

INTRODUCTION

In architecture, as in many other domains, the eighteenth century was a period of transition. The ‘fine old taste’ of Mansart, Lemercier and Le Vau was clearly no longer in favour, while research in progress was leading to the architecture of the revolutionary period, to neo-classicism and to eclecticism. Nevertheless, it is no easy matter to advance an interpretation of these developments, for the old and the new were inextricably interwoven. One can, for example, list the innovatory qualities of De Wailly, Boullée and Ledoux, while at the same time investigating what it was that bound them to the French tradition. Architectural forms develop in a manner that is resistant to any attempt at over-simplification.

The situation is perhaps a little clearer with regard to theory. The Enlightenment saw the demise of classical architectural theory, in spite of the attempts by Jacques-François Blondel in particular, from the 1750s to the 1770s, to revive it. The architects of the revolutionary period introduced a new concept, in which the rules presupposed by the ideal of *convenance* were rejected.

A transitional period may be characterised at least as much by what disappears, and by the reasons for that disappearance, as by the new configurations which emerge. The exhaustion of the architectural theory inherited from the *Grand Siècle* may thus serve as a guiding thread in our study of the changes that took place in the course of the eighteenth century.

One should not suppose, however, that the theoretical debate will by itself

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serve to explain very much, not least because it must reflect, albeit with distortions, the burning issues of the day. Among such issues, the new division of labour between architects and engineers may well have played an important role. Engineers were distinguished from architects in the eighteenth century, and began then to exert a considerable influence upon the design of space. By deploying a network of new institutions, by codifying their knowledge and practice, they developed a system which was to pose an increasingly serious threat to the architects and, indeed, to wrest some of their traditional prerogatives from them. The theoretical renewal of architecture in the revolutionary period may also be said to constitute an attempt to recover lost ground.

One of the main thrusts of the present study is therefore the link between the demise of classical theory and the relationship between architects and engineers. To be more precise, I have sought to compare the theoretical statements made by architects with writings of a more narrowly technical kind, so as to identify significant discrepancies.

My interpretation of these differences refers to changes on the social and economic level and to the effects of such changes upon the organisation of space. The division between architects and engineers increased as the state's control over planning was consolidated, as economic exchanges intensified and as the rate of technological change accelerated. The concepts of engineers bear the mark of these general tendencies, just as the doctrines of classicism reflected the desire for stability in the hierarchies of the society of the *Ancien Régime*.

The reader should be warned, however, against any too facile an opposition between architect and engineer, for the two professions were still complementary. Since there was no real breach until the very end of the century, the situation was characterised rather by the emergence of an independent but imaginary technology deployed by engineers, whose task it was to plan a territory. Their actual practice remained in fact close to that of the architects. In many respects, the latter also give the impression of being heirs to the architects of the *Grand Siècle* and to their efforts of rationalisation. In order to arrive at a more accurate assessment of the influence of this inheritance, one has to go back to the founding, in 1671, of the Royal Academy of Architecture. Colbert had designed the Academy as an instrument of technical control, which, given the influence of Perrault's doctrine, would seem to have blazed a trail for the engineers. Imbued from the start with contradictions, classical architectural theory presented a variety of approaches, its very diversity

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accounting for its longevity and its use, in part, by the technicians of the Enlightenment.

A retrospective survey is also required if one wishes to understand the attempt made by Jacques-François Blondel, undoubtedly the greatest teacher of architecture of his day, a convinced rationalist and a theorist of planning, to revive the classical ideal. His monumental *Cours d'Architecture*, which was published between 1771 and his death in 1774, combined original insights with the consolidation of retrogressive positions, and a highly refined aesthetic sensibility with the systematisations of stultifying academic rules. The failure of his endeavour was to take on a very particular meaning in later years. In his desire to re-establish links with tradition, he merely succeeded in highlighting its shortcomings, and thereby helped unwittingly to hasten its decline.

Blondel's ideal was a hierarchical architecture, reflecting the social conditions of the *Ancien Régime*, though rationalised as far as might be. In his mind, the notion of *convenance* was concerned mainly with the reflection of status made apparent through controlled architectural magnificence. But opposed to this was another rationality, one based on notions of utility rather than on any formal considerations. Founded in 1716, the corps of the Ponts et Chaussées was consolidated under Perronet. The engineers of the Ponts et Chaussées, who were entrusted with the building of roads and bridges, and also with architectural projects, developed an approach of undeniable efficacy, concerned as it was with issues of the moment. Utility, allied to the excellence and disinterestedness of the engineer, the general will and the policy of these norms and their relation to architectural theory will be the subject of the chapters that follow.

This comparison must be formulated in terms of the concrete issues of the day. It was because architectural theory had ceased to keep step with such issues that it finally fell apart. I have chosen to focus upon problems posed by the design and the construction of buildings and, also, those raised by the planning of town and country, subjects of irreconcilable oppositions.

Apart from Blondel, a number of other figures emerge at this period, for although he may have proved to be the most 'classical' theoretician of architecture he was by no means the only one. Where the decoration of buildings was concerned, Patte had much in common with Blondel, although he continued to be more concerned with problems of construction and advanced town planning. Perronet, who was chief engineer to the Ponts et Chaussées and director of the Ecole des Ponts et Chaussées from 1747 to 1794, was the embodiment of the engineer as artisan and administrator. Finally, Prony, who

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collaborated with Perronet on the building of the pont de Neuilly and on the pont Louis XVI, now the pont de la Concorde, sought to promote a standard based upon mathematics. In this respect, he seems to prefigure the approach of the nineteenth century. These figures will crop up again and again in the course of this study. They belonged to very much the same circles and, in the course of their development, they seem to have conducted a kind of conversation, through which the crucial questions of the day – architectural theory and practice, teaching and the diffusion of knowledge, planning and design – were debated.

In the end, this debate encountered some serious obstacles. Blondel's wish for spatial and functional coherence was at odds with a system involving the free disposition of fractures and reassemblages. One party favoured continuity pure and simple, whereas the other desired a combination of the continuous and the discontinuous. After a certain time, a confrontation became inevitable.

Such concepts were linked, or so it has been claimed, to differing perceptions of society and of the process of building. Whereas Blondel sought to rationalise what already existed, by harmonising architecture with the social structure, the thinking of the engineers evolved in an egalitarian context which may be described as pre-revolutionary. Their thinking was not therefore divorced from the paradoxes of state and citizen, of an intention to resort to planning and architectural design. In the area which concerns us here, the revolution begins with the publication in 1788 of Lagrange's *Mécanique analytique*, the closure of the old Academies, the foundation of the Polytechnique in 1794, the mathematisation of the science of engineering and the passage from the classical world to the universe of the machine and of precision. This passage would not have been a real possibility without the paradoxes upon which the engineers' system was based. The tensions within their discourse, and the often risky nature of their venture, seem to anticipate a universe of process, of flux and of movement, quantified by means of calculation.

Admittedly, the first intimations of this change only occurred around 1750, and it had not even assumed a very definite shape between 1770 and 1780. The French Revolution hastened the process to a quite spectacular degree. It was anyway obscured by contrary tendencies, involving the union of the arts and the sciences, the natural quality of technological intervention, and even the pronounced taste of engineers for aesthetics. However, the important thing to grasp is that the architecture of the closing years of the eighteenth century was already part of a new world. Through their rejection of classical formulae and

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their quest for a natural basis to architecture, Boullée and Ledoux belong to the same realm as the engineers. But did architecture yet represent a form of knowledge susceptible to being theorised? Did it yet have a place within the decision-making processes?

It was in order to answer such questions that I set about writing the present book. The study of the demise of classical theory and of the emergence of an independent technological discourse actually enables one to retrace the origins of the discord in the relationship between architecture and scientific and technological rationality which was often denounced subsequently. The crisis of modern architecture is linked in one respect to that affecting the relations between this rationality and the sphere of the visible, which no longer seem to be linked by any form of organic necessity. From this point of view, classicism offers the paradoxical example of a fertile relation between architectural debate and scientific investigation. If classical architecture in fact depended upon a network of knowledge and practice which was earlier than any scientific systematisation, the questions which it prompted were a constant source of stimulus for the scientists. The interest shown by a man like Claude Perrault, a doctor and a member of the Academy of Sciences, in the theory of Orders and its links with phenomena in the domain of perception was by no means unique. Architecture served as more than just a metaphor for man's domination of the world, for it constituted a field for experimentation, and a model for the comparison of already highly formalised theories with looser determinations, linked to aesthetics and to taste. This complicity dissolved in the course of the eighteenth century, giving rise to the emergence of opposed pairs, namely, sensation and calculation, solidity and construction, tradition and innovation. Theoreticians then saw it as their task to reconcile inexorably divergent terms. Blondel therefore perfected architectural criticism, Prony posited an intimate connection between poetic inspiration and the analytic spirit, while Patte tried to base construction on a number of propositions which were certain and self-evident to all. We know the subsequent fate of the union of the arts and the sciences, a theme which was nevertheless built into the programme of the Revolution. In this respect, the Enlightenment venture, and its failure, are still relevant to us today.

But it is also worth reflecting upon the links between theory, aesthetic sensibility and the pleasure of looking, a pleasure arising in large part out of habit but one which nevertheless does not necessarily rule out the invention of new combinations, nor even attempts at rationalisation. From this angle too, classical theory turns out to be full of interest. The details of the various

Cambridge University Press

978-0-521-12369-3 - French Architects and Engineers: In the Age of Enlightenment

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Excerpt

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orders, the cornices and the mouldings which feature on every page of the treatises, represent the basic elements of a genuine apprenticeship in perception. The architects were also quite willing to explore unexpected solutions, or at times to simplify their orders to make it easier for the workmen to execute them well. Classical theory offered a model open to change. This flexibility was gradually eroded in the course of the eighteenth century, a development which also corresponded to a far-reaching change in sensibility, making it possible for architectural detail to be reduced to ornament. I needed to understand this shift, which is as revealing as the general evolution of design. I therefore thought it appropriate to devote some space to the problem of detail in architecture, before studying Blondel's aesthetic more closely. If I were asked to define the qualities of classicism and of Enlightenment architectural theory which are of relevance to us today, I would suggest that the former's apprenticeship in the pleasure of looking, and the tension between invention and rigour, apparent in every treatise, are still worth retaining, and that the latter's ambiguous combination of loyalty to the past with an urgent sense of the need for renewal is a quality that we have not yet rediscovered.



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Every division into historical periods poses a problem, for one is involved in isolating coherent sequences within a confused mass of facts and hypotheses. The choice of such sequences generally reflects the author's basic preoccupations. I have noted my own preconceptions in the course of the present chapter, beginning with the notion of an eighteenth century in which the part played by tradition and by innovation is sometimes difficult to grasp. The collapse of classical architectural theory must be seen in the context of a general shift from an 'approximate world' to a 'universe of precision'.¹ I will then consider the connections between architectural theory and professional disputes, before, finally, discussing the key figures around whom I have chosen to organise this study.

THE TRADITION OF ENLIGHTENMENT

Since it is poised between the classical age and the industrial era, the eighteenth century represents an intermediate period, and one that is still difficult to interpret. Yet our view of Enlightenment architecture depends on the kind of interpretation that is advanced. If it is still legitimate, on the basis of the pioneering studies of Emil Kaufmann,² to emphasise the innovatory concepts of Ledoux, Boullée and Lequeu, one can by the same token draw inspiration from Allan Braham's analyses, and therefore reject the 'obsessive search for underlying principles' which, according to him, has long been in

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favour in art history.³ Indeed, the problem revolves around the importance of the seventeenth and nineteenth centuries in the interpretation of the advances of the Enlightenment.

I shall return to the question of classicism in chapter 2. Here I want simply to observe that, if its definition, architecturally speaking, dates back to the last century and is still hedged around with uncertainties, one can nevertheless point to a society and a mode of production that were classical – a fragmented universe, a society that was still traditional and in the grip of custom, and a technological context in which water and wooden machinery predominated.⁴ In spite of scientific progress, the works of Newton, Cartesian philosophy or the bold speculations of Pierre Bayle, seventeenth-century life was still conducted at the leisurely pace dictated by the available means of transport, in a daily struggle against nature, liable at any moment to annihilate the boldest ventures. This latter aspect is typified by Holland's patient conquest of the sea. The development of its trade and the dynamism of its publishing houses also bear witness to innovatory currents which emerge in a framework which one might have supposed was immutable. The nineteenth century offers us another perspective from which to interpret the Enlightenment. Industrial expansion, a series of more or less violent spurts and periods of growth, progress, the mathematisation of knowledge, are phenomena too familiar to need describing. We still have to account, however, for the eighteenth century, and for the transition from the world of gesture and of approximation to that of the machine and of precision.

There is a great temptation to interpret this transition in terms of the succeeding period, and to place more emphasis upon innovatory concepts and 'pioneers' than upon tradition and its upholders. Through its confidence in the virtues of experimentation, through its advocacy of social reforms based upon reason, the philosophy of the Enlightenment portends a work of conscious elaboration.

However, the eighteenth-century mode of production resembles to a confusing degree that of the previous period. Although coal heating was then used in London, and Newcomen's machine had made its appearance in the mines,⁵ hydraulic works were still well to the fore, especially in France.⁶ Nevertheless, what the Enlightenment *Philosophes* understood by reason was not what was to be understood by the term around 1800, and they themselves were often disconcerted by a Revolution whose possibility and extent they had been far from suspecting. Although it sometimes seems to anticipate the nineteenth century, the eighteenth century remained above all else the heir of the

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classical age, and its main problems derived from those of the previous century. The thinkers of the *Grand Siècle*⁷ were already haunted by questions concerning nature and reason, the individual and society, experiment and calculation, just as men such as D'Alembert and Lavoisier were to follow the trail blazed by Descartes, Mariotte or Huygens.

We therefore need to consider the range of possible interpretations of the Age of Enlightenment. One can of course choose to emphasise what was inherited from the past or what seemed to anticipate the future, but in either case one would undoubtedly be guilty of over-simplification. What in fact seems to have occurred is a kind of critical mass phenomenon, a slow rise culminating in a qualitative leap around the year 1800.⁸ In the eighteenth century, the classical edifice finally cracked; in a hesitant and contradictory fashion, the possibility of a new equilibrium was gradually discernible.

In architecture, the new developments are often difficult to assess. The main theoretical concepts, for example, date from the seventeenth century: *bienséance*, *convenance* and even taste itself had been the subject of debate within the Academy since the time of Colbert.⁹ There was relatively little development, however, in what was actually built, and one wonders whether the forms of someone like Ledoux are genuinely 'revolutionary'. From the rope manufactory of Rochefort to the observatory of Paris, proceeding by way of the study of the art of fortifications, the bareness of walls, the contrast in volume and emphasis upon geometry are not alien to classical order. What occurs in Ledoux is perhaps a simple displacement of the ideal of *convenance*, which leads him to generalise solutions which had formerly been restricted to utilitarian projects. But this displacement refers to the problems posed by architectural theory, and by its institutions, around the year 1800. Since grand treatises, such as those by Durand and Rondelet, are to be found after this date, what exactly does one mean by the demise of classical theory?

What undoubtedly ceased was a certain kind of dialogue between the various treatises. As Werner Szambien emphasises, 'Classical theory only had possible lines of development as a collective venture for as long as there was still scope for conflict.'¹⁰ The unity of classical theory therefore consisted in such conflicts, which were always liable to erupt, and which in reality reflected the existence of a broad consensus. In challenging each other over the question of the Orders, were architects not implicitly recognising the validity of research undertaken in their subject since the Renaissance? Conversely, the demise of classical theory was characterised by the increasingly tame nature of a number of debates. Thus, the proportions of the Orders or the rules of

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convenance became less and less important, and controversies on such topics abated. It remains for us to identify the transformations of which this disaffection was the symptom.

These transformations quite obviously reflect those occurring in society. The last years of the eighteenth century saw the collapse of the *Ancien Régime*, a hierarchised ‘society of orders’¹¹ for which the court at Versailles constituted to some extent the archetype.¹² In place of the regulated play of oppositions and of parties, the Revolution established a new type of relation between state and citizen, and a new, institutionalised violence. At the same time, a technological rationality based upon physico-mathematical calculation had just been consolidated. In this context, the bonds between architecture and scientific and technological rationality were gradually dissolved. Soon architecture would constitute nothing more than an ineluctably subordinate domain for the application of technology. In spite of the fact that Louis Hautecœur continued his *Histoire de l’architecture classique en France* up to 1900,¹³ there was nevertheless a distinct break at the beginning of the nineteenth century. As a new understanding of the nature of society arose, the order of knowledge ceased to reflect the need, which had still inspired the *Encyclopédistes*, for a visual and spatial equivalent. While ‘court society’ was able to recognise itself in the gradations of classical architecture, the rising bourgeoisie would increasingly identify itself with engineers whose task it was to organise the territory and to adapt it to the needs of industry and of profit. The accuracy of their calculations would become synonymous with progress. From the world of gesture and approximation to the universe of precision, the evolution of technology came up against that of society.

By relating architecture and technology to each other, I hope in this study to isolate some of the factors which made this evolution possible. The collapse of classical theory may also be interpreted in terms of the growing technological domination of the engineers, a domination whose structure and functioning I will explore below.

THEORY, PRINCIPLES AND APPLICATION

I propose to begin this study of theory by considering a number of questions arising out of the link between architectural theory, the execution of a particular project and professional debate. In *L’architecture et la règle*, Jean-Pierre Epron defines theory as an edifice with several floors, comprising a corpus of