

Resumo

Este artigo pretende provar que entre os anos 1735 e 1755 Veneza foi o berço da teoria arquitectónica Moderna, gerando uma forte crise na arquitectura clássica tradicionalmente baseada na suposição Vitruviana de que essa imitava, em pedra ou em mármore, estruturas de madeira antigas. De acordo com os seus críticos racionalistas, tais como o frade franciscano veneziano e crítico de arquitectura Carlo Lodoli (1690-1761) e os seus seguidores no século XIX, a arquitectura clássica é singularmente enganadora e não é fiel à natureza dos materiais – noutras palavras, desonesta e falaciosa. Este questionamento não emanou de arquitectos dedicados à prática, mas do próprio Lodoli – um filósofo e educador do patriciado de Veneza – que não tinha formação de arquitecto. As raízes desta crise recaem numa nova abordagem da arquitectura decorrente da nova filosofia racionalista do período iluminista com a sua ênfase na razão e na crítica universal. ●

Abstract

This paper attempts to prove that in the years 1735 to 1755 Venice was the birth-place and cradle of Modern architectural theory, generating a major crisis in classical architecture traditionally based on the Vitruvian assumption that it imitates early wooden structures in stone or in marble. According to its rationalist critics such as the Venetian Observant Franciscan friar and architectural theorist Carlo Lodoli (1690-1761) and his nineteenth-century followers, classical architecture is singularly deceptive and not true to the nature of materials, in other words, dishonest and fallacious. This questioning did not emanate from practising architects, but from Lodoli himself – a philosopher and educator of the Venetian patriciate – who had not been trained as an architect. The roots of this crisis lay in a new approach to architecture stemming from the new rationalist philosophy of the Enlightenment age with its emphasis on reason and universal criticism. ●

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IN SEARCH OF THE ORIGINS OF MODERNISM

VENICE AND THE CRISIS OF CLASSICAL ARCHITECTURE IN THE MID-EIGHTEENTH CENTURY

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Introduction

Venice and the Veneto have been long regarded as strongholds of classical architecture (except for a brief sally into Baroque and Rococo), embodied in the Renaissance in the works of Michele Sanmicheli (1484-1559), Jacopo Sansovino (1486-1570), Andrea Palladio (1508-1580), and Vincenzo Scamozzi (1548-1616), and in the eighteenth century by the revival of the Palladian ideal. A practice rooted in the study of Vitruvius played an important role in establishing Renaissance Venice as a neo-Vitruvian architectural centre.¹ Important editions of Vitruvius published by Venetian printing presses, such as those of Daniele Barbaro in 1556 and 1567, Giovan Antonio Rusconi in 1590, and Giovanni Poleni in 1739-43, contributed significantly to the dissemination of classicism, not only in the Veneto, but also throughout Italy and Europe. Even today, Venice is a museum which looks back to its glorious past, and one in which modernism had negligible architectural impact in the twentieth century. Despite this, it can be claimed that during the years 1735 to 1755 Venice was the birthplace and cradle of Modern architectural theory, generating a major crisis in classical architecture. Traditionally, the Vitruvian assumption was that classical architecture in stone or in marble originated from early wooden structures; Vitruvius had indeed suggested that the different members of classical architecture could be traced from primitive wooden dwellings. According to this

¹ On Venice and Vitruvius, see especially the recent book by D'Evelyn (2012).

theory, the columns, the pediments and the other main parts of the classical orders, such as frieze and entablature, were at some time changed from wood to stone or marble, and the particular forms, especially those of the Doric and Ionic orders, resulted from this. According to its mid-eighteenth century rationalist critics such as the Venetian Observant Franciscan friar and architectural theorist Carlo Lodoli (1690-1761) (fig. 1) and his nineteenth-century followers, classical architecture is singularly deceptive and not true to the nature of materials, in other words, dishonest and fallacious. This questioning did not emanate from practising architects, but from Lodoli himself – mostly a dedicated educator of the Venetian patriciate and a philosopher – who had not been trained as an architect.² The roots of this crisis lay in a new approach to architecture stemming from the new rationalist philosophy of the Enlightenment age with its emphasis on reason and universal criticism.

I – Lodoli and his lost treatise on architecture

Characterized by his contemporaries as a “new Diogenes” and as “the Socrates of architecture” (Memmo 1973, I, 39),³ partly for his Socratic method of teaching and his annoying and irritating manner of formulating his questions and partly for his refusal to commit himself to print, Lodoli seems to have written extensively on various subjects, including philosophy and architecture, and to have prepared material for a philosophical encyclopaedia entitled *Istituzione al Sapere* (Memmo 1973, I, 52-3).⁴ The bulk of his many and diverse unpublished writings unfortunately perished due to moisture from a leaking roof in a room under the Piombi prisons in the Ducal Palace. They had been put in this secret chamber “for safety” by the Council of Ten, who sequestered most of Lodoli’s papers after his death in 1761 (Memmo 1973, I, 118-20). There they rotted until they were rendered illegible. Lodoli, however, wrote extensively on architecture during his lifetime, which resulted in an architectural treatise written in various versions, including one in classical distichs (a poem of two-line verses, a *distichon* consists of a hexameter and a pentameter) (Memmo 1973, II, 49).⁵ Lodoli’s biographer, the Venetian patrician Andrea Memmo (1729-1793), writes in this respect that Lodoli “said he did not want to print his treatise on architecture” (Memmo 1973, II, 49).⁶ Girolamo Zanetti (1713-82) confirms that in 1754, after twenty years, Lodoli finally completed his manuscript, but refused to publish it, probably in conscious emulation of Socrates who published nothing during his lifetime (Zanetti 1759, 65-6).⁷ He also commissioned from an unknown Venetian artist a volume of drawings to his own specifications aimed at illustrating his novel ideas, referred to by Memmo as the “*libro delle sostituzioni*” (The Book of Substitutions) (Memmo 1973, I, 369-70), but this also perished in the general destruction of his papers. Copies of this volume were pre-

² On Carlo Lodoli, see the short biography by Del Negro (2005, 390-5). A comprehensive bibliography up to 2006 is published by Cellauro (2006, 25-9, particularly note 2, 25-27). To this bibliography should be added the recent studies by Neveu (2006; 2010, 60-7; 2009, 27-38) and Ungureanu (2011).

³ The characterization of Lodoli as the “Socrates of architecture” also appears in Pietro Vitali’s engraving of a lost portrait painted by Alessandro Longhi (fig. 2). In his “Saggio Sopra l’Architettura [Pisa 1756],” Algarotti (1963) mentions Lodoli as being “simile all’antico Socrate”.

⁴ It was written for the convenience of his pupils and remained in manuscript.

⁵ “[Lodoli] aveva molto scritto sopra di essa [architettura], ed in varii modi ancora; di che molti, come si disse, possono già fare testimonianza: Ricordomi per sino che convertì in sugo i più solidi principii, li aveva dettati in versi a maniera di antichi distici, uno de’ quali è appunto quello che feci mettere d’intorno al suo ritratto al primo volume”.

⁶ “diceva di non volere stampare il trattato della sua architettura”.

⁷ “Poiché l’uomo costante [Lodoli a tutte le traversie, dopo quattro lustri [20 years] condotto a fine il laborioso disegno, ha il suo sistema ridotto in carta, ed è pronto a darlo alla luce: non tanto per giustificare se stesso per sodisfare all’importunità degli amici, che gelosi più di lui medesimo della sua gloria; per più anni l’hanno così stimolato, che per acchetarli, e liberarsi dalle troppe frequenti incitamenti, ha creduto dover ridursi a tal termine”.

Fig. 1 – Alessandro Longhi, Portrait of Carlo Lodoli, Gallerie dell’Accademia, Venice, inv. no. 908, c. 1760 (Photo: By courtesy of the Ministero dei beni e delle attività culturali e del turismo).



sented before 1752 to both Doge Pietro Grimani (1677-1752, Doge 1741-1752) and Martino Caracciolo (Apostolic Nuncio in Venice from 1744 to 1753), but neither of these has been traced so far (Memmo 1973, II, 50).⁸ Lodoli's ideas on architecture are thus only known indirectly from the writings of Zaccaria Sceriman (1708-1784) in *Viaggi di Enrico Wanton : alle terre incognite australi, ed ai regni delle scimie, e de' cinocefali* (Sceriman 1749); from Count Francesco Algarotti (1712-1764), one of Lodoli's earliest pupils, in *Saggio sopra l'architettura* (Pisa, 1756) (Algarotti 1963), a résumé and critique of Lodoli's thought written during the friar's lifetime; and from Andrea Memmo in *Elementi dell'architettura Lodoliana; o sia l'arte del fabbricare con solidità scientifica e con eleganza non capricciosa* (Memmo 1786), which was published twenty-five years after Lodoli's death. Memmo's volume was numbered "I", and a second was promised. It was not until 1834, however, long after his death, that the second volume was published in Zara, then a Venetian possession, which resulted – thanks to the efforts of Memmo's daughter, Lucia Mocenigo – in a complete edition of Memmo's text on Lodoli (1833-34).

Memmo reports that seeing that Lodoli was unlikely to publish his treatise on architecture, one of his pupils at his school at San Francesco della Vigna, Francesco Foscari, "then a most charming youth, now a weighty senator" (Memmo) was invited to prepare such a text, but he was too distracted first by bad health and later by public office,⁹ so that the second choice fell on Francesco Algarotti. The latter was the second son of a very wealthy Venetian merchant with the prestigious status of *cittadino originario* (citizen-by-birth) without patrician status. In 1737, aged twenty-five, he published what was to be his best-known book, *Il Newtonianismo spiegato alle Dame* (Newtonianism for Ladies), one of the many eighteenth-century pamphlets produced for "ladies of leisure", which consisted of an exposition of Newton's theories of light and colour. Algarotti had first-hand knowledge of Lodoli's architectural theory from his student days in about 1725 to 1730 at San Francesco della Vigna under Lodoli's supervision. Algarotti thought that Lodoli's theory was strictly utilitarian and that neither ornament nor references to historical values were acceptable to him, contrary – in Memmo's view – to Lodoli's practice and statements; finally, Algarotti maintained that Lodoli condemned all buildings, modern and ancient. In this respect, Memmo states that "Lodoli enormously admired the buildings of Roman antiquity and of those moderns which most closely resembled them... thus he left intact all good buildings of such kind, nor would he ever have suggested that anyone should destroy them. How often one heard him praise the magnificent simplicity of the Pantheon, and give pride of place to Palladio as the purest and most plastic architect of all... Lodoli only wished to correct, to re-order and to attempt to ascertain whether it was possible to do better" (Memmo, II, 17-18).¹⁰ Many of Lodoli's contemporaries, however, contributed to the dissemination of the opinion that the Franciscan friar condemned Classical architecture and the study of antiquity.¹¹ Memmo's isolated attempt was to try to reassess their views in the light of his personal acquaintance with Lodoli. It is likely, however, that Memmo modified Lodoli's ideas to his own Classical and Neo-

⁸ "e molti disegni fece stendere di sua invenzione da buona mano, che mi ricordo, come altri, di aver veduti, alcuni dei quali mi assicura ancora il lodatissimo vivente padre Giustiniani da Venezia d'aver fatti legare d'ordine del suo amico, per farne un dono a' suoi cari padroni, serenissimo Doge Grimani e Monsignor Caracciolo allora nunzio pontificio in Venezia".

⁹ For further details on Federico Foscari and Lodoli, see Foscari (1983-1984, 35-40).

¹⁰ "Il Lodoli ammirò pur assaissimo gli edifici degli antichi romani e quelli dei moderni che eransi ad essi più avvicinati... Quante volte non udivasi egli a lodare la magnifica semplicità del Pantheon, e preferire il Palladio come il più puro, ed il più pastoso diceva, di tanti altri architetti... Egli non voleva che correggere, riordinare, e che si cercasse se si poteva far meglio".

¹¹ In addition to Algarotti's *Saggio sopra l'architettura*, see for example *La Minerva. Nuovo Giornale de' Letterati d'Italia* (1763, 4): "s'è trovato un Critico [Carlo Lodoli] di umore assai strano, che giunse a pubblicar colle stampe, essere inutile lo studio delle cose antiche, e a porre in derisione chi lo coltiva". Zaguri (1787, 27): "So, ch'egli chiama false, ed improprie tante rappresentazioni contrarie alla verità, tanti sporti, e membrature interne contrarie al buon senso, tutti quasi gli ornamenti inutili od affettati, vuol bandire ogni bellezza, di cui l'utilità intrinseca non apparisca, chiamando tuttocio arbitrio, pratiche viziose, sconvenienze, chimere dell'arte; ma sopra tutto richiama al tribunal di sua ragione la materia, di cui sono le fabbriche composte, e le dà inesorabile bando, volendole di legno costrutte, e non di pietra, giacchè, dic'egli, non altro che legno quelle pietre rappresentar vogliono; e vuole che tutti i crepiti, le fessure, e le rovine delle fabbriche succedano in giusta pena del torto, che si è fatto alla verità usando d'una materia, e indicandone un'altra, e così distrugge tutti gli accidenti non solo, ma la sostanza d'ogni antica, e moderna architettura"; and Sceriman (1749): « Imerocchè prendendo maggior ascendente sopra l'errore, ed assuefatti gli orecchi dell'universale ad una

dottrina che parve sulle prime nemica d'un arte sì nobile, e quasi rea di stato per voler distruggere nell'opinione de' cittadini la riputazione verso le fabbriche più accreditate [my emphasis], gli riuscì di farsi capo setta, e di vedere sotto i suoi vessilli molti personaggi per grado e per fama di sapere eminenti".

¹² For further details on Memmo's architectural career, see Williamson (2000, 93-104). As Venetian ambassador to Constantinople (now Istanbul) from 1778 to 1782, Memmo also arranged for the restoration and embellishment of the embassy. It was given a Palladian porch with Ionic columns and a tympanum, and windows similar to those created by Lodoli in 1743 for the Pilgrim's Hospice at S. Francesco della Vigna in Venice; see Bertele (1932, 193-311, 331-332).

¹³ "Non sono però di suo proprio fondo, come si dee sapere, tale paroli, ma di Dio stesso, riportate da Geremia...; principio luminosissimo, ed in cui parve che s'incontrasse fra' Gentili quegli che fu dall'Oracolo giudicato il più sapiente fra gli uomini, cioè Socrate, il quale nella sua scuola voleva che fossero prima sradicati i pregiudizii, dubitando sempre delle opinioni ch'erano in corso, per giunger indi con maggior facilità alla conoscenza del vero".

¹⁴ "che adoperato il ferro ed il fuoco (il che di grazia s'intenda in modo figurato) per purgar quanto fosse possibile quell'architettura, ch'ebbe corso nel colto mondo, onde render netto il suo terreno finora inselvatichito e spinoso, pensava di sostituirvi subito le nuove teorie".

-Palladian taste.¹² In favour of Algarotti's version is also the important fact that the Venetian *literato* had been one of Lodoli's earliest pupils, whereas Memmo never systematically attended the school of the Franciscan friar.

II – The vision of a new architecture true to materials

Championing a rational and functional new architecture to which Memmo gave the name of *arte nuova* or *nuovo istituto* (Memmo 1973, I, 25 and 33; and II, 50), Lodoli was probably the most avant-garde theorist of the Enlightenment, his *tabula rasa* ideas on architecture being viewed by Modern Movement historiography in Fascist Italy as precursors to modernist principles (Gallo 1935; Gengaro 1937; Gabrielli 1945; Gabrielli 1938-1939; Ragghianti 1936; Persico 1947). Lodoli was indeed the first architectural theorist to formulate the revolutionary doctrine of "truth-to-materials" and to introduce the notion of function into architectural discourse, as stated in his *distichon* "DEVONSI UNIR ET FABRICA E RAGIONE / E SIA FUNZION LA RAPPRESENTAZIONE" (Building must be united with reason, and let function be the representation). It appeared on an oval stone frame surrounding his portrait by the Venetian painter Alessandro Longhi (1733-1813), now apparently lost, but known by a widely circulated print engraved by Pietro Marco Vitali (1755-1810). At the foot of the oval frame there are two further stone tablets: one inscribed "UT ERUAS ET DESTRUAS" and the other "UT PLANTES ET AEDIFICES", both are from chapter I, verse 10 of Jeremiah, prophesying "To root and to destroy" and "to build and to plant". For Lodoli's enemies, particularly the Venetian patrician Pietro Zaguri (1733-1805), this was proof that he was committed to the actual destruction of all ancient and modern buildings (Zaguri 1787, 25-7). On the contrary, replied Memmo, Lodoli was merely following Socrates who believed that prejudice must be uprooted before truth could be appreciated: "However, these are not his own original words, but the words of God himself, reported by Jeremiah...; an enlightened principle, in which it seemed that there was among the educated class, the one whom the Oracle judged to be wisest of all men, that is Socrates, who in his school insisted that first of all every prejudice should be uprooted, always doubting current opinions, in order to arrive at a knowledge of the real truth more easily" (Memmo 1788, 234).¹³ Memmo understood the mottoes from Jeremiah as containing the summation of Lodolian theory: to question and reject past and present architectural theory and practice and to substitute this with his new theories and a new architecture in which building and reason would be united (Memmo 1788, 235).¹⁴

Lodoli's main contribution to the architectural debate of the eighteenth century was to base architectural design on Galileo Galilei's discovery of the new science

of strength of materials, as formulated in his *Discorsi e dimostrazioni matematiche, intorno à due nuove scienze* (Discourses and Demonstrations concerning two New Sciences) (Galileo 1638; Memmo 1973, I, 5).¹⁵ Furthermore, it is well known that Lodoli also introduced the notion of *architettura organica* or “organic architecture” (similar to what we would today call ergonomics), a term which Lodoli applied to the design of furniture, which, in his view, should take into consideration the shape and proportions of the human body in order to achieve comfort and fitness for purpose (Memmo 1973, I, 84). Lodoli seems to have extended his concept of “organic architecture” and his ergonomic theories to buildings and to architecture proper since Memmo reports that he would have liked architects to design “delle case come delle sedie ragionate”, “houses like chairs designed with reason” (Memmo 1973, I, 85), that is, comfortable and in accordance with the shape and proportions of the human body. According to Lodoli, the paradigm of a rational and a functional architecture is to be found in the design of the Venetian gondola in which “every piece of wood had its shape and size proportionate to its particular nature and was put in place with reason; so that if the bottom had been made of carob and the sides of silver fir, that is the opposite of its actual construction, the gondola would have been a ruin” (Memmo 1973, I, 86-7).¹⁶ The gondola’s scientific and complex design represented for Lodoli the perfect embodiment of his concept of truth-to-materials. Perhaps the gondola’s oddest characteristic is that it is asymmetrical not only in plan, but in section as well, allowing the rower to row only one side, thus making the large craft more easily manoeuvrable.

Like many of the great architectural thinkers of the eighteenth century, Lodoli was not trained as an architect. Just as Abbé Jean-Louis de Cordemoy (1631-1713)¹⁷ was a liberal scholar by training, and Abbé Marc-Antoine Laugier (1713-1769) (Laugier 1753) was a fashionable Jesuit preacher and historian, Padre Carlo Lodoli was an Observant Franciscan friar, a philosopher, a scientist, and an educator of the Venetian patriciate, and in close touch with many leading Enlightenment philosophers of his age, such as Montesquieu (1689-1755), Antonio Conti (1677-1749), Giambattista Vico (1688-1741), and Pietro Giannone (1676-1748) (Memmo 1973, I, 75). Architecture was not Lodoli’s exclusive concern and he knew that his theory and occasional forays into architectural design were out of tune with the taste and teaching of his day. It is in this context that the Venetian patrician and pornographic writer Giorgio Baffo denigrated him as an “architetto novo, e immaginario”, “a new and imaginary architect” in the injurious sonnet *Quel scagazzà de Lodoli fratazzo*, written on the occasion of Lodoli’s death in 1761.¹⁸

¹⁵ “E quasi ch’egli avesse sotto gli occhi il testo di que’ dialoghi, mi fece conoscere che difficilmente potrebbero esser diversi nei corollarij gli stessi scientifici principj, che il Galileo scoprì nella meccanica ed egli quasi conseguentemente nell’architettura”.

¹⁶ “Ogni pezzo di legno aveva la sua figura proporzionata alla sua differente indole, ed era messa in luogo con ragione; che se si fosse fatto il fondo di carrubo e le coste d’abate, cioè il contrario, la gondola sarebbe stata una rovina”.

¹⁷ Jean-Louis de Cordemoy is the author of the influential *Nouveau Traité de Toute l’Architecture, ou l’Art de Bâtir, Utile aux Entrepreneurs et aux Ouvriers* (1714).

¹⁸ This characterization appears in Baffo’s sonnet *Quel scagazzà de Lodoli fratazzo*; see del Negro (1991), where five other sonnets are published (336-8), which were written on the occasion of Lodoli’s death in 1761.

III – Lodoli’s architectural principles

the first principle of Lodoli’s architectural theory is to make in architecture only what has a definite function, and ensues from strict necessity. Algarotti writes in

¹⁹ “Che niente ha da vedersi in una fabbrica, che non habbia il proprio suo uffizio e non sia parte integrante della fabbrica stessa, che dal necessario ha da risultare onnimamente l’ornato, e non altro che affettazione e falsità sarà tutto quelli che introdiranno nelle opere loro gli architetti di là del fine, a cui nello edificare è veramente ordinato che che sia”.

²⁰ Granger (1931, 6): “Architecti est scientia pluribus disciplinis et variis eruditionibus ornata, [cuius iducio probantur omnia] quae ab ceteris artibus perficiuntur. Opera ea nascitur et fabrica et ratiocinatione. Fabrica est continuata ac trita usus meditatio, quae manibus perficitur e materia cuiusculque generis opus est ad propositum deformationis. Ratiocinatio autem est, quae res fabricatas sollertiae ac rationis proportionem demonstrare atque explicare potest”.

this respect of Lodoli’s theory: “that nothing should be shown in a building which does not possess its own specific function [*uffizio*] and is not an integral part of the building itself, which must rely wholly on the necessary for ornament, and anything which architects introduce in their work which exceeds the objective which it is truly intended to achieve, whatever it may be, is nothing more than affectation and falsity. In accordance with such principles, the faulty practices to be condemned are not few in number...” (Algarotti 1963, 35).¹⁹ “Nothing, he insists, should be shown in a building that does not also truly perform a function” (“*Niuna cosa, egli [Lodoli] insiste mettere si deve in rappresentazione, che non sia anche veramente in funzione*”) This last sentence was versified in the motto which appears in the circular frieze surrounding Lodoli’s portrait by Longhi: DEVONSI UNIR ET FABRICA E RAGIONE – E SIA FUNZION LA RAPPRESENTAZIONE. Function and reason (this last concept being the chief authority of the Enlightenment), as well as truth and representation are indeed key concepts of Lodoli’s theory, which recur throughout Memmo’s and Algarotti’s texts. Half of the portrait motto – DEVONSI UNIR ET FABRICA E RAGIONE – is derived from the maxim of Vitruvius in Book I.i.1: “Ea (architectura) nascitur et fabrica et ratio/cinatio/ne” in Vitruvius’ paragraph “The science of the architect is adorned with many disciplines and different pieces of information, and the arts participating in construction have to be approved by the [architect’s] judgement. *It [architecture] is born out of construction and reason.* Construction is a continuous meditation on the common way of making buildings which is the carrying out by hand and with materials of every project according to its design. Reason is the explanation of the buildings on the basis of theories and proportions”.²⁰ This motto on the portrait, in its Italian versified version, also appears in the foundation tablets of the Ospizio di Terra Santa at San Francesco della Vigna in Venice designed by Lodoli: on one side the date, 1743, and on the other, half the portrait motto in its Latin version, but Lodoli deliberately set the extra syllables /cina/ in the O (in *ratione*) to play on the ambiguity and imply both reason, as a general concept, and comment or dialectic. The tablets are now in the dark passage which Memmo mentioned, and are barely visible. Yet the motto is repeated in the engraving of that singular, completely Lodolian door which Giovanni Ziborghi had published with Giovanni Pasquali in 1748 in an edition of Vignola to which was appended an elementary book of instructions on mechanics dedicated to Lodoli (Ziborghi 1748). As a frontispiece to the mechanics section, Ziborghi printed an engraving of the door with the same inscription within it: “Ex Fabrica et Ratiocinatione. Vitruvius”. Lodoli’s translation of the maxim runs as follow: “L’architettura nasce dall’esperienza [my emphasis] non meno che dal raziocinio [my emphasis]” and explains further that “L’architettura è una scienza intellettuale e pratica [my emphasis], diretta a stabilire col raziocinio il buon uso e le proporzioni degli artefatti, e coll’esperienza [my emphasis] a conoscere la natura de’ materiali che li compongono” (Memmo 1973, II, 275). From this it emerges that Lodoli interpreted the Vitruvian *modus operandi* of architectural production as essentially based on reason and on the experimental investigation of the various building materials. Reason

and experience are key concepts of eighteenth century philosophy,²¹ and it is with these concepts that Lodoli tried to give an up-to-date interpretation of Vitruvius' definition of architecture in Book I, chapter 1 of his *De architectura*, which was to be consistent with the spirit of the age.

The second half of the portrait motto – E SIA FUNZION LA RAPPRESENTAZIONE – is the versified form of Lodoli's famous maxim and his most important architectural principle according to Algarotti: "Niuna cosa, egli insiste [Lodoli], mettere si deve in rappresentazione, che non sia anche veramente in funzione". It appears to be Lodoli's own Italian translation of the following sentence from Vitruvius' *De architectura*, Book IV.ii.5: "*Ita quod non potest in veritate fieri, id non putaverunt in imaginibus factum posse certam rationem habere*". This is confirmed by Memmo when he writes: "Padre Lodoli far from being a declared enemy of every ornament as the Count [Algarotti] made him out to be, did not dream of excluding it entirely, provided it was not placed where it was contrary to decorum; as to which Vitruvius reasons well, namely *one should never make an image of that which could not exist in truth, or as Lodoli said, in function* [my emphasis]" (Memmo 1973, II, 38).²² The words "*in funzione*" in Lodoli's architectural theory appear to be the Italian translation of the words "*in veritate*" in Vitruvius's maxim, and are therefore directly connected to the concept of truth or *veritas* in architecture. The words "*in rappresentazione*" used by Lodoli appear, in turn, to be the Italian translation of the words "*in imaginibus*" in Vitruvius' maxim, which had already been used by Daniele Barbaro in his 1556 Italian translation of Vitruvius (Piranesi uses the words "*in figura*" in his Italian quotation of the relevant Vitruvian sentence in his *Della Magnificenza ed Architettura de' Romani* of 1761).

The other main principle of Lodoli's architectural theory provides a better understanding of the notion of function in architectural design and clarifies his conception of functionalism, which appears to have been essentially structural. Lodoli, in fact, argued for an architecture entirely derived from the nature of materials and governed by the law of statics in order to achieve "truth" or "function" in architectural design. In this Algarotti claimed that Lodoli intended to overturn ancient and modern architecture and to substitute a new one derived from a use of materials based on their true structural nature: "For what reason should not stone represent stone, wood wood, each material itself and not another? On the contrary, ever since architecture has been practised and taught, architecture should follow these precepts: it should be appropriate to the characteristic qualities, to the flexibility or the rigidity of the component part, to the degrees of the resisting force, to its own individual essence, or to the nature of the material which is being used. Thus the nature of wood being formally different from the nature of stone, so must the forms which you give to wood in the construction of a building be different from those you give to stone. Nothing is more absurd, Algarotti is reporting, than to build so that a material does not signify itself, but has to signify another. That is to wear a mask, to take part in a continuous falsehood. Hence the fissures in buildings, the cracks, the

²¹ On the concepts of "Reason" and "Experience" in the eighteenth century, see Biasutti (2001, 1-17; 1990a, 33-62; 1990b, 45-71).

²² "Il Padre Lodoli ben lunghi dall'essere poi quale conte lo fa supporre [Algarotti], nemico dichiarato d'ogni ornamento, non s'immaginò al certo di escluderne alcuno, purchè non fosse messo contro convenienza; sulla quale Vitruvio si ben ragiona, cioè che non si dovesse mai mettere in imagine od in termine più preciso del Lodoli, quello che non avrebbe potuto starsene in verità, o come l'altro diceva *in funzione* [my emphasis]".

²³ “I ... disordini non si vedrebbero, se quando richiede la propria essenza e la indole materia se ne ricavassero le forme, la costruzione, l’ornato. Si giungerà solamente in tal modo a fabbricare con vera ragione architettonica: cioè dall’essere la materia conformata in ogni sua parte secondo la indole e natura sua, ne risulterà nelle fabbriche leggitima armonia, e perfetta solidità. Ed ecco il forte argomento, l’ariete del Filosofo [Lodoli], con che egli urta impetuosamente, e quasi d’un colpo tutta la moderna intende rovesciare, e la antica architettura. Alle quali sostituirà quando che sia una Architettura propria, omogenea alla materia, ingenua, sincera, fondata sulla ragion vera delle cose, per cui salde si manterrano le fabbriche, intere, e in un fiore di lunghissima, e quasi eterna giovinezza”.

²⁴ On the development of statics in the eighteenth century, see Heyman (1972) and Straub (1952, 52-138).

²⁵ On Galileo’s contribution to the theory of the strength of materials, see Straub (1952, 64-7).

ruins; almost a manifest punishment for the wrong which has been continuously done to the Truth. Such disorder will cease to appear if and when the forms, the construction and the ornamentation are derived from the true essence and inherent characteristics of the material. Only in this way will one succeed in building with true architectonic Reason: that is, when the material conforms in each of its parts to its inherent characteristics and its individual nature, only then will the result be legitimate harmony and perfect solidity. And that is the strongest argument, the battering ram of the Philosopher [Lodoli], with which he, with one impetuous stroke, intends to overturn both the whole of modern and ancient architecture. For which he would substitute, everywhere, his own individual architecture, true to the materials, honest, sincere, based on the true reason of things, so that buildings will remain firm, and in the flower of very long and almost eternal youth” (Algarotti 1963, 37).²³ When architecture has will have attained this great objective, it will then be true, honest, and reasonable. Algarotti felt, however, that the realization of such new principles would wreak catastrophe on architecture. He foresaw for his beloved art “the most terrible consequences” from such a novel doctrine which led him to conclude in his criticism of Lodoli’s doctrine that “lies are more beautiful than truth” (“del vero più bella è la menzogna”).

IV – Lodoli and the development of the science of the strength of materials

Lodoli’s theory owes much to the development of statics and increased understanding of the strength of materials at the beginning of the seventeenth century.²⁴ The formal beginning of this discipline originated with the publication in 1638 at Leiden of Galileo’s book *Two New Sciences* (*Discorsi e dimostrazioni matematiche intorno a due nuove scienze, attenenti alla Mecanica & movimenti locali*) (Galileo, 1638). Although Galileo’s contributions to our knowledge of statics are based on the work of his predecessors, such as Archimedes, Jordanus de Nemore, Leonardo da Vinci, Cardano and others, whose doctrines were revised by him and more clearly formulated, Galileo was the first to discuss the bending strength of a beam. He thus became the founder of an entirely new branch of science: the theory of the strength of materials which was destined to play a vital part in Lodoli’s architectural philosophy and in modern engineering science.²⁵ Galileo’s work on the mechanics of materials is included in the first two dialogues of his *Two New Sciences*. It begins with several observations made during his visits to the Venetian arsenal and discusses geometrically similar structures. He states that if we make structures geometrically similar, then, with increase of the dimensions, they become weaker

and weaker. In illustration he states: “A small obelisk or column or other solid figure can certainly be laid down or set up without danger of breaking, while very large ones will go to pieces under the slightest provocation, and that purely on account of their weight”. To prove this, he starts with a consideration of the strength of materials in simple tension and states that the strength of a bar is proportional to its cross-sectional area and is independent of its length. This strength of the bar Galileo calls the “absolute resistance to fracture” and gives some figures relating to the ultimate strength of copper. Having established the absolute resistance of a bar, Galileo investigates the resistance to fracture of the same bar if it is used as a cantilever with the load at the end.²⁶

During the eighteenth century, the scientific results of the preceding one hundred years found practical applications and scientific methods gradually introduced. The new tendency was to solve problems of statics mathematically by making experiments to ascertain the strength of materials.²⁷ Thus in 1707 and 1708, Antoine Parent (1666-1716) tested the resistance of timber beams and had published the result in a learned paper submitted to the French Academy of Sciences (Straub 1952, V, 105-111).²⁸ In 1729, a complete and accurate set of tables was available showing the ultimate compressive, tensile and bending strength of different kinds of wood, stone, metal and glass. These tables were published by the physicist Musschenbroek (1692-1761) of Leyden in a treatise written in Latin and entitled *Introductio ad cohaerentiam corporum firmorum*. Lodoli himself made careful measurements with the help of the *machina divulsoria* (Memmo 1973, II, 46)²⁹ of the principal building materials available in Venice and his tests of their strength, whether loaded vertically or horizontally, resulted in tabulations which are among the first recorded systematic comparisons of various materials in structural use, and furthermore, couched entirely in the Venetian dialect, the better to serve practical builders and architects. None of these tabulations seems to have survived (Memmo 1973, I, 315).³⁰

Statics and the search for an architecture true to materials and to methods of construction are actually at the centre of Lodoli's doctrine (Memmo 1973, I, 20; I, 108; II, 314),³¹ and in this he may be seen as the forerunner of the modern engineer who, from the nineteenth century onwards, would base his designs on calculations. His main contribution to the architectural debate of the eighteenth century was to base architecture on Galileo's discovery of the new science of the strength of materials as formulated in his *Two New Sciences* (Galileo, 1638). Memmo writes in this respect: “He had me know that it was most unlikely that the corollaries of the scientific principles that Galileo had discovered in mechanics, would differ much from those which he himself had discovered in architecture” (Memmo 1973, I, 5).³² Originator of the modern doctrine of “truth to materials”, Lodoli rejected the principles of classical architecture based on the transposition of the forms peculiar to wood into marble or stone and argued for a newer and better architecture in which the architect would use forms that were in the nature of each material used.

²⁶ For further details on the Galilean science of the strength of materials, see Timoschenko (1983, 7-15).

²⁷ On this topic, see Gargiani (2003, 99-115; 2008, 172-91).

²⁸ “Knowledge of building materials – First tests of their strength”.

²⁹ “Il padre Lodoli possedeva la macchina divulsoria, e ne faceva vedere a tutti le esperienze che aveva in massima parte trascritte”.

³⁰ “Il padre Lodoli aveva fatta una fatica quasi inconcepibile nel formar alcune tavole, ad uso de' falegnami e protti, cioè architetti veneziani, nelle quali traducendo i termini toscani al margine nel vernacolo loro, dava dopo gli esperimenti fatti, tutte le proporzioni di resistenza ai dati pesi ne' legnami, i quali pongonsi in opera nello Stato Veneto, supposti senza essenziali difetti in sè stessi; ed in oltre di tutte quelle che per i sovra imposti pesi dovevano avere le diverse qualità di pietra, marmi, muraglie e mattoni ben cotti ec. Queste tavole che sarebbero state senza dubbio utilissime, specialmente agli imperiti fabbricatori, e che da molti furono vedute, soggiacquero ancor esse purtroppo al crudele destino di tutti gli altri scritti”.

³¹ I, p. 20: “La meccanica e la statica degli edifizj, fondamento primario della buona architettura”; I, p. 108: “Le leggi statiche [devono] essere il solo fondamento dell'arte architettonica”; and II, p. 314: “Ne Vitruvio nè gli altri che scrissero negli antepassati secoli *de re aedificatoria* s'immaginarono mai che fossero necessari i calcoli sulle resistenze de' materiali, de' pesi, degli urti interni ed esterni, senza i quali calcoli non è possibile che un architetto sappia se la fabbrica sia per esser solida, sicura, durevole”.

³² “E quasi ch'egli avesse sotto gli occhi il testo di que' dialoghi, mi fece conoscere che difficilmente potrebbero esser diversi nei corollarij gli stessi scientifici principj, che il Galileo scopri nella meccanica ed egli quasi conseguentemente nell'architettura”. For the influence of Galileo in the eighteenth century, see Hall (1980, 81-101).

Conclusion

Lodoli's attempt at reforming contemporary architecture seems to have aroused widespread hostility in Venice. Indeed we are told by Memmo that "in relation to architecture he fought with everyone". Lodoli's ideas appear marginal in the context of their influence on eighteenth century architectural thinking and as such he can be seen as a "prophet of Modernism" with no contemporary influence. One has to wait until the nineteenth century to find his doctrine appropriated by leading theorists and practising architects when it reached Karl Friedrich Schinkel (1781-1841) and Gottfried Semper (1803-79) in Germany, Augustus W. N. Pugin (1812-52) and John Ruskin (1819-1900) in England, Eugène Emmanuel Viollet-le-Duc (1814-79) in France, and Horatio Greenough (1805-52), and a following line of functionalists in the United States.

Lodoli exists only as a footnote in most major history books of modern architecture, yet his role in the origins of Modernism should undoubtedly be revisited and his role in this avant-garde movement should be recognized. Through Lodoli, Venice can be seen as the cradle of modern architectural theory which was destined gradually to transform the nature of architecture in the coming centuries. Enlightenment philosophy combined with Newtonism played a central role in the crisis of classical architecture and Vitruvianism giving birth to a new Post-Renaissance approach to architecture. From now on the doctrine of "truth to materials" would replace the concept of the imitation of nature and the ancients. ●

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