of architecture. This division is already implicit in Vitruvius when he writes that the architect, "ought to be both naturally gifted and amenable to instruction." Vitruvius, *The Ten Books of Architecture*, trans. Morris Hicky Morgan (New York: Dover, 1960), p. 5.

24. Durand, *Précis*, vol. 2, p. 1.

25. The idea that in architecture, generic principles exist as they do in the sciences has not yet been confirmed either by Durand's work or by those who later shared similar beliefs. As a matter of fact, already in this century many opposing arguments have been made. Edmund Husserl, *Origin of Geometry: An Introduction* (New York: Nicolas Hays, 1978), p. 160, suggests that architecture cannot be part of an "ideal objectivity" as sciences are: "This is, we note, an "ideal objectivity." It is proper to a

whole class of spiritual products of the cultural world, to which not only all scientific constructions and the sciences themselves belong but also, for example, the constructions of literature. Works of this class do not, like tools (hammers, pliers) or like architectural and other such products, have a repeatability in many like exemplars. The Pythagorean theorem, (indeed) all of geometry, exists only once, no matter how often or even in what language it may be expressed." Effectively, it would be difficult to find in architecture the sort of concept that, like the Pythagorean theorem in geometry, needs to be formalized only once.

26. Alberto Pérez-Gómez, *Architecture and the Crisis of Modern Science* (Cambridge: MIT Press, 1983), p. 322, writes that "architectural theory during the nineteenth century would be founded on the belief that all the variables of the real world can be reduced to the conceptual realm and the resultant of any architectural problem is a direct "function" of the combination of these variables."

27. The fact that the illustrations play a significant role in both books, the *Quattro Libri* and the *Précis*, is by no means secondary to the discussion about the systematization of architectural knowledge. Both architects, Durand and Palladio, were aware of the importance that graphical expression of an idea

has in architecture. They excelled in presenting their ideas graphically to the point that it is not an exaggeration to argue that the influence of both books is due more to their illustrations than to the texts themselves. James Ackerman, in a short bibliographical reference on the *Quattro Libri*, writes that there is little abstract theory in Palladio's books and that their extraordinary influence on so many generations of architects is mostly due to the illustrations. See Dora Wiebenson, ed., *Architectural Theory and Practice from Alberti to Ledoux* (Chicago: Architectural Publications, 1982).

28. The practical results of the application of Durand's theories can be seen in the numerous designs realized by the students of the *École des Beaux Arts*. These works can be praised for their coherence and consistency as much as they may be criticized for the limited vision of architecture that they exhibit as a whole. What Durand's method provided was a sort of conceptual space within which endless variants could be created. The limits of that space, however, were not questioned. The very same coherence exhibited by these works prevented them from addressing architecture in its full complexity. The few built projects, which can be considered the ultimate expression of Durand's principles, are also purely syntactic exercises, lacking soul and distinguished by an

endemic incapability to express anything beyond themselves. For a compendium of these built works, see Szambien, *J.N.L. Durand*, pp. 295–335.

29. The repeated attempts to make architecture a scientific discipline suggest that what is actually being attempted is an adjustment of architecture to the predominant conception of science in a particular historical period. This was the case in the early sixties, when the so-called Design Methods group attempted to create a science of design, based on rational principles, which according to their theories embodied not only architecture, but any human-made production. In the domain of architecture, some architects in the seventies borrowed the idea of syntactic structures from linguistics to attempt a formalization of architectural knowledge. Behind all of these attempts, ideas and concepts founded in the emerging area of computing played their part. It is precisely in the area of design and computing that the quest for a systematization of architectural knowledge has received major attention. However, much work that has been developed in this area is based on the dubious assumption that architecture can be expressed in terms of geometry or mathematics, both of which are more suitable for computer implementation than architecture.