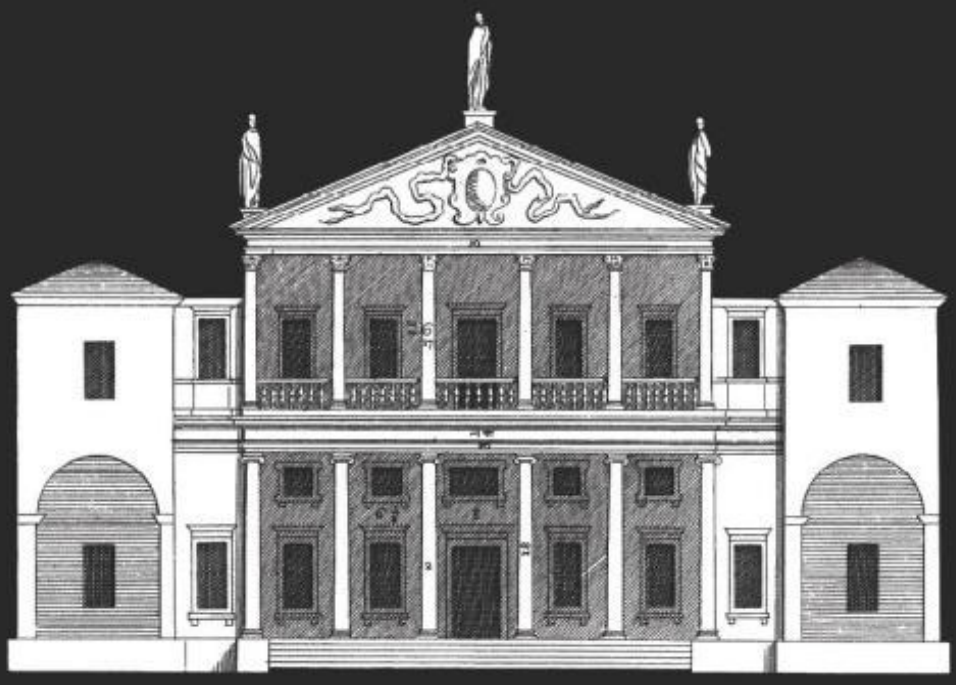
*Andrea Palladio*

# THE FOUR BOOKS OF ARCHITECTURE



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# The Four Books of Architecture

# Andrea Palladio

This Dover edition, first published in 1965, is an unabridged and unaltered republication of the work originally published by Isaac Ware in 1738, to which has been added a new Introduction written especially for this edition by Adolf K. Placzek.

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**THE THIRD BOOK OF Andrea Palladio's ARCHITECTURE.**

**THE FOURTH BOOK OF Andrea Palladio's ARCHITECTURE.**

# *Introduction to Dover Edition*

It can be safely said that Andrea Palladio ranks not only among the most famous, but also among the most influential architects of all time. However, when we turn to his life and to his person, we find that very little of either the man or of his life is known. He was born in Padua in 1508, of humble family, but grew up in Vicenza. He was originally trained as a sculptor (a not unusual thing for Renaissance architects) and as a stone mason. In Count Giangiorgio Trissino he found a generous patron, who took him to Rome in 1541. It was there that his eyes were opened to the full glory of classic architecture and that he turned to the study of ancient buildings. He traveled widely in Italy, but—with the possible exception of Nîmes—never outside. He returned to Rome several times, but he did not become connected with the greatest architectural task of his age, the rebuilding of Saint Peter's. Most of his life he spent in Vicenza, where he died in 1580. Palladio was a superb architect, but he was not an innovator like Brunelleschi or Michelangelo. He built churches, town and country houses, public buildings and bridges in Venice and on the Venetian mainland and in and around Vicenza. Many of these buildings were built of cheap material (brick faced with stucco instead of stone for which the designs would have called) and are therefore now in rather poor condition. Among his main works are the churches of S. Giorgio Maggiore and of Il Redentore in Venice, the Villa Capra near Vicenza, the Palazzi Valmarana, Chiericati and Thiene, and the exterior of the Basilica (Town Hall), all in Vicenza. His last great work was the Teatro Olimpico in Vicenza, which his pupil Vincenzo Scamozzi finished after his death. It contains a permanent stage built in perspective—a most remarkable creation.

The question immediately arises: why this enormous fame and influence? For it was not only his buildings that were imitated again and again, both in their pure plans and elevations and in their details; also his writings, above all the *Four Books of Architecture,* have had the most profound and widespread impact. This book has been translated into every major European language, issued and reissued time after time and has remained a basic book for every architectural library. Why this fame and influence? The answer, in all likelihood, lies in the fact that Andrea Palladio was more than an interpreter of a particular style or a skillful publicist for his own works; that he was—and remains—the spokesman for the belief in valid rules, in immutable canons, for the belief that there is a correct, a right way to design. One can go even further and call him a spokesman for absolute standards. He is the only architect after whom an architectural idiom is named: Palladianism. Nobody speaks of Brunelleschism, Bramantism, or, in more recent examples, of Wright-ism or Le Corbusier-ism. "Miesian" would be a possible term, and in a way for the same reason—because of the striving for a perfect, a valid form inherent in it. In this sense, Mies van der Rohe himself could be labeled a Neo-Palladian.

Palladianism is the conviction, first of all, that a universally applicable vocabulary of architectural forms is both desirable and possible; secondly, that such a vocabulary had been developed by the ancient Romans (Palladio's knowledge of Greek architecture was scant), and thirdly, that a careful study and judicious use of these forms will result in Beauty. This Beauty, according to the Palladians, is therefore not only derived from ideal forms and their harmony; it is also rooted in historical correctness; and it includes the most practical, reasonable solution of the specific problem on hand. Much of Palladio's thought is based on Leon Battista Alberti's De Re *Aedificatoria,* the first of the great architectural treatises of the Renaissance (published in 1485), but even more closely on the writings of a Roman architect of the Augustan age, Vitruvius, which were issued in print for the first time in 1486. This is the only architectural book preserved from the

Roman and Greek world, and was, as such, for Palladio and his contemporaries the authoritative voice of Antiquity. Of course Palladio was deeply impressed by the Roman remains themselves. He studied them thoroughly and even published the first scholarly guide book to classical Rome (*Le Antichità di Roma,* 1554), a little volume much used in the next two centuries.

Palladio's main work, however, and the one on which much of his fame and of the durability of Palladianism rests, is *I Quattro Libri dell'Architettura,* as the *Four Books of Architecture* are called in the original. It was first published in Venice in 1570, and proved immediately to be a book of the greatest importance. A second edition followed in 1581, a year after the author's death, another in 1601, and so on in remarkable succession. The effect of this book on the major European countries—France, the Netherlands and Germany above all—where the Renaissance developed more slowly, was equally profound. In England it was the great Inigo Jones (1573–1652) who first imported Palladianism. During his visit to Italy in 1614 he not only acquired a number of original drawings by Palladio from the latter's pupil Scamozzi, but also a copy of the *Quattro Libri,* which he studied most carefully and richly annotated. This annotated copy is preserved at Worcester College, Oxford, and it can be called a book in which literally two civilizations meet. The Banqueting House at Whitehall (1619–1622), the Queen's House in Greenwich (1616–1635) and other buildings are the result of this meeting; with them the Italian High Renaissance finally reached England.

The first complete English translation of *I Quattro Libri* was not published until 1715, by an enterprising Venetian architect, Giacomo Leoni, who had settled in London. In the following years Palladianism became the ruling style in England. The hegemony of one style or taste at a given time is of course the result of concurring factors; but if a single individual can be credited (or blamed, as the position may be), then Richard Boyle, third Earl

of Burlington (1695–1753) is the man to whom England owes the long rule of strict Palladianism in the eighteenth century—and, more indirectly, America its own brand of the same style. An art patron of vast influence and wealth, he was also an architect in his own right, and a precise and demanding scholar. The engravings in Leoni's edition of Palladio had not been faithful to the original: there had been decorative embellishments in the Baroque spirit, additions, and even misinterpretations of the original design intent. This, most probably on Burlington's suggestion, was to be remedied by a faithful and accurate reproduction of the original plates, and an exact translation of the text. The man to accomplish this was Isaac Ware (birthdate unknown, d. 1766), who was himself an architectural writer, a fairly prominent architect of his day, and a follower of Burlington. The edition came out in 1738 and can certainly be considered a successful accomplishment. Indeed the accuracy of the reproductions is amazing. In spite of this, it has remained the less accessible of the two variants, partly because Leoni was first on the scene, was more ambitious in his publishing ventures and persisted through two more English editions. In fact, Ware's faithful edition became somewhat of a rarity; and it is for this reason, too, that the present reissue is of the greatest value. It will make a work available to the general public which has long been elusive and inaccessible, yet can still be considered essential to the study of architectural forms. And while the short and factual text is obviously of less importance than the plates, the good English translation deserves a special mention. To those who do not read Italian, it will convey something of the clarity and restraint of Palladio's own style, besides containing the necessary key to the structures and forms he chose to illustrate.

The work, as is evident from the title, is divided into four parts ("books"):

The *First Book* is concerned with building materials, building techniques, and most of all with that great preoccupation of the Renaissance architect, the five orders of architecture (Tuscan, Doric, Ionic, Corinthian, Composite), as they are expressed in columns, pilasters and the architraves resting on

them. Palladio then turns briefly to the other parts of a classic building (stairs, chimneys, roofs, etc.).

The *Second Book* treats of private houses on a grand scale. Apart from a few Roman reconstructions, this book shows Palladio's own designs—the many villas on the Venetian mainland and in and around Vicenza, among them the most famous of all, the Villa Capra ("La Rotonda" as it is sometimes called; plate 13).

The *Third Book* deals with streets, piazzas, bridges and basilicas (a basilica was originally not a religious building, but a Roman hall of justice). Again, Palladio reproduces Roman works, including a reconstruction of Julius Caesar's Rhine bridge, and then turns to his own designs. Plate 19 shows the famous arcades of the Basilica in Vicenza, from which the much imitated "Palladian motif" derives.

The *Fourth Book* deals with Roman temples; particularly noteworthy are the beautiful drawings of the Pantheon (plates 51–60). Plates 44–45 show Bramante's Tempietto in S. Pietro Montorio. This is the only building in the book which is not either by Palladio himself or of Roman origin. The remarks on p. 97 (chapter XVII) throw a bright light on Palladio's position towards his Renaissance precursors and contemporaries.

A modern biography of Palladio in English is still lacking. For the most illuminating analysis of Palladio's design ideas, particularly his use of mathematical proportions, the reader is referred to *Architectural Principles in the Age of Humanism* (3rd rev. ed., 1962) by Rudolf Wittkower, to whom we are indebted for much of our present knowledge of sixteenth-century as well as eighteenth-century Palladianism.

1964

ADOLF K. PLACZEK
*Avery Library*
*Columbia University*


REGINA VIRTUS
THE FOUR BOOKS
OF
ANDREA PALLADIO's
ARCHITECTURE:
WHEREIN,
After a short Treatise of the Five ORDERS,
Those Observations that are most necessary in
BUILDING,
PRIVATE HOUSES, STREETS, BRIDGES, PIAZZAS,
XISTI, and TEMPLES are treated of.
LONDON,
Published by
ISAAC WARE,
Anno MDCCXXXVIII.

To the Right Honourable

**RICHARD**
**Earl of BURLINGTON, &c.**

MY LORD,

**Y**OUR giving me free acceſs to Your ſtudy, wherein many of the original drawings of PALLADIO, beſides thoſe which compoſe this work, are preſerved, and taking upon You the trouble of reviſing the tranſlation, and correcting it with Your own hands, are ſuch inſtances of Your love to arts, and of Your friendſhip to me, that I cannot too publickly return YOUR LORDSHIP thanks for favours that ſurpaſs all acknowledgment.

YOUR LORDSHIP need not be informed of what importance it is to ſuch who make architecture their ſtudy to have the works of our excellent author put into their hands truly genuine. Nor can I doubt but this performance will be acceptable to the publick, ſince it has had the good fortune to meet with YOUR LORDSHIP'S approbation: To obtain which, will always be the chief ambition of

YOUR LORDSHIP'S

*Most Obedient Humble Servant,*

Iſaac Ware.

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# A

# B

## C

**C**ampana, *the body of the Corinthian capital.*

**C**ancellarie, *libraries,* p. 44 *and* 45. pl. 29.

**C**artelli, *or* Cartocci, *a kind of ſeroll,* p. 26.

**C**avetto, p. 15. pl. 11.

**C**auriola, p. 88. pl. 10.

**C**aulicola, *ſtem of the leaf in the Corinthian capital.*

**C**imacio *of capital,* p. 15. pl. 11.

**C**imacia *of pedeſtal,* p. 17. p. 14.

**C**ima recta, *or* Gola diritta, p. 15. pl. 11.

**C**ima *or* Gola reverſa, p. 18 . pl. 15.

**C**imbia, Fillet, *or* Cincture, p. 14. pl, 10.

**C**iziceni, p. 45. pl. 29.

**C**olonelli, p. 63. pl. 3.

**C**ollarino, p. 14. pl. 10.

**C**orrenti, p. 67. pl. 6.

# D

**D**ado, *the dye of a pedeſtal,* p. 17. pl. 14.

**D**entelli, *or* Dentels, p. 22. pl. 24.

**D**iaſtilos, p. 84.

**D**ipteros, *double winged with columns,* p. 83.

# E

# F

**F**aſcia, p. 18. pl. 15.

**F**luting *or* Flutes, *the chanellings of a column*.

**F**regio *or* Frize, p. 15. pl. 11.

**F**uſarolo, p. 24.

**F**uſt, *ſhaft of a column*.

# G

**G**occie, p. 18. pl. 15.

**G**occiolatoio, *or* Corona, p. 15. pl. 11. *and* p. 18. pl. *15*.

**G**ola diritta, *or* Cima recta, p. 15. pl. 11.

**G**ola, *or* Cima reverſa, p. 18. pl. 15.

**G**radetto, Gradetti, *or* Annuli, p. 18. pl. 15.

**G**ronda, *or* Drip, p. 14.

**G**uttæ, *or* Drops, p. 18.

# I.

**I**mpoſts, p. 17. pl. 14.

**I**ntaglia's, *carved ornaments of the frize and architrave.*

**I**ntavolato, *or* Cima, *or* Gola reverſa, p. 22.

**I**ntercolumniation, *the ſpace between columns.*

# L

**L**iſtello, *fillet*.

**L**oggia, *or* Veſtibulo, p. 27. *and p. 42,* pl. 18.

# M

# O

# P

**P**aleſtra, p. 77. pl. 21.

**P**edeſtal, p. 14. pl. 10.

**P**eridromis, p. 21.

**P**eripteros, *winged round with columns,* p. 83.

**P**eriſtilio, p. 44. pl. 23.

**P**icnoftilos, *thick of columns,* p. 83.

**P**iano, p. 32. pl. 30.

**P**linth, Orlo, *or* Zocco, p. 17. pl, 14.

**P**oggio, *or* Pedeſtal, p. 42.

**P**ortico, p. 42 pl. 18.

**P**rofile, *ſide view.*

**P**roſtilos, *fronted with columns,* p. 21.

**P**ſeudodipteros, *falſe-winged round with columns,* p. 83.

# R



b

# S

# T

**T**ablino, p. 42. pl. 18.

**T**enia, *or* Benda, p. 18. pl. 15.

**T**errazzo, *plaiſter*.

**T**eſtudine, *covering of porch,* p. 43.

**T**etraſtili, *of four columns,* p. 44. pl. 25.

**T**ondino, *or* Aſtragal, p. 14. pl. 10.

**T**orus, *or* Baſtone, p. 14. pl. 10.

**T**ribuna, *or* Cupola, p. 85.

**T**riclini, *eating parlours,* p. 44. pl. 29.

**T**riglyph, p. 18. pl. 15.

# V

# X

**X**iſti, p. 77. pl. 21.

# Z

**Z**occo, Orlo, *or* Plinth, p. 17. pl. 14.

# ERRATA.

Beſides a few literal Miſtakes, the Reader will be pleaſed to take notice of the following :

Page 14. line 14. read *beſides the being*. P. 15. l. 11. r. *Gocciolatoio*. P. 19. l. 10. *r. Euſtilos*. Ibid. l. 17. *r. fourth and an eigth*. P. 21. l. 6. r. *nine modules and an half*. Ibid. 1. 21. r. *Siſtilos*. P. 24. l. 10. r. *Picnoſtilos*. P. 25. l. 45. r. *thinner at the top*. P. 32. l. 10. r. *two parts in three*. P. 52. 1. ult. r. *delight*. Every where read *mezato* and *mezati*. P. 55. l. 21. r. as *there are*. P. 85. l. 30. r. *Aereoſtilos*. P. 96. l. 44. *r. Fuſarolo*. P. 97. l. 19. r. *elegance*. P. 97. l. 42. r. *Martirio*.

Plate 10. firſt Book, for 8 *minutes* in Cavetto of impoſt, read *5 minutes*.

# ADVERTISEMENT.

**T**HE works of the famous ANDREA PALLADIO, publiſhed by himſelf at *Venice* in the year 1570. have been univerſally eſteemed the beſt ſtandard of architecture hitherto extant. The original work written in Italian being very ſcarce, ſeveral have attempted to tranſlate the fame into English, and to copy his excellent and most accurate wooden prints on copper plates.

IN particular, two perſons have publiſhed what they honour with the title of PALLADIO'S works: The firſt, and in all reſpects the beſt of the two, was done in the year 1721. by Mr. LEONI; who has thought fit not only to vary from the ſcale of the originals, but alſo in many places to alter even the graceful proportions preſcribed by this great maſter, by diminiſhing ſome of his meaſures, enlarging others, and putting in fanciful decorations of his own: and indeed his drawings are likewiſe very incorrect; which makes this performance, according to his own account in the preface, ſeem rather to be itſelf an original, than an improvement on PALLADIO.

THE other work (publiſhed in the year 1735.) is done with ſo little underſtanding, and ſo much negligence, that it cannot but give great offence to the judicious, and be of very bad conſequence in miſleading the unſkilful, into whoſe hands it may happen to fall.

To do juſtice therefore to PALLADIO, and to perpetuate his moſt valueable remains amongſt us, are the principal inducements to my undertaking ſo great and laborious a work; in executing of which, I have ſtrictly kept to his proportions and meaſures, by exactly tracing all the plates from his originals, and engraved them with my own hands: So that the reader may depend upon having an exact copy of what our author publiſhed, without diminution or increaſe; nor have I taken upon me to alter, much leſs to correct, any thing that came from the hands of that excellent artiſt.

FROM the ſame motive I have choſen to give a ſtrict and literal tranſlation, that the ſenſe of our author might be delivered from his own words.

*Scotland-Yard*,
*June*, 1737.

# THE AUTHOR'S PREFACE

## *TO THE READER.*

**G***UIDED by a natural inclination, I gave myſelf up in my moſt early years to the ſtudy of architecture: and as it was always my opinion, that the antient* Romans*, as in many other things, ſo in building well, vaſtly excelled all thoſe who have been ſince their time, I propoſed to myſelf* VITRUVIUS *for my maſter and guide, who is the only antient writer of this art, and ſet myſelf to ſearch into the reliques of all the antient edifices, that, in ſpight of time and the cruelty of the Barbarians, yet remain; and finding them much more worthy of obſervation, than at firſt I had imagined, I began very minutely with the utmoſt diligence to meaſure every one of their parts; of which I grew at laſt ſo ſollicitous an examiner, (not finding any thing which was not done with reaſon and beautiful proportion) that I have very frequently not only travelled in different parts of Italy, but alſo out of it, that I might intirely, from them, comprehend what the whole had been, and reduce it into deſign.*

*Whereupon perceiving how much this common uſe of buildings was different from the obſervations I had made upon the faid edifices, and from what I had read in* VITRVIUS, LEON BATTISTA ALBERTI, *and in other excellent writers who have been ſince* VITRUVIUS*, and from thoſe alſo which by me have lately been practiſed with the utmoſt ſatisfaction and applauſe of thoſe who have made uſe of my works; it ſeemed to me a thing worthy of a man, who ought not to be born for himſelf only, but alſo for the*

*utility of others, to publiſh the deſigns of those edifices, (in collecting which, I have employed ſo much time, and expoſed myſelf to ſo many dangers) and conciſely to ſet down whatever in them appeared to me more worthy of conſideration; and moreover, thoſe rules which I have obſerved, and now obſerve, in building, that they who ſhall read theſe my books, may be able to make uſe of whatever will be good therein, and ſupply thoſe things in which (as many perhaps there may be) I ſhall have failed; that one may learn, by little and little, to lay aſide the ſtrange abuſes, the barbarous inventions, the ſuperfluous expence, and (what is of greater conſequence) avoid the various and continual ruins that have been ſeen in many fabricks.*

*I applied myſelf the more willingly to this undertaking, as I ſee great numbers of perſons at this time applying theimſelves to the ſtudy of this profeſſion, many of which are worthily and honourably mentioned in the books of Meſſer* GIORGIO VASARI ARETINO, *a painter and rare architect.*

*I therefore hope, that the manner of building may with univerſal utility be reduced, and ſoon brought to that pitch of perfection, which in all the arts is greatly deſired, and to which it ſeems that this part of Italy is very nearly arrived; ſince that not only in Venice, where all the good arts flouriſh, and which only remains as an example of the grandeur and magnificence of the* Romans, *one begins to ſee fabricks that have ſomething good in them, ſince Meſſer* GIACOMO SANSOVINO, *a celebrated ſculptor and architect, firſt began to make known the beautiful manner, as is ſeen (not to mention many other beautiful works of his) in the new* Procuratia, *which is the richeſt and moſt adorned edifice, that perhaps has been made ſince the antients; but alſo in many other places of leſs fame, particularly in* Vicenza, *a city of no very large circumference, but full of moſt noble intellects, and abounding ſufficiently with riches ; and where I had firſt an opportunity to practiſe what I now publiſh for common utility, where a*

*great number of very beautiful fabricks are to be ſeen, and where there have been many gentlemen very ſtudious in this art, who, for their nobility and excellent learning, are not unworthy to be numbered among the moſt illuſtrious; as Signor* GIOVAN GIORGIO TRISSINO, *the ſplendor of our times ; the Counts* MARC' ANTONIO *and* ADRIANO DE THIENI, *brothers ; Signor* ANTENORE PAGELLO, *Knight ; and beſides theſe, who are paſſed to a better life, having eternized their memory in their beautiful and moſt adorned fabricks, there is now Signor* FABIO MONZA, *intelligent in a great many things ; Signor* ELIO DE BELLI, *ſon of Signor* VALERIO, *famous for the artifice of camei's and engraving in cryſtal ; Signor* ANTONIO FRANCESCO OLIVIERA, *who, beſides the knowledge of many ſciences, is an architect, and an excellent poet, as he has ſhewn in his* Alemana, *a poem in heroick verſe, and in a fabrick of his at* Bofchi di Nanto, *a place in the* Vicentine ; *and laſtly, (to omit many more, who might very deſervedly be placed in the ſame rank) Signor* VALERIO BARBARANO, *a moſt diligent obſerver of all that belongs to this profeſſion.*

*But to return to our ſubject : As I am to publiſh thoſe labours that I have from my youth hitherto undergone, in ſearching and meaſuring (with the greateſt care and diligence I could) all thoſe antient edifices that came to my knowledge ; and upon this occaſion, in a few words, to treat of architecture, as orderly and diſtinctly as was poſſible for me ; I thought it would be very convenient to begin with private houſes, becauſe one ought to believe, that thoſe firſt gave rife to publick edifices ; it being very probable, that man formerly lived by himſelf ; but afterwards, ſeeing he required the aſſiſtance of other men, to obtain thoſe things that might make him happy, (if any happineſs is to be found here below) naturally fought and loved the company of other men: whereupon of ſeveral houſes, villages were formed, and then of many villages, cities, and in theſe publick places and edifices were made.*

*And alſo becauſe of all the parts of architecture there is none lo neceſſary to mankind, nor that is oftener uſed than this, I lhall therefore firſt treat of private houſes, and afterwards of publick edifices ; and ſhall briefly treat of ſtreets, bridges, piazze, priſons, baſiliche (which are places of juſtice) xiſti, paleſtre (which are places where men exerciſed themſelves) of temples, theatres, amphitheatres, arches, baths, aqueducts ; and laſtly, of the manner of fortifying cities and ſea-ports.*

*And in all theſe books I ſhall avoid the ſuperfluity of words, and ſimply give thoſe directions that ſeem to me moſt neceſſary, and ſhall make uſe of thoſe terms which at this time are moſt commonly in uſe among artificers.*

*And becauſe I cannot promiſe any more myſelf, (lave the long fatigue, great diligence, and the love that I have beſtowed to underſtand and practiſe what I now offer,) if it pleaſes* GOD *that I may not have laboured in vain, I ſhall heartily thank his goodneſs ; acknowledging withal, myſelf obliged to thoſe, that from their beautiful inventions, and from the experience they had, have left the precepts of luch an art, becauſe they have opened a more eaſy and expeditious way to the diſcovery of new things, and that by their means we have attained to the knowledge of many things, which perhaps had otherwile been hid.*

*The firſt part ſhall be divided into two books ; in the firſt ſhall be treated of the preparation of the materials, and when prepared, how, and in what manner, they ought to be put to uſe, from the foundation up to the roof : where thoſe precepts ſhall be, that are univerſal, and ought to be obſerved in all edifices, as well private as publick.*

*In the ſecond I ſhall treat of the quality of the fabricks that are ſuitable to the different ranks of men : firſt of thoſe of a city ; and then of the moſt convenient ſituation for villa's, and in what manner they are to be diſpoſed.*

*And as we have but very few examples from the antients, of which we can make uſe, I ſhall inſert the plans and elevations of many fabricks I have erected, for different gentlemen, and the deſigns of the antients houſes, and of thoſe parts which are moſt remarkable in them, in the manner that* VITRUVlUS *ſhews us they were made.*

*ERRATA.*

**P**AGE 5. line 24. read *Giovanni*. 1. 29. r. *Damiano*. 1. 30. r. *St. Agnes*, now called *Santa Agneſa*. 1. 31. r. *Numentana*. p. 6. 1. ult. r. *Tofo*. p. 10. 1. 18. r. modiglions. p. 22. 1. 6. r. *dentelli* only. p. 25. 1. 5. *dele* may. p. 27. 1. 38. r. *Paduan*. p. 31. 1. 44. r. *regolo*. p. 32. l. I. r. triangle.

# THE FIRST BOOK OF Andrea Palladio's ARCHITECTURE.

# CHAPTER I.

## *Of the ſeveral particulars that ought to be conſider'd and prepar'd before we begin to build.*

**G**REAT care ought to be taken, before a building is begun, of the ſeveral parts of the plan and elevation of the whole edifice intended to be raiſed : For three things, according to VITRUVIUS, ought to be conſidered in every fabrick, without which no edifice will deſerve to be commended; and theſe are utility or convenience, duration and beauty. That work therefore cannot be called perfect which ſhould be uſeful and not durable, or durable and not uſeful, or having both theſe ſhould be without beauty.

AN edifice may be eſteemed commodious, when every part or member ſtands in its due place and fit ſituation, neither above or below its dignity and uſe ; or when the *loggia's,* halls, chambers, cellars and granaries are conveniently diſpoſed, and in their proper places.

THE ſtrength, or duration, depends upon the walls being carried directly upright, thicker below than above, and their foundations ſtrong and ſolid: obſerving to place the upper columns directly perpendicular over thoſe that are underneath, and the openings of the doors and windows exactly over one another ; ſo that the ſolid be upon the ſolid, and the void over the void.

BEAUTY will reſult from the form and correſpondence of the whole, with reſpect to the ſeveral parts, of the parts with regard to each other, and of theſe again to the whole ; that the ſtructure may appear an entire and compleat body, wherein each member agrees with the other, and all neceſſary to compoſe what you intend to form.

WHEN thoſe ſeveral particulars have been duly examined upon the model or draught, then an exact calculation ought to be made of the whole expence, and a timely proviſion made of the money, and of thoſe materials that ſhall ſeem moſt neceſſary, to the end that nothing may be wanting, or prevent the compleating of the work. In ſo doing, the builder will not only be commended; but it will alſo be of the utmoſt advantage to the whole ſtructure, if the walls are equally and expeditiouſly carried up : for being thus diſpatch'd, they will fettle proportionably, every where alike, and not be ſubject to thoſe clefts ſo commonly found in buildings that have been finiſh'd at divers times.

THEREFORE, having made choice of the moſt ſkilful artiſts that can be had, by whoſe advice the work may the more judiciouſly be carried on, you muſt then provide a ſufficient quantity of timber, ſtone, ſand, lime and metals; concerning which proviſion I intend to lay down ſome very uſeful directions. There muſt alſo be a ſuffisient number of joyſts, to frame the floors of the halls and chambers; which ought to be diſpoſed and placed in ſuch a manner, that the diſtance betwixt each joyſt may be the width of one joyſt and an half when they are framed together.

You muſt likewiſe obſerve, that when the jambs of doors and windows are to be made, not to chuſe ſtones bigger than a fifth, or leſs than a fixth part of the void or opening. And if you intend to adorn the building with columns or pilaſters, make the baſes, capitals, and architraves of ſtone, and the other parts of brick.

WITH reſpect to the walls, care muſt be taken, as they are raiſed, that they may proportionably be diminiſhed in the thickneſs. Which obſervation, if rightly applied, may be of ſingular ſervice, and enable you to make a truer eſtimate of the charge, and avoid great part of the expence.

BUT as I ſhall treat more diſtinctly of theſe ſeveral particulars under their reſpective heads, this general hint may ſuffice at preſent, and may ſerve as a ſketch of the whole fabrick.

THE ſame regard is likewiſe to be had to the quality and goodneſs of thoſe materials, that the beſt may be choſen. The experience gained from the buildings of others, will very much help to determine what is fit and expedient to be done.

AND although VITRUVIUS, LEON BAPTISTA ALBERTI, and other excellent writers, have laid down very uſeful rules with reſpect to the choice of the materials, I ſhall nevertheleſs take notice of ſuch as are moſt eſſential, that nothing may appear to be wanting in this treatiſe.

# CHAP. II.

## *OF TIMBER.*

**V**ITRUVIUS tells us, in the ninth chapter of his ſecond book, that timber ought to be felled in autumn, or during the winter ſeaſon, in the wane of the moon ; for then the trees recover the vigour and ſolidity that in ſpring and ſummer was diſperſed among their leaves and fruit. It will, moreover, be free from a certain moiſture, very apt to engender worms, and rot it, which at that time will be conſumed and dried up. It ought likewiſe to be cut but to the middle of the pith, and ſo left until it is thoroughly dry, that the moiſture, the cauſe of putrefaction, may gradually diſtil and drop away.

WHEN fell'd, it muſt be laid in a proper place, where it may be ſhelter'd from the ſouth ſun, high winds, and rain. That of a ſpontaneous growth eſpecially ought to be fully dried, and daubed over with cow-dung, to prevent its ſplitting. It ſhould not be drawn through the dew, but removed rather in the afternoon ; nor wrought when wet and damp, or very dry : the one being apt to cauſe rottenneſs, and the other to make clumſy work. Neither will it in leſs than three years be dry enough to be made uſe of in planks for the floors, windows, and doors.

THOSE therefore who are about to build, ought to be inform'd from men thoroughly acquainted with the nature of timber, that they may know which is fit for ſuch and ſuch uſes, and which not.

IN the above-mention'd chapter VITRUVIUS gives many other uſeful directions, beſides what other learned men have written upon that ſubject.

# CHAP. III.

## *OF STONES.*

**S**TONES are either natural, or artificially made by the induſtry of men. The former are taken out of quarries, and ſerve to make lime (of which more hereafter) and alſo to raiſe walls. Thoſe of which walls are commonly made, are marble and hard ſtones, alſo called live ſtone ; or ſoft, and tender.

MARBLE and live ſtone ought to be wrought as ſoon as they are taken out of the quarry, which then may be done with much more eaſe than after they have continued ſome time expoſed to the air. But the ſofter kind muſt: be dug in ſummer, and placed under a proper ſhelter for the ſpace of two years before they are uſed, that they may more gradually harden, being thus defended from high winds, rain, and froſts (eſpecially when the nature of the ſtone is not well known, or if it be dug out of a place that never was open'd before) by which means they will be made much fitter to reſiſt the inclemencies of the weather.

THE reaſon for keeping them ſo long is, that being ſorted, thoſe which have receiv'd damage, may be placed in the foundations; and the others, which have not been injured, ſhould be uſed above ground: and thus they will laſt a long time.

THE ſtones artificially made are commonly called *quadrelli,* or bricks, from their ſhape. Theſe ought to be made of a chalky, whitiſh, and ſoft earth, dug up in autumn, and temper' d in winter, that, in the ſpring following, it may the more conveniently be work'd up into bricks; always avoiding that earth that is over fat or ſandy. But if neceſſity obliges to make them in the winter or ſummer time, they muſt carefully be cover'd during the former ſeaſon with dry ſand, and in the latter with ſtraw. When made, they require a long time to dry; for which reaſon a good ſhelter is the moſt proper place, to cauſe the outſide and inſide to dry or harden equally, which can't be accompliſhed in leſs than two years.

AND as bricks are made either larger or ſmaller, according to the quality of the building, and their intended uſe; ſo the antients made them larger for publick and great buildings than for ſmall and private ones; and therefore holes ought to be made here and there through the larger, that they may dry and burn the better.

# CHAP. IV.

## *OF SAND.*

**T**HERE are three ſorts of ſand commonly found ; pit, river, and ſea ſand. The beſt of all is pit ſand, and is either black, white, red, or aſh-colour'd ; which laſt is a kind of earth calcined by ſubterraneous fires pent up in the mountains, and taken out of pits in *Tuſcany*.

THEY alſo dig out of the earth in *Terra di Lavoro,* in the territories of *Baia* and *Cuma*, a ſort of ſand, called *Pozzolana* by VITRUVIUS, which immediately cements in the water, and makes buildings very ſtrong. But long experience has ſhewn, that of all the ſeveral kinds of pit ſand, the white is the worſt. The beſtſt river ſand is that which is found in rapid ſtreams, and under water-falls, because it is moſt purged. Sea ſand, although the worſt, ought to be of a blackiſh colour, and ſhine like glaſs : that which is large grained, and neareſt to the ſhore, is beſt. Pit ſand, being fatteſt, makes, for that reason, the moſt tenacious cement, and is therefore employ'd in walls and long vaults ; but it is apt to crack.

RIVER ſand is very fit for covering and rough-caſting of walls. Sea ſand ſoon wets and ſoon dries, and waſtes by reaſon of its ſalt, which makes it very unfit to ſuſtain any conſiderable weight.

EVERY kind of ſand will be good that feels criſp when handled, and, if laid upon white clothes, will neither ſtain or leave earth behind it. But that ſand is bad, which, being mix'd with water, makes it turbid and dirty: As alſo ſuch as has remain'd a long while expoſed to the weather; for then it will contain ſo much earth and corrupt moiſture, that it will be apt to produce ſhrubs and wild fig-trees, which are very prejudicial to buildings.

# CHAP. V.

## *Of LIME, and of the method of working it into mortar.*

**T**HE ſtones of which lime is made, are either dug out of hills, or taken out of rivers. All thoſe taken out of hills are good where dry, brittle, free from moiſture, or the mixture of any ſubſtance, which being conſumed by the fire, diminiſhes the ſtone. That lime will therefore therefore be beſt which is made of the moſt hard, ſolid, white ſtone, and which, being burnt, is left a third part lighter than the ſtone of which it was made.

THERE is alſo a ſpungy ſort of ſtone, the lime of which is very good for covering and rough-caſting of walls; likewiſe a ſcaly rugged ſtone, taken out of the hills of *Padua,* that makes an excellent lime for ſuch buildings as are moſt expoſed to the weather, or ſtand under water, becauſe it immediately ſets, grows hard, and is very laſting.

ALL ſtones taken out of the earth are much better to make lime of, than thoſe which are collected; and rather taken from a ſhady moiſt pit, than from a dry one. The white are better than the brown, as being the moſt eaſily work'd. The pebbles found in rivers and rapid ſtreams, are excellent for lime, and make very white neat work; therefore it is chiefly uſed in the rough-caſting of walls. All ſtones, either dug out of the hills or rivers, burn quicker

or ſlower, in proportion to the fire given them, but are generally calcined in ſixty hours. When calcined, they muſt be wetted, in order to ſlack them ; obſerving not to pour on the water all at once, but at ſeveral times, to prevent its burning before it be well-tempered, and afterwards muſt be laid in a moiſt ſhady place, only covering it lightly with ſand, taking care not to mix any thing with it; and when uſed, the more it is work'd up with the ſand, the better it will cement; except that made of a ſcaly ſtone, like that from *Padua,* be-cauſe that muſt be uſed as ſoon as it is ſlacked, to prevent its burning and conſuming away ; it will otherwiſe be uſeleſs.

To make mortar, lime ſhould be mix'd with ſand in this proportion; three parts of pit ſand to one of lime, and but two of ſea or river ſand to one of lime.

# CHAP. VI.

## *OF METALS.*

**T**HE metals commonly employ'd in buildings, are iron, lead, and copper. Iron ſerves to make nails, hinges, bars, gates, bolts for faſtenings, and ſuch like works.

THERE is no iron any where found pure; nor any, when taken out of the earth, but muſt firſt be melted, and then purged of its droſs by the fire, to make it fit for uſe. For then it will eaſily be made red-hot, will be ſoft enough to be wrought, and ſpread under the hammer; but cannot ſo eaſily be melted again, except it is put into a furnace made for that purpoſe: And if not well hammer'd when red-hot, it will burn and waſte away.

IT is a ſign the iron is good, if, when reduced into bars, you ſee the veins run ſtreight and uninterrupted, and that the ends of the bars be clean and without droſs: For theſe veins will ſhew that the iron is free from lumps and flaws; by the ends we may know the goodneſs of the middle; and, when wrought into ſquare plates, or any other ſhape, if its ſides are ſtreight and even, we may conclude it is equally good in all its parts, as it has equally in every part endured the hammer.

MAGNIFICENT palaces, churches, towers, and other publick edifices, are generally covered with lead. The pipes and gutters to convey the water, are alſo made of the ſame. It likewiſe ſerves to faſten the hinges and iron-work in the jambs of doors and windows. The three ſorts of lead uſually found, are the white, black, and that of a colour between both, by ſome called aſh-colour'd. The black is ſo called, not because it is really ſuch, but becauſe it is intermix'd with ſome blackneſs; therefore the antients, to diſtinguiſh it from the white, gave it very properly that name. The white is much more perfect, and of greater value than the black. And the aſh-colour'd holds the middle rank betwixt both.

LEAD is either taken out of the earth in a great maſs, without any mixture, or in ſmall, ſhining, blackiſh lumps; and is ſometimes found ſticking in ſmall flakes to the rocks, to marble, and to stones. All the different ſorts melt very eaſily, because the heat of the fire liquifies it before it can be made red-hot; and if thrown into an extreme hot furnace, it will not preſerve its ſubſtance, but be converted into litharge and droſs. Of the three ſorts the black is the ſofteſt and moſt weighty, and therefore will eaſily ſpread under the hammer. The white is harder and lighter. The aſh-colour'd is much harder than the white, and is of a middle weight between both.

PUBLICK buildings are ſometimes cover'd with copper; and the antients alſo made nails and cramps thereof, which were fix'd in the ſtone below, and to that above, to unite and tie them together, and prevent them from being puſhed out of their place. And by means of theſe nails and cramps, a building, which can't poſſibly be made without a great number of pieces of ſtone, is ſo join'd and fix'd together, that it appears to be one entire piece, and for the ſame reaſon is much ſtronger and more durable.

THESE nails and cramps were likewiſe made of iron; but the antients moſt commonly made them of copper, becauſe it is leſs ſubject to ruſt, and conſequently will laſt much longer. The Letters for inſcriptions, that were placed in the frizes of buildings without, were made of copper; and hiſtory informs us, that the hundred famous gates of *Babylon,* and HERCULES' two pillars, eight cubits high, in the iſland of *Gades,* were alſo made of that metal.

THE beſt and moſt excellent copper is that which is extracted and purged from the ore by fire. If it is of a red colour, inclining to yellow, well-grained, and full of pores, we may then be pretty certain it is freed from droſs.

COPPER will heat red-hot in the fire, like iron, and ſo liquify that it may be caſt. If thrown into an extreme hot furnace, it will not endure the flames, but totally conſume and waſte away. Although it be hard, it will nevertheleſs bear the hammer, and may be wrought into very thin plates. The beſt method to preſerve it is to dip it into tar; for tho' it does not ruſt like iron, yet it has a peculiar ruſt, called verdigreaſe, especially if it be touched with any ſharp liquor.

THIS metal mix'd with tin, lead and braſs (which laſt is only copper coloured with *lapis calaminaris)* makes *bronze,* or bell-metal, which is often uſed by architects in making baſes, columns, capitals, ſtatues, and ſuch-like ornaments. There are to be ſeen in the church of *St. Giovani Laterano* in *Rome* four braſs columns (one of which only has its capital) made by the order of AUGUSTUS of the metal that was found in the prows of thoſe ſhips he had taken in *Egypt* from MARK ANTHONY.

THERE alſo remains in *Rome* to this day four antient gates; viz. the *Rotunda,* formerly the *Pantheon;* that of *St. Adriano,* formerly the temple of SATURN; that of *St. Coſmo* and *St. Domiano,* formerly the temple of CASTOR and POLLUX, or rather of ROMULUS and REMUS; and that of *St. Agnas,* now called *St. Agneſe,* without the gate *Viminalis ſu la via Numenta*.

THE moſt beautiful of theſe is that of *Santa Maria Rotunda;* wherein the antients endeavoured to imitate by art that ſort of *Corinthian* metal in which the natural colour of gold did moſtly predominate: For we read, that when *Corinth,* now called *Coranto,* was burnt and deſtroy'd, the gold, ſilver, and copper were melted and united into one maſs, which was ſo temper'd and mix'd together, that it compoſed the three ſorts of braſs afterwards called *Corinthian*. In the firſt, ſilver prevailed, of which it retained the whiteneſs and luſtre; the ſecond, as it partook more of the gold, retained moſtly its yellow colour; the third was that in which all the three metals were pretty equally mix'd. All theſe have afterwards been imitated by various workmen.

HAVING ſufficiently explained the ſeveral particulars and materials moſt neceſſary to be conſider'd and prepared before we begin to build; it is proper, in the next place, to ſay ſomething of the foundations, ſince it is from them the whole work muſt be raiſed.

# CHAP. VII.

## *Of the qualities of the ground where foundations ought to be laid.*

**T**HE foundations are properly called the baſis of the fabrick, *viz.* that part of it under ground which ſuſtains the whole edifice above; and therefore of all the errors that can be committed in building, thoſe made in the foundation are moſt pernicious, because they at once occaſion the ruin of the whole fabrick, nor can they be rectified without the utmoſt difficulty. For which reason the architect ſhould apply his utmoſt diligence in this point; inaſmuch as in ſome places there are natural foundations, and in other places art is required.

WE have natural foundations when we build on a chalky foil, which in ſome degree reſembles ſtone*; for theſe, without digging or any other aſſiſtance from art, are of themſelves very ſtrong and ſufficient foundations, and capable to ſuſtain any great edifice, either on land or in water.

BUT when nature does not furniſh foundations, then art muſt be made uſe of; because the places to build on are ſometimes either ſolid ground, gravel, ſand, or a moiſt and marſhy foil. Where it is ſolid, the foundation need be no deeper than what the quality of the building, and the ſolidity of the ground

ſhall require (according as the judicious architects ſhall think proper) and muſt not exceed the fixth part of the height of the whole edifice, if there are no cellars or ſubterraneous offices wanted.

Obſervations made in digging of wells, ciſterns, and ſuch like, are of great uſe, and very much help us to know the ſolidity of the ground; as do alſo the herbs that ſpontaneouſly grow thereon, eſpecially if they are ſuch as ſpring up only in a hard and firm foil. The ſolidity may likewise be known by trowing a great weight upon the earth, provided it neither ſhakes or reſounds (which may eaſily be obſerved by the help of a drum ſet upon the ground, if the percuſſion only gently moves it, without making it found, or without moving the water in a veſſel ſet near it:) It may alſo be judged of by the adjacent places.

BUT when the place is either ſandy or gravelly, regard muſt be had whether it be on land or in the water. If it be on land, that only is to be obſerved which has before been ſaid concerning dry ground. But if buildings are to be in rivers, the ſand and gravel will be altogether uſeleſs; because the water, by its continual current and flood, is always ſhifting their bed: We muſt therefore dig until a firm and ſolid bottom be found. If that cannot eaſily be done, let ſome of the ſand and gravel be taken out, and then piles, made of oak, muſt be driven in, until their ends reach the ſolid ground, upon which one may build.

BUT if a building is to be raiſed upon a boggy foil, then it muſt be dug out, until firm ground be come at, and ſo deep therein as is in proportion to the thickneſs of the walls, and the largeneſs of the fabrick.

SOUND and firm ſoils, fit to ſuſtain buildings, are of various kinds: For, as ALBERTI well obſerves, in ſome places the ſoil is ſo hard, that iron can ſcarce cut its way into it, and ſometimes ſtill harder; in others blackiſh or whitiſh, which is eſteem'd the weakeſt; ſome are like chalk, or otherwiſe ſoft : But the beſt is that which is cut with the moſt labour, and when wet does not diſſolve into mud.

No buildings ſhould be erected on ruins before their depth is firſt known, and whether they are ſufficient to ſuſtain the edifice.

WHEN the ground is ſoft, and ſinks very much, as it commonly does in bogs, then piles are to be uſed, whoſe length ought to be the eighth part of the height of the walls, and their thickneſs the twelfth part of their length. The piles are to be driven ſo cloſe to one another, as not to leave ſpace for others to come in between. Care muſt alſo be taken to drive them rather with blows frequently repeated, than ſuch as are violent; that ſo the earth may bind the better to faſten them.

THE pilings are to be not only under the outſide walls, which are placed upon the canals; but alſo under thoſe which are placed on the earth, and divide the fabrick: For if the foundations of the middle walls are made different from thoſe on the outſide, it will often happen, that when the beams are placed by each other in length, and the others over them croſſways, the inſide walls will ſink, and the outſide ones, by being piled, will remain unmov'd; which, beſides its being very disagreeable to the ſight, will occaſion all the walls to open, and ruin the whole edifice. This danger therefore is to be avoided by a trifling expence in piling ; for according to the proportion of the walls, the piles in the middle will be ſmaller than thoſe for the outſide.

* There are ſtrictly no proper words in English for Taſo or Scaranto,

# CHAP. VIII.

## *Of foundations.*

**F**OUNDATIONS ought to be twice as thick as the wall to be built on them; and regard in this ſhould be had to the quality of the ground, and the largeneſs of the edifice; making them greater in ſoft ſoils, and very ſolid where they are to ſuſtain a conſiderable weight.

THE bottom of the trench muſt be level, that the weight may preſs equally, and not ſink more on one ſide than on the other, by which the walls would open. It was for this reaſon the antients paved the ſaid bottom with *Tivertino,* and we uſually put beams or planks, and build on them.

THE foundations muſt be made ſloping, that is, diminiſhed in proportion as they riſe; but in ſuch a manner, that there may be juſt as much ſet off on one side as on the other, that the middle of the wall above may fall plumb upon the middle of that below: Which alſo muſt be observed in the ſetting off of the wall above ground; becauſe the building is by this method made much ſtronger than if the diminutions were done any other way.

SOMETIMES (especially in fenny places, and where columns intervene) to leſſen the expence, the foundations are not made continued, but with arches, ever which the building is to be.