# Leon Battista Alberti
# On the Art of Building in Ten Books

translated by

Joseph Rykwert, Neil Leach, Robert Tavernor

ix Introduction Joseph Rykwert

xxii *De re aedificatoria:* Editions

xxv On the Illustrations in This Edition

# On the Art of Building

1 Foreword by Angelo Poliziano

2 Prologue

7 Book One: Lineaments

33 Book Two: Materials

61 Book Three: Construction

92 Book Four: Public Works

117 Book Five: Works of Individuals

154 Book Six: Ornament

189 Book Seven: Ornament to Sacred Buildings

244 Book Eight: Ornament to Public Secular Buildings

291 Book Nine: Ornament to Private Buildings

320 Book Ten: Restoration of Buildings

363 Abbreviations Used in the Notes

366 Notes

417 Bibliography

420 Glossary

429 Index

## From Angelo Poliziano to his Patron, Lorenzo de' Medici, Greetings.

Leon Battista the Florentine, of the great Alberti clan, was a man of rare brilliance, acute judgment, and extensive learning. Among the many excellent works that he left to posterity were the ten books he had composed on architecture. These he had corrected and edited with the utmost care; he was on the point of publishing them and dedicating them to you[1] when fate struck him down. His kinsman Bernardo,[2] a wise man and very devoted to you, wanting both to honor the memory and wishes of that great man, and to acknowledge his gratitude for the favors you have shown him, has had the original manuscripts transcribed and gathered into one volume to present to you, Lorenzo de' Medici.

It was his particular desire that I should commend both his gift and its author, Battista, to you. This did not seem at all advisable to me, for fear that my own poor talents would only diminish so perfect a work and so great a man. The work will gather much more praise to itself when it is read than I could bestow on it by any of my words; and my tribute to the author is constrained by the brevity of a letter, as well as the poverty of my style.

Surely there was no field of knowledge however remote, no discipline however arcane, that escaped his attention; you might have asked yourself whether he was more an orator or a poet, whether his style was more majestic or graceful. So thorough had been his examination of the remains of antiquity that he was able to grasp every principle of ancient architecture, and renew it by example; his invention was not limited to machinery, lifts, and automata,[3] but also included the wonderful forms of buildings. He had moreover the highest reputation as both painter and sculptor, and since he achieved a greater mastery in all these different arts than only a few can manage in any single one, it would be more telling, as Sallust said about Carthage,[4] to be silent about him than to say little.

I would like you, Lorenzo, to give this book a place of honor in your library, read it carefully yourself, and make sure that it is widely published. For it is worthy to live on the lips of the learned,[5] and the patronage of the arts, abandoned by all others, rests with you alone. Farewell. ◆

# Here Begins the Work of Leon Battista Alberti on the Art of Building.[1] Lege Feliciter.

Many and various arts, which help to make the course of our life more agreeable and cheerful, were handed down to us by our ancestors, who had acquired them by much effort and care.[2] All of them seem to compete toward the one end, to be of the greatest possible use to humanity, yet we realize that each has some integral property, which shows it has a different advantage to offer from the others. For we are forced to practice some of these arts by necessity, while others commend themselves to us for their utility, and still others we appreciate because they deal with matters that are pleasant to know. I need not specify these arts: it is obvious which they are. Yet, if you reflect on it, you would not find one among all the most important arts that did not seek and consider its own particular ends, excluding anything else. If, however, you were eventually to find any that proved wholly indispensable and yet were capable of uniting use with pleasure as

*Portrait of Alberti: "Leon Batista Alberti gentil huomo Fiorentino."*



well as honor, I think you could not omit architecture from that category: architecture, if you think the matter over carefully, gives comfort and the greatest pleasure to mankind, to individual and community alike; nor does she rank last among the most honorable of the arts.

Before I go any farther, however, I should explain exactly whom I mean by an architect; for it is no carpenter that I would have you compare to the greatest exponents of other disciplines: the carpenter is but an instrument in the hands of the architect.[3] Him I consider the architect, who by sure and wonderful reason and method, knows both how to devise through his own mind and energy, and to realize by construction, whatever can be most beautifully fitted out for the noble needs of man, by the movement of weights and the joining and massing of bodies. To do this he must have an understanding and knowledge of all the highest and most noble disciplines.[4] This then is the architect. But to return to the discussion.

Some have said that it was fire and water which were initially responsible for bringing men together into communities,[5] but we, considering how useful, even indispensable, a roof and walls are for men, are convinced that it was they that drew and kept men together. We are indebted to the architect not only for providing that safe and welcome refuge from the heat of the sun and the frosts of winter (that of itself is no small benefit), but also for his many other innovations, useful to both individuals and the public, which time and time again have so happily satisfied daily needs.

How many respected families both in our own city and in others throughout the world would have totally disappeared, brought down by some temporary adversity, had not their family hearth harbored them, welcoming them, as it were, into the very bosom of their ancestors?[6] Daedalus received much praise from his contemporaries for having constructed a vault in Selinunte where a cloud of vapor emanated so warm and gentle that it induced a most agreeable sweat, and cured the body in an extremely pleasant manner.[7] What of others? How could I list the devices—walks, swimming pools, baths, and so forth—that help to keep us healthy? Or even vehicles, mills, timepieces, and other smaller inventions, which nonetheless play so vital a role in our everyday lives? What of the methods of drawing up vast quantities of water from hidden depths for so many different and essential purposes? And of memorials, shrines, sanctuaries, temples, and the like, designed by the architect for divine worship and for the benefit of posterity? Finally, need I stress how, by cutting through rock, by tunneling through mountains or filling in valleys, by restraining the waters of the sea and lakes, and by draining marshes, through the building of ships, by altering the course and dredging the mouths of rivers, and through the construction of harbors and bridges, the architect has not only met the temporary needs of man, but also opened up new gateways to all the provinces of the world? As a result nations have been able to serve each other by exchanging fruit,

spices, jewels, experience and knowledge, indeed anything that might improve our health and standard of living.

Nor should you forget ballistic engines and machines of war, fortresses and whatever else may have served to protect and strengthen the liberty of our country, and the good and honor of the state, to extend and confirm its dominion. It is my view[8] moreover that, should you question all the various cities which within human memory have fallen into enemy hands by siege, and inquire who defeated and conquered them, they would not deny that it was the architect; and that they could easily have scorned an enemy armed with weapons alone but could no longer have resisted the power of invention, the bulk of war machines and the force of ballistic engines, with which the architect had harassed, oppressed, and overwhelmed them. On the other hand, those besieged would consider no protection better than the ingenuity and skill of the architect. Should you examine the various military campaigns undertaken, you would perhaps discover that the skill and ability of the architect have been responsible for more victories than have the command and foresight[9] of any general; and that the enemy were more often overcome by the ingenuity of the first without the other's weapons, than by the latter's sword without the former's good counsel. And what is more important, the architect achieves his victory with but a handful of men and without loss of life. So much for the use of architecture.

But how congenial and instinctive the desire and thought for building may be to our minds is evident—if only because you will never find anyone who is not eager to build something, as soon as he has the means to do so; nor is there anyone who, on making some discovery in the art of building, would not gladly and willingly offer and broadcast his advice for general use,[10] as if compelled to do so by nature. It often happens that we ourselves, although busy with completely different things, cannot prevent our minds and imagination from projecting some building or other. Or again, when we see some other person's building, we immediately look over and compare the individual dimensions, and to the best of our ability consider what might be taken away, added, or altered, to make it more elegant,[11] and willingly we lend our advice. But if it has been well designed and properly executed, who would not look at it with great pleasure and joy? Need I mention here not only the satisfaction, the delight, but even the honor that architecture has brought to citizens at home or abroad? Who would not boast of having built something? We even pride ourselves if the houses we live in have been constructed with a little more care and attention than usual. When you erect a wall or portico of great elegance and adorn it with a door, columns, or roof, good citizens approve and express joy for their own sake, as well as for yours, because they realize that you have used your wealth to increase greatly not only your own honor and glory, but also that of your family, your descendants, and the whole city.[12]



The island of Crete was much celebrated for the tomb of Jupiter,[13] Delos was revered more for the beauty of its city and the majesty of its temple than for the fame of the oracle of Apollo. As to the imperial authority and fame that the Latins got by their building, I need only mention the various tombs and other ruins of past glory still visible all around, which have taught us to accept much of the historical tradition that may otherwise have seemed less convincing. Of course Thucydides did well to praise the ancients who had the vision to adorn their cities with such a rich variety of buildings as to give the impression of having far greater power than they really had.[14] Has there been one among the greatest and wisest of princes who did not consider building one of the principal means of preserving his name for posterity? But enough on this.

To conclude, then, let it be said that the security, dignity, and honor of the republic depend greatly on the architect: it is he who is responsible for our delight, entertainment, and health while at leisure, and our profit and advantage while at work, and in short, that we live in a dignified manner, free from any danger. In view then of the delight and wonderful grace of his works, and of how indispensable they have proved, and in view of the benefit and convenience of his inventions, and their service to posterity, he should no doubt be accorded praise and respect, and be counted among those most deserving of mankind's honor and recognition.[15]

Aware of this, we have undertaken, for our own pleasure, to inquire more fully into his art and his business, as to the principles from which they are derived, and the parts of which they are composed and defined. Finding them to be very diverse in kind, infinite (almost) in number, admirable in nature, and marvelously useful, I wondered what human condition, what part of the state, what class of citizen owed more to the architect, since he is responsible for every comfort: was it prince or private citizen, religious or secular institution, business or leisure, or individuals as opposed to mankind as a whole? We therefore decided for many reasons, too lengthy to enter into here, to collect and commit them to these ten books.

They will be dealt with in this order:[16] first we observed that the building is a form of body, which like any other consists of lineaments and matter, the one the product of thought, the other of Nature; the one requiring the mind and the power of reason, the other dependent on preparation and selection; but we realized that neither on its own would suffice without the hand of the skilled workman to fashion the material according to lineaments. Since buildings are set to different uses, it proved necessary to inquire whether the same type of lineaments could be used for several; we therefore distinguished the various types of buildings and noted the importance of the connection of their lines and their relationship to each other, as the principal sources of beauty; we began therefore to inquire further into the nature of beauty—of what kind it should be, and what is appropriate in each case. As

in all these matters faults are occasionally found, we investigated how to amend and correct them.

Each book, then, has been given a title according to its varying contents as follows: book 1, Lineaments; book 2, Materials; book 3, Construction; book 4, Public Works; book 5, Works of Individuals; book 6, Ornament; book 7, Ornament to Sacred Buildings; book 8, Ornament to Public Secular Buildings; book 9, Ornament to Private Buildings; book 10, Restoration of Buildings. Appended are: The Ship, Economics, Arithmetic and Geometry, and The Service That the Architect Provides.[17] ◆



# Here Begins the First Book on the Art of Building by Leon Battista Alberti. The Lineaments.[1]

I
4—4v*

Since we are to treat of the lineaments of buildings, we shall collect, compare, and extract into our own work all the soundest and most useful advice that our learned ancestors have handed down to us in writing, and whatever principles we ourselves have noted in the very execution of their works. We shall go on to report things contrived through our own invention, by careful, painstaking investigation, things we consider to be of some future use. But since it is our desire to be as limpid, clear, and expeditious as possible in dealing with a subject otherwise knotty, awkward, and for the most part thoroughly obscure, we shall explain, as is our custom, the precise nature of our undertaking. For the very springs of our argument should be laid open, so that the discussion that follows may flow more easily.[2]

Let us therefore begin thus: the whole matter of building is composed of lineaments and structure.[3] All the intent and purpose of lineaments lies in finding the correct, infallible way of joining and fitting together those lines and angles which define and enclose the surfaces of the building. It is the function and duty of lineaments, then, to prescribe an appropriate place,[4] exact numbers,[5] a proper scale,[6] and a graceful order for whole buildings and for each of their constituent parts, so that the whole form and appearance of the building may depend on the lineaments alone. Nor do lineaments have anything to do with material, but they are of such a nature that we may recognize the same lineaments in several different buildings that share one and the same form, that is, when the parts, as well as the siting and order, correspond with one another in their every line and angle. It is quite possible to project whole forms in the mind without any recourse to the material, by designating and determining a fixed orientation and conjunction for the various lines and angles. Since that is the case, let lineaments be the precise and correct outline, conceived in the mind, made up of lines and angles, and perfected in the learned intellect and imagination.

Now, as we wish to inquire into the inner nature of building and construction as a whole, it may be of some relevance to consider what were the origins and what the evolution of those dwelling places we call buildings. And, if I am not mistaken, what follows may be taken as the correct account of the whole matter. ◆

2
4v—5v

In the beginning, men sought a place of rest in some region safe from danger;[7] having found a place both suitable and agreeable, they settled

*The corresponding folios in the *editio princeps* appear at the beginning of each chapter.

in all these matters faults are occasionally found, we investigated how to amend and correct them.

Each book, then, has been given a title according to its varying contents as follows: book 1, Lineaments; book 2, Materials; book 3, Construction; book 4, Public Works; book 5, Works of Individuals; book 6, Ornament; book 7, Ornament to Sacred Buildings; book 8, Ornament to Public Secular Buildings; book 9, Ornament to Private Buildings; book 10, Restoration of Buildings. Appended are: The Ship, Economics, Arithmetic and Geometry, and The Service That the Architect Provides.[17] ◆



# Here Begins the First Book on the Art of Building by Leon Battista Alberti. The Lineaments.[1]

1
4—4v*

Since we are to treat of the lineaments of buildings, we shall collect, compare, and extract into our own work all the soundest and most useful advice that our learned ancestors have handed down to us in writing, and whatever principles we ourselves have noted in the very execution of their works. We shall go on to report things contrived through our own invention, by careful, painstaking investigation, things we consider to be of some future use. But since it is our desire to be as limpid, clear, and expeditious as possible in dealing with a subject otherwise knotty, awkward, and for the most part thoroughly obscure, we shall explain, as is our custom, the precise nature of our undertaking. For the very springs of our argument should be laid open, so that the discussion that follows may flow more easily.[2]

Let us therefore begin thus: the whole matter of building is composed of lineaments and structure.[3] All the intent and purpose of lineaments lies in finding the correct, infallible way of joining and fitting together those lines and angles which define and enclose the surfaces of the building. It is the function and duty of lineaments, then, to prescribe an appropriate place,[4] exact numbers,[5] a proper scale,[6] and a graceful order for whole buildings and for each of their constituent parts, so that the whole form and appearance of the building may depend on the lineaments alone. Nor do lineaments have anything to do with material, but they are of such a nature that we may recognize the same lineaments in several different buildings that share one and the same form, that is, when the parts, as well as the siting and order, correspond with one another in their every line and angle. It is quite possible to project whole forms in the mind without any recourse to the material, by designating and determining a fixed orientation and conjunction for the various lines and angles. Since that is the case, let lineaments be the precise and correct outline, conceived in the mind, made up of lines and angles, and perfected in the learned intellect and imagination.

Now, as we wish to inquire into the inner nature of building and construction as a whole, it may be of some relevance to consider what were the origins and what the evolution of those dwelling places we call buildings. And, if I am not mistaken, what follows may be taken as the correct account of the whole matter. ◆

2
4v—5v

In the beginning, men sought a place of rest in some region safe from danger;[7] having found a place both suitable and agreeable, they settled

*The corresponding folios in the *editio princeps* appear at the beginning of each chapter.

down and took possession of the site. Not wishing to have all their household and private affairs conducted in the same place, they set aside one space for sleeping, another for the hearth, and allocated other spaces to different uses. After this men began to consider how to build a roof, as a shelter from the sun and the rain. For this purpose they built walls on which a roof could be laid—for they realized that in this way they would be the better protected from icy storms and frosty winds; finally they opened windows and doors in the walls, from floor to roof, so as to allow entry and social gathering within, and also to let in the sunlight and the breezes at the right time, as well as to let out any moisture and vapor that may have formed inside the house. Whoever it was who first started to do these things, the goddess Vesta, daughter of Saturn, or the brothers Heurialus and Hiperbius, or Gallio, or Thraso, or the Cyclops Typhincius,[8] I believe that such were the original occasion and the original ordinance of building. The business has grown, I believe, through experience and skill, so that it is now almost without bounds, what with the introduction of the various building types; of which some are public, others private, some sacred, others profane, some of practical necessity, others merely for the permanent adornment of the city, while yet others are for more temporary pleasures. But no one will question our account of their origins.

Since this is the case, the elements of which the whole matter of building is composed are clearly six: locality, *area*,[9] compartition,[10] wall, roof, and opening. If these elements are clearly recognized, what we have to say will be understood more easily. We shall therefore define them as follows: by locality we mean all that land which is seen to surround the prospective building; the *area* is a part of this locality. We shall define the *area* as that certain, particular plot of land which is to be enclosed by a wall for a designated practical use; included in this definition is any surface within the building on which our feet may tread. Compartition is the process of dividing up the site into yet smaller units, so that the building may be considered as being made up of close-fitting smaller buildings, joined together like members of the whole body.[11] The wall we shall term all that structure which rises from the ground upward in order to support the weight of the roof, or which acts as a screen to provide privacy for the interior volumes of the building. We shall refer to the roof, not only as that uppermost part of the building which fends off the rain, but also, in general, as whatever is extended in length and breadth above the head of anyone walking below, such as ceilings, vaults, arches, and so forth. We shall call an opening anything within the building affording entry or exit to man or thing.

We shall deal with these matters and their every aspect, but first we will make some observations, which are fundamental to, and so much part of, the whole subject that they are highly relevant to our argument. If we were to consider those attributes with which each of the parts we have enumerated should be endowed, we would come up with three that should never be overlooked, and which are most becoming to roofs, openings, and so on. That is, their individual parts should be well suited to the task for which they were designed and, above all, should be very commodious; as regards strength and endurance, they should be sound, firm, and quite permanent; yet in terms of grace and elegance,[12] they should be groomed, ordered, garlanded,[13] as it were, in their every part.[14] Now that we have set down the roots and foundations of our discussion, let us continue our argument. ◆



3
5v—7

As for the locality,[15] the ancients put much effort into ensuring that it should contain (as far as possible) nothing harmful and that it should be supplied with every convenience. Above all, they took the greatest care to avoid a climate that might be disagreeable or unwholesome; it was a very prudent precaution, even an indispensable one. For while there is no doubt that any defect of land or water could be remedied by skill and ingenuity, no device of the mind or exertion of the hand may ever improve climate appreciably; or so it is said. Certainly the air that we breathe and that plays such a vital role in maintaining and preserving life (as we can ourselves observe), when really pure may have an extraordinarily beneficial effect on health.

Who can have failed to notice the extensive influence that climate has on generation, growth, nourishment, and preservation? As you may have seen, those who enjoy a purer climate surpass in ability others subjected to a heavy and damp one; for that very reason, so it was said, the Athenians were much sharper than the Thebans.

Climate, we may therefore agree, depends on the location and formation of the landscape; some reasons for this variation will seem quite obvious, while others, because of their very obscure nature, lie well hidden and totally evade us. We shall examine the obvious ones first and then those which are obscure, so that we will know how to select the most advantageous and healthy locality in which to live.

The ancient theologians called the atmosphere Pallas;[16] Homer makes her a goddess and calls her Glaucopis,[17] a reference to air so pure that it is completely transparent by nature. It is quite apparent that the healthiest form of air is that which is the purest and least polluted, the most easily pierced by sight, the most transparent and light, and which is always serene and largely constant; whereas we term as pestilential any form of air whose consistency is so cloudy and vaporous as to render it dense and fetid, so that it hangs heavy on the brow and dulls that keenness of sight. I believe that the sun and the wind, more than any other factor, are responsible for determining these two conditions. We shall not, however, discuss questions of physics here—that is exactly how the force of the sun manages to draw up

vapors from the innermost bowels of the earth and then raise them to high heaven, or how once gathered together into a huge cloud in the vastness of the sky, either through their immense weight or from being dried out by the action of the sun's rays to one side, they topple over in that direction, thereby producing a great rush of air and arousing the winds, and driven by thirst, plunge into the ocean; finally, replenished by the sea and pregnant with moisture, wandering once more in the atmosphere, they are propelled by the winds and squeezed like sponges, and discharge the droplets of moisture they are carrying to form rain, thus renewing the vapors on land. Whether this theory we report is correct, or whether wind is some dry exhalation of the earth, or hot vapor expelled by the force of cold, or just a breath of air, or yet air that has been disturbed by the movement of the earth or by the course and radiation of the stars, or whether it is that general animating spirit that moves of its own accord, or even something that is not a separate entity in itself but rather consists of air that has been burnt by the heat of the highest ether and reduced to liquid form, or whether there is any further theory or explanation, sounder or based on more ancient authority, I suggest we should pass it by, as it may detract from the main argument.

All this will, if I am not mistaken, help us to appreciate the reason why some parts of the world are seen to enjoy the most delightful of climates, while others, which may be their very close neighbors, are marred by gloomy weather and murky days. I must suppose that the reason for this is their unfavorable position as regards the sun and the winds. Cicero says that Syracuse was sited so that there was not a single day in the whole year on which the inhabitants could not see the sun;[18] such a situation is very rare, however, and if there are no strong reasons or grounds for avoiding it, it is the location to be sought in preference to any other.

The locality to be chosen, therefore, should be quite free of raging clouds and all the dense thickness of vapors. Those who investigate such matters have observed that the rays and heat of the sun act more fiercely on dense than on rarefied materials, as they do on oil compared to water, or on iron compared to wool. From this they deduce that the air is thick and heavy wherever the heat is more oppressive. The Egyptians, striving to prove their ascendancy over all other nations of the world, boasted that man was first created in their country, and that he could only have been created in a land where he would be able to live in the best of health; for they had been endowed, above all else, with certain favors by the gods—a wonderful climate and a perpetual spring. But even among the Egyptians, writes Herodotus, those who live nearest Libya, where the wind never varies, are by far the healthiest.[19] Certainly various towns in Italy, and other nations, appear to have become unhealthy and pestilential places for no other reason than their sudden temperature changes from hot to cold.



It is no bad thing, then, to consider the quality and angle of the sun to which a locality is exposed, so that there is no excess of sunlight or shade; the Garamantes cursed the sun at its rising and setting, so scorched were they by the excessive persistence of its rays, while other nations appear pallid from living in almost perpetual night.[20] This variation is not so much dependent on the lesser or greater inclination of the earth's axis (although that is an important factor) as on the configuration of the ground itself and its degree of exposure to the sun and the winds. Personally, I prefer gentle breezes to winds, though I would consider winds, however fierce and blustery, less irksome than a stagnant and heavy atmosphere. Water that does not move, Ovid tells us, absorbs badness.[21] What of air? I might almost say that it takes pleasure in movement. For it is my view that movement dissipates the vapors that rise from the earth, and movement consumes them. I would prefer, however, that these winds reach me broken down by intervening woods and mountains or exhausted by the length of their journey, and I would ensure that they do not pass over land where they might pick up and bring us anything harmful. For this reason it is advisable to avoid any location in whose neighborhood anything noxious is given off, such as offensive smells or unclean vapor rising from marshes, and in particular from polluted waters and ditches.

Naturalists agree that any river fed by the melting snows brings with it a cold, dense air; but of waters, none can be so foul as those which spoil away by remaining stagnant; the less it is dispersed by favorable winds, the greater the effect of the contagion on the neighborhood. The winds, they say, cannot all be classed as healthy or unhealthy of their nature. Pliny, on the authority of Theophrastus and Hippocrates,[22] considers Aquilo[23] to be the most favorable for the restoring and maintaining of health;[24] the naturalists all declare Auster[25] the most damaging to mankind, and they do not even consider it safe to leave cattle grazing in the fields while it blows. And again the stork will never hazard flying into Auster; when Aquilo blows, dolphins hear voices calling with the wind, but with Auster they hear much less well, and only against the wind. They say too that when Aquilo prevails, eels may survive for six days out of water, although such is not the case with Auster, so dense is it and its power so unhealthy. As Auster brings illness, and especially catarrh, so Coro[26] makes us cough.

South-facing coastlines are not recommended, primarily because the reflected rays of the sun afflict them with two suns, in effect: one burns down from the sky, the other up out of the water. Such places are subjected to sharp changes in temperature, as the chilling shades of night draw in at sunset. Some are even of the opinion that at sunset the overall effect of the sun, both direct and reflected off the water, sea, or mountains, is at its most harmful, since a place that has already been heated by the sun all day is made sweltering by the additional heat produced by the reflection. If on top of all

these effects you are also exposed to oppressive winds, what could be more harmful or intolerable? Morning breezes too have been rightly reproved, as they bring with them raw vapors as they rise.

We have discussed the sun and the winds, and the obvious influence we feel they exert on the climate, whether it is healthy or not; we have done so briefly, as seemed relevant to our argument, and we shall deal with them in greater detail in their appropriate place.[27] ◆

4 7–9 When selecting the locality, it is worth ensuring that everything is to the liking of those who are to live there, be it the nature of the place or the company they will have to keep.

In no way would I build a city on a steep and inaccessible ridge of the Alps, as Caligula had intended, unless compelled by the utmost necessity.[28] I would also avoid the uninhabitable wilderness that Varro describes in Rhineland Gaul,[29] and Caesar in contemporary Britain.[30] Nor would I like to live on birds' eggs alone, as they used to on the island of Oenoe in the Black Sea,[31] or on acorns, as in Pliny's time in some regions of Spain.[32] In short, I would not wish the locality to lack anything that might prove useful.

Quite rightly, Alexander did not want to found a city on Mount Athos: the project of the architect Polycrates, although splendid in other respects, could not supply the inhabitants with sufficient provisions.[33] Yet Aristotle might have found a site with difficult access particularly pleasing for the foundation of a city,[34] while I notice that it was the practice of some nations to leave vast expanses on their borders deserted and forsaken, so as to deny any advantage to an enemy. The question of whether such methods should be condoned or not shall be dealt with elsewhere; but provided they are of public benefit, I find no reason to condemn their adoption.

In general, however, I would prefer to site buildings in a locality that has many different points of access, to allow the easiest possible provision by ship, cart, or beast, both in summer and in winter. The locality should not be too damp with excess of waters nor too parched by drought, but it ought to enjoy a comfortable, temperate climate. If this ideal condition is not possible, rather let it be somewhat cold and arid than too hot and humid, for it is possible to counteract the cold with roofs and walls, through clothing and the heat of the fire, or by moving about; dryness, meanwhile, is not considered particularly harmful to body or soul; indeed, they say that dryness may harden a man and cold make him rugged, but moisture will always make the body languid, and heat cause it to wilt. One may see how men are physically strong and free of disease during the cold season or in cold climates, although it is generally conceded that while those in cold places have superior physiques, those in warm places have sharper wits.



From Appian, the historian, I have learned that the main reason why the Numidians were so long-lived was that they never had to endure any cold winters.[35] The best locality of all, however, is a moderately warm and moist one, for it will produce men tall and elegant in stature and cheerful in character. The next most convenient are the sunniest parts of snowy countries or the most moist, shady zones of arid, sunburnt regions.

But there is no site less suitable or seemly for any building whatsoever than one that is hidden away in some valley; for (to pass over such obvious reasons as that, being out of sight, it can enjoy no honor, while being denied the delights of a view, it can have no charm) it will inevitably suffer the ruinous torrents of rain and swirling floods; by absorbing too much damp, it will always rot; and it will constantly exhale earthy mists so damaging to man's health. In such a place no man could retain any strength, as the spirit wilts, nor any body show stamina, as its joints are weakened; mold will grow on books; tools will rust away, and everything in the stores will decay from excess of moisture, until it is all ruined. Furthermore, should the sun break through, reflected rays would cause the heat to grow more intense, but if kept out, the shade will make the air coarse and stagnant. What is more, should the wind penetrate as far as that, it would only rage with more violence and fury by being forced through fixed channels, but should it not reach there, the air would become as thick as mud. It would not be unfair then to consider such a valley as a puddle or a stagnant pool of air.

Let the site therefore have a dignified and agreeable appearance, and a location neither lowly nor sunk in a hollow, but elevated and commanding, where the air is pleasant and forever enlivened by some breath of wind. It should, moreover, be well endowed with all the useful and pleasurable things of life, such as water, fire, and food. Care should be taken, however, to ensure that it contains nothing that might prove harmful to the inhabitants or their possessions. Springs should be laid bare and sampled, and their water tested by fire to check that it contains nothing sticky, putrid, or difficult to digest that might make the inhabitants ill. I shall not dwell here on the goiters and stones for which water may be responsible. I shall pass over the more remarkable and miraculous effects it may have, since the architect Vitruvius has already listed them in a most learned and elegant manner.[36]

There is an aphorism of the physician Hippocrates, that those who drink untreated water that is heavy and unpleasant to taste will develop a hot and swollen belly, while the rest of their bodies, their elbows, shoulders, and faces, will become remarkably weak and emaciated.[37] They will also suffer adverse clotting of the blood from defective spleens, falling prey to many infectious diseases; in summer runny bowel movements caused by bile secretion and discharge of humors will weaken them; and then all year

round they will be troubled by more aggravating and permanent illnesses, such as dropsy, asthma, and pleurisy. The young will go mad because of black bile,[38] while older people will be consumed by burning humors; women will have difficulty in conceiving and great trouble giving birth, while everyone, of whatever age or sex, will be plagued by disease and driven to an untimely death. Nor will they be able to enjoy a single day of their lives free of sadness and without the affliction of bad humors and the harassment of every kind of trouble, so that their minds will be forever anguished by sorrow and grief.

We could mention many other fascinating anecdotes recorded by the ancient historians on the properties of water and the good and bad effects it may have on man's health, but they are curious ones that would serve to show off our erudition rather than illustrate our argument; in any case we shall deal more extensively with water in the appropriate place. But this much at least is obvious, and should not be overlooked: water provides nourishment for all that grows, plants, seeds, and anything that shares vitality, and by which we are refreshed and sustained. We ought, therefore, to inspect with the greatest possible care the quality of the water available in any locality where we intend to live. Diodorus relates that in much of India men have tall, strong bodies and alert minds, because the air they breathe is pure and the water they drink wholesome.[39]

We say that water has the best flavor when it has none, and the most pleasing color, when it is quite devoid of any; in fact the water that is considered the best is that which is clear, transparent, and light—so that when strained through white cloth it leaves no mark, when boiled no sediment—and which, wherever it flows, leaves the riverbed free of moss and the rocks without stain. Good water should also produce tender vegetables when used for cooking, and good bread when used in baking.[40]

In the same way, great care should be taken to ensure that the locality is not responsible for anything infectious or poisonous, which might put the inhabitants at risk. There are well-known ancient instances, hardly worth mentioning, such as the tree leaves of Colchis, which oozed a honeylike substance;[41] anyone who tasted it would fall unconscious for a whole day, as if dead. Or the disaster that they say befell Anthony's army, because of a toxic plant that the soldiers ate for want of grain, which drove them insane and made them intent on digging up stones, until their frenzy reached such a pitch that they collapsed from disturbance of the bile, and perished, there being (according to Plutarch) no antidote, except drinking wine:[42] all well-known tales.

But good heavens, what about our own times in Apulia, here in Italy, where small land-spiders are common,[43] with an incredibly poisonous bite that can send men into various forms of delirium, as though driven mad? Most surprisingly, there is no swelling, no telltale mark appears anywhere



on the body to show the bite or sting of a poisonous insect; but to begin with men lose consciousness, fainting from the shock, and then, if there is no one to help them, they soon die. They may be treated with a remedy of Theophrastus, who maintained that snake bites could be healed by the sound of the flute.[44] Musicians caress the ears of the afflicted with various forms of harmony, and when they hit the right one, the victim will leap up as though startled, and then, through joy, straining every nerve and muscle, will keep time to the music in whatever manner takes his fancy. Some of the victims will, as you may see, try to dance, others to sing, while others will exert themselves attempting whatever their passion and frenzy dictate, until they are exhausted; they continue to sweat for several days more, and only recover when the madness, which had taken root, has been totally satiated.

We read a similar event that befell the Albanians who fought against Pompey with a large cavalry force. For it is said that spiders were found there which would cause the death of anyone who touched them, either by laughing or by crying.[45] ◆

5
9—10 When selecting the locality, it is not enough to consider only those indications which are obvious and plain to see, but the less evident should also be noted, and every factor taken into account.

It is a sign of good air and pure water, if the locality produces a fine and abundant harvest, if it sustains a large number of men to a ripe old age, if it rears young men who are strong and handsome, and if the births there are frequent and successful, provided they are all natural and the children are not marred by any deformity. I myself have seen cities (which out of respect for the times shall remain nameless) in which there is not a single woman who when giving birth does not realize that she has become the mother of both man and monster. I know of another town in Italy where there are so many born either with tumors, squints, and limps, or who are crippled, that there is scarcely a family that does not contain someone deformed or handicapped in some way; and it is a sure indication, when many marked discrepancies are to be seen in bodies or their members, that the climate is at fault or that some other latent deficiency is responsible. Here the old saying is relevant: a heavy atmosphere will reduce the appetite, and a rarefied one increase thirst.

Nor would it be wrong to take the physical appearance of animals as a guide to the likely condition of men who are to live in the locality. For should the cattle appear sturdy, with long, well-developed limbs, it is not unreasonable to expect human offspring to be similarly endowed.

Nor is it inappropriate to take inanimate objects into consideration when looking for indications of the climate and winds: we may deduce from neighboring buildings, for example, that if they are rough and rotting, it is a

sign of some adverse outside influence. If trees should all lean in one particular direction, as though by common consent, or have broken branches, clearly they have suffered the violence of the wind. Similarly, when the upper surfaces of tough stones,[46] whether local or imported, are unusually eroded, they betray sharp changes in temperature between hot and cold. Above all, any region beset by these storms and temperature changes should be avoided: exposure to extremes of hot and cold weakens and impairs the structure and composition of the body and its parts, and may lead to disease and premature old age; indeed the main reason why a city lying at the foot of mountains that face west is considered especially unhealthy is that it is particularly exposed to sudden nocturnal exhalations and the chilling darkness.

It is also useful to take careful account of any unusual feature of the locality, by consulting what wise men have recorded of the events of the past; nature has imbued some places with hidden properties, which may benefit or disadvantage the citizens; it is said, for example, that Locri and Croton have never suffered a plague,[47] that poisonous animals are never found on the island of Crete, and that deformed children are seldom born in France. In some places, according to the naturalists, lightning occurs neither in the heat of the summer nor in winter, yet in Campania, Pliny tells us, flashes of it are seen in all south-facing cities during both these seasons;[48] the Ceraunian mountains in Epirus, meanwhile, are said to be named after the frequent thunder they suffer,[49] and the continual thunder on the island of Lemnos has, according to Servius, prompted the poets to claim that Vulcan fell to earth there.[50] It is said that thunder and lightning have never been seen in the Bosphorus and amongst the Insodones;[51] if it rains in Egypt it is considered a miracle, but on the banks of the Hydaspes, at the beginning of summer, it rains continuously.[52] The wind blows so rarely in Libya that the thickness of the atmosphere causes different shapes formed of condensed vapors to appear in the sky; on the other hand, in a large part of Galatia the wind blows so hard during the summer that stones are thrown up into the air like sand,[53] and in Spain, along the Ebro, they say that the northwesterlies are capable of overturning well-laden carts. The south wind does not blow over all of Ethiopia,[54] yet historians would claim that this is the wind that dries up all the vegetation in Arabia and in the land of the Troglodytes. Thucydides writes that Delos has never suffered any earth tremors but has always stood firm on the same rock, although earthquakes have brought ruin to all the surrounding islands. We ourselves have seen that stretch of Italy, along the whole range of the Hernician mountains, from Algidus[55] near Rome as far as Capua, repeatedly shaken and all but destroyed by earthquakes. Some believe that Achaia takes its name from the frequent floods it suffers.[56] I have discovered that Rome has always been troubled by some sort of fever, which Galen diagnosed as a form of semitertian ague,



and which requires the application of various and almost contradictory methods of treatment according to the different hours of the day.[57] It is an ancient poetic legend that whenever the giant Typhon, who is buried on the island of Procida, turns in his grave, the whole island shakes from its very foundations.[58]

The poets have sung about this because of the violence of the earthquakes and eruptions that plagued the place, and that forced the Eretrians and the Chalcidians, who had once settled there, to flee; similarly other colonists, sent there some time later by Hieron of Syracuse to found a city, also fled through the continual fear of danger and disaster.

All these things should be examined repeatedly and over a long period; they should be compared with the characteristics of other places, to provide a full understanding of the locality. ◆

6
10—11

Inquiry should also be made into whether the locality suffers any other, less obvious, disadvantage; Plato believed that some places would occasionally be ruled by some divine power or demonic government, which might be either favorably or ill disposed toward the inhabitants.[59] There are indeed some places where men are more likely to go mad, others where, for a trifle, they will seek self-destruction, and others where they are more likely to take their own lives by hanging, or leaping from heights, or by the sword and poison. After a close scrutiny of all the most hidden, obscure evidence that nature has to offer, you must weigh up anything else that may seem relevant.

It is an ancient custom, traced back as far as Demetrius, to inspect the color and condition of the livers of cattle grazing on the site when founding a city or a town, or even when just setting out a temporary military camp:[60] should they show signs of infection, the place is manifestly unhealthy and should be avoided.

Varro informs us of tiny atomlike creatures that he has detected, which flit about in the atmosphere, enter our lungs as we breathe, and stick to our entrails;[61] they gnaw away at them, causing violent and wasting disease, which leads to plague and destruction.

Nor should you fail to consider that some places may not in themselves be particularly inconvenient or treacherous, but are so unprotected that when strangers arrive from some foreign land, they often bring with them plague and misfortune; and this may be caused not only by arms and violence, or the work of some barbarian or savage hand: friendship and hospitality may also prove harmful. Some whose neighbors desired political change have themselves been put at risk by the upheaval and turmoil. The Genoese colony of Pera, on the Black Sea, is always prone to disease, because slaves are

daily brought there sick of soul and neglected of body, wasting away from idleness and filth.

It is said to be the mark of prudence and wisdom to examine the destiny of a locality by interpreting auspices and through observation of the heavens; I do not think these methods should be despised, provided they accord with religion.[62] Who would deny the importance of that which we call chance in human affairs, whatever it may be? Can we deny that the public fortune of the city of Rome greatly favored the expansion of the empire? The town of Iolaus in Sicily, which was founded by the nephew of Hercules, although frequently assaulted by Carthaginian and Roman forces, remained forever free; and can the ill-fortune attached to the place have had no connection with the temple at Delphi, burnt down first by Phlegyas, and a third time destroyed by fire at the time of Sulla? And what of the Capitol? How often did it burn? How often was it in flames?

The town of the Sybarites,[63] after being harassed again and again, and having been repeatedly destroyed and deserted, was totally abandoned in the end. Misfortune dogged the inhabitants, even when they had fled the place; for although they moved elsewhere, and changed the original name of the town, they could in no way escape disaster: they were attacked by the natives of their new land, and the members of all the chief and most ancient families were put to the sword and slaughtered; they were annihilated together with their temples and the entire town. But there is no need to go on: history books are full of such examples.

It is generally agreed that it is no mark of a foolish man to make sure of everything that would justify the care and expense of construction, and to ensure that the work itself is as lasting and salubrious as possible; it is surely the duty of that wise and sensible man not to overlook anything which might be of use to this end. Is an undertaking that leads to your own well-being, that favors a life of dignity and pleasure, and that entrusts the fame of your name to posterity not one of great benefit to yourself and your family? For here you may devote yourself to noble studies; here you may enjoy your children and your dear family; here you may pass your days in business or at leisure; here you may pass every period of your life. I am of the opinion, therefore, that there is nothing, aside from virtue,[64] to which a man should devote more care, more effort and attention, than to the acquisition of a good home to shelter himself and his family; and who would expect to achieve this if he ignores the advice that we have just given? But enough of this: we will now move on to discuss the *area*.[65] ◆

7
11—12

In choosing the *area*, whatever advice we gave on the locality should also be respected; for just as the locality is a particular part selected out of some larger territory, so too the *area* is a precisely limited and defined section of the overall locality taken for future building. For this reason the *area* will



display almost the same advantages and disadvantages as the locality; but nonetheless in this account certain precepts will appear, some of which might seem to concern the *area* specifically, while others relate not only to determining the actual *area* but also to questions about the locality as a whole, such as the following.

It is necessary to bear in mind the work we are undertaking, whether it is public or private, whether sacred or profane, and other such categories with which we shall deal in detail at the appropriate place. Fora, theaters, gymnasia, and temples all require quite different sites and conditions; and so the shape and position of the *area* should depend on the purpose and use to which it is to be put.

So as to keep the discussion general, we shall only deal with topics that we consider to be relevant; but let us first say a few words about lines, which might help us to state our argument more clearly; as we are dealing with the setting out of *areae*, it will be useful to describe the elements involved.

Every outline is made up of lines and angles; lines make up the outer perimeter, which encloses the whole extent of the *area*. Any part of the surface within this perimeter that is contained between two intersecting lines is called an angle. When two lines intersect, four angles are formed; if any one of them equals the other three, they will be termed right angles. Those which are smaller than right angles are called acute, and those greater, obtuse. A line may be either straight or curved: there is no need here to deal with lines that spiral like a snail shell or a whirlpool. The straight line is the shortest possible line that may be drawn between two points. The curved line is part of a circle.[66] A circle is the line made by one of two points moving on one plane, so that throughout the operation its course remains no farther or closer than the initial distance set between it and the other, the fixed and central point, which it circumscribes.

It should be added, however, that the curved line, which we called a part of a circle, will be known as an arc or bow (because it resembles one) to us architects; the straight line drawn between two separate points on a curve will for the same reason be called a chord; the line that extends perpendicularly from the center of the chord as far as the arc is termed an arrow; the line drawn from the fixed point at the center of the circle to the curved boundary of that same circle is referred to as the ray; the fixed point, which always stays in the middle of the circle, is given the name center: the straight line that passes through the center and transects two points on the curved edge of the circle is called the diameter. Then there are different types of arcs: some are complete, others segmented, yet others pointed. A complete arc is one that takes up half of a whole circle, that is, one whose diameter is the same as its chord. A segment of an arc is one whose chord is less than the diameter; such an arc is always the section of a semicircle. A pointed arc consists of two segments of arc, so that at the top these two

intersecting arcs meet at an angle, which never happens with a complete or segmented one.

Now that we have established this, let us proceed. ◆

8 *Areae* may be either polygonal or curved; polygonal ones may be described
12—13v entirely by straight lines or by a mixture of straight and curved, but I cannot recall having come across any building of the ancients that has a polygonal *area* or is composed of several curved lines without any intervening straight ones.

As we deal with these matters, there is something we must watch, since we would be strongly criticized for its absence in any part of the building, while its presence contributes much to charm and convenience. I mean that certain variety[67] possessed by both angles and lines, as well as by individual parts, which is neither too much nor too little, but so disposed in terms of use and grace, that whole may correspond to whole, and equal to equal.

Right angles are the most useful. Acute angles are never used, even in the smallest and most insignificant of *areae*, except reluctantly and when forced to either by the constraints of the site or by important demands of the *area*. Obtuse angles are considered respectable enough, provided they are always even in number.

The circular *area* is said to have the largest capacity and to be the cheapest to enclose with a mound or wall; those considered next have a number of jutting-out corners, provided all the angles throughout the *area* balance out and match one another; the most commendable are those conveniently raised to their full height from hexagonal or octagonal plans,[68] although I have also seen a decagonal one,[69] which looks most practical and graceful. It is quite feasible to have twelve or even sixteen corners, and I have seen one with twenty-four, but they are somewhat rare.[70]

The lines along the sides should be of equal length to those opposite them, and nowhere in the work should the longest lines be joined to the shortest by a single stroke, but there should be a fitting and dignified proportion[71] between them, according to the demands of each case. The angles ought to be positioned counter to the pressure of rocks or the likely direction of violent water and winds, so as to divide and dissipate the destructive blows as they strike, by facing the trouble with the strongest part of the wall[72] rather than the weakness of a side. But if the other lineaments of the building prevent you from using a corner there, as you might wish, a curved wall must be used instead, the curve being part of the circle, and the circle, according to the philosophers, being all angle.

The *area* may be either on a level surface, on a slope, or on top of a hill. If it is on a level surface, a mound should be formed, so as to place the building on some kind of podium, which will ensure it greater dignity and also



prevent several inconveniences: floods caused by swollen rivers or heavy rains are likely to deposit mud in flat places, which gradually raises the level of the ground; the surrounding plain is also raised simply through the negligence of man, who fails to clear away the rubble and refuse that gather daily. The architect Frontinus[73] claimed that in his time frequent fires had been responsible for increasing the height of the hills of Rome;[74] and we can see today how the whole city has been buried by dirt and filth. I myself have seen an ancient shrine in Umbria,[75] built at ground level, but which nonetheless has now been for the greater part buried by a buildup of soil, because it stands on a plain at the foot of mountains. But why should I mention only what lies at the bottom of a slope? That noble relic outside the walls of Ravenna, which has a single hollowed stone for a roof, although it is near the sea and well away from mountains, has nonetheless been one-quarter-buried by the sheer force of time.[76] The precise height to which each of the *areae* should be raised will be dealt with more thoroughly (and not summarily, as we do here) when we come to the appropriate place.[77]

It is at any rate essential to make sure that each *area* is made quite firm by artifice, if it is not so by nature; I therefore insist that the advice of those who want us to test the soil so as to see whether it is compact enough, or too loose and soft to bear the weight of the building, by digging one or two trenches at some distance from each other, should first be followed. If the building is to be placed on an inclined site, provision must be made to ensure that the higher parts do not exert damaging pressure, nor that any chance movement in the lower section drag the rest to ruin. Indeed, I would wish that the base of the whole structure be the most solid and best reinforced part of the building.

If the *area* is to be on top of a hill, the site should be leveled out, either by building up the sides at some point or by cutting away what had been the peak of the hill. We must go about this in a way that best preserves dignity, while incurring the least expense in terms of cost and labor. It may in fact be best to pare some earth away from the top and to build some onto the slope. Whoever the unnamed architect was who set the town of Alatri on a rocky peak in the Hernician mountains, he was well versed in these matters. He took great care to reinforce the foundations (whether of citadel or temple) with fragments of rock cut from the top of the peak, which is the only evidence still remaining, since the superstructure has been demolished.[78] But what I approve of even more is that wherever the sides fell away sharply, he set the corners of the *area* forward, strengthening them with the powerful bulk of huge rocks packed together; yet he so arranged the stones that the very economy gave a certain dignity to the structure. In the same way, another architect introduced a measure of which I approve: where he had an insufficient quantity of stone to withstand the thrust of the mountain, he constructed a series of hemicycles, their backs turned into the

mountain. This structure was not only pleasing to see and extremely strong, but also very economical, for he had constructed a wall that, although not itself solid, had as much strength as one that was, and whose thickness was equivalent to the sagittae of the arches.

I also greatly approve of the technique recommended by Vitruvius, which was practiced by the ancient architects and may be seen throughout Rome, but especially in the wall of Tarquinius;[79] this was to employ the support of buttresses. They do not, however, always follow the rule that the distance between the buttresses should be equal to the height of the structure, but make them distant or close, according to whether the ground is stable or liable to slip, as it were. I have noticed too that the ancient architects were not content with just a single substructure by each *area*, but that they preferred several, like steps,[80] securing the whole slope to the very heart of the mountain; a measure which I feel should not be overlooked.

The stream by Perugia, which flows between Mount Lucino[81] and the hill on which the town itself sits, continually erodes and undermines the foot of the hill, causing the land above it to slide down; this has been responsible for much of the city slipping and falling into ruin.

Consequently, I also very much approve of the numerous chapels that have been added on both sides of the site of the Vatican Basilica;[82] for those built against the wall of the basilica, where dug out of the hillside, are of considerable help and convenience: they support the constant pressure of the slope and intercept any moisture seeping down through the hill, stopping it from entering the building, so that the main wall of the basilica remains dry and therefore stronger. The chapels on either side, at the base of the slope, are quite capable of sustaining the weight of the ground, which had been leveled above them, because of their arched construction and because they buttress any earth movement.

I notice how the architect who built the temple of Latona in Rome showed great ingenuity in designing the building proper as well as its foundations: he set an angle of the site into the hillside on which it sits, so that the pressure of the weight was split between two straight walls, which (being set at an angle) offset the danger by dividing and dissipating the load.[83]

Since we set out to praise the prudence with which the ancients designed their buildings, I would not wish to ignore one particularly relevant example that springs to mind. The architect of St. Mark's in Venice incorporated a most useful measure into the design: for although he made the foundations of the whole church compact and strong, he left a number of shafts running through them, to allow an easy escape to any vapors that might have built up underground.

To conclude: any *area* that you intend to cover with a roof ought to be perfectly level, but those that are to be exposed to the heavens should have



just enough of a fall to allow rainwater to run off. But enough of this topic; we have said more perhaps than the occasion demanded, since many of our comments apply equally to walls. We have thus dealt in the same place with two things that are by nature inseparable. We must now deal with compartition. ◆

9
13v—15

All the power of invention, all the skill and experience in the art of building, are called upon in compartition;[84] compartition alone divides up the whole building into the parts by which it is articulated, and integrates its every part by composing all the lines and angles into a single, harmonious work that respects utility, dignity, and delight.[85] If (as the philosophers maintain) the city is like some large house, and the house is in turn like some small city,[86] cannot the various parts of the house—atria, *xysti*,[87] dining rooms, porticoes, and so on—be considered miniature buildings? Could anything be omitted from any of these, through inattention and neglect, without detracting from the dignity and worth of the work? The greatest care and attention, then, should be paid to studying these elements, which contribute to the whole work, so as to ensure that even the most insignificant parts appear to have been formed according to the rules of art.

To achieve this properly, all that has been said above about the locality and the *area* is highly relevant: just as with animals members relate to members, so too in buildings part ought to relate to part; from which arose the saying, "Large buildings should have large members." This was a principle followed by the ancients, who would give everything, including bricks, a larger scale in grand, public buildings than in private ones. Each member should therefore be in the correct zone and position; it should be no larger than utility requires, no smaller than dignity demands, nor should it be strange and unsuitable, but right and proper, so that none could be better;[88] the most noble part of the house, for example, should not be left in some forgotten corner, nor should the most public be hidden away, nor anything private exposed to view. Account should also be taken of the seasons, so that rooms intended for summer use should not be the same as those intended for use in winter, in that they should have different sizes and locations; summer rooms should be more open, nor is it amiss if winter ones are more closed in; summer ones require shade and draught, while winter ones need sunlight. Care must be taken to prevent the inhabitants' moving from a cold place to a hot one, without passing through some intermediate zone, or from a warm place to one exposed to the cold and the wind. This can be very detrimental to the body's health.[89]

The parts ought to be so composed that their overall harmony contributes to the honor and grace of the whole work, and that effort is not expended in adorning one part at the expense of all the rest, but that the harmony is

such that the building appears a single, integral, and well-composed body, rather than a collection of extraneous and unrelated parts.

Moreover, in fashioning the members, the moderation shown by nature ought to be followed; and here, as elsewhere, we should not so much praise sobriety as condemn unruly passion for building: each part should be appropriate, and suit its purpose. For every aspect of building, if you think of it rightly, is born of necessity, nourished by convenience, dignified by use; and only in the end is pleasure provided for, while pleasure itself never fails to shun every excess. Let the building then be such that its members want no more than they already have, and what they have can in no way be faulted.

Then again, I would not wish all the members to have the same shape and size, so that there is no difference between them: it will be agreeable to make some parts large, and good to have some small, while some are valuable for their very mediocrity. It will be equally pleasing to have some members defined by straight lines, others by curved ones, and still others by a combination of the two, provided, of course, that the advice on which I insist is obeyed, and the mistake is avoided of making the building appear like some monster with uneven shoulders and sides. Variety[90] is always a most pleasing spice, where distant objects agree and conform with one another; but when it causes discord and difference between them, it is extremely disagreeable. Just as in music, where deep voices answer high ones, and intermediate ones are pitched between them, so they ring out in harmony, a wonderfully sonorous balance of proportions results, which increases the pleasure of the audience and captivates them; so it happens in everything else that serves to enchant and move the mind.[91]

This whole process should respect the demands of use and convenience, and follow the methods sanctioned by those who are experienced: to contravene established customs often detracts from the general elegance, while conforming to them is considered advantageous and leads to the best results. Although other famous architects seem to recommend by their work either the Doric, or the Ionic, or the Corinthian, or the Tuscan division as being the most convenient, there is no reason why we should follow their design in our work, as though legally obliged; but rather, inspired by their example, we should strive to produce our own inventions, to rival, or, if possible, to surpass the glory of theirs.[92] We will deal with these matters, however, more thoroughly in the appropriate place, when we consider how the city, the members of the city, and their respective services ought to be disposed.[93] ◆

10 15—16 We shall now deal briefly with the outlines of walls. First, however, I would like to mention a precaution I have observed the ancients always took: they never allowed any one side of an *area* to be drawn too far in a straight line



without being broken by being bent into some curve or cut by an angle. Why such experienced men should take this step is obvious: they wanted to reinforce the wall by offering support.

When considering the methods of walling, it is best to begin with its most noble aspects. This is the place therefore where columns should be considered, and all that relates to the column; in that a row of columns is nothing other than a wall that has been pierced in several places by openings. Indeed, when defining the column itself, it may not be wrong to describe it as a certain, solid, and continuous section of wall, which has been raised perpendicularly from the ground, up high, for the purpose of bearing the roof.

There is nothing to be found in the art of building that deserves more care and expense, or ought to be more graceful, than the column. Columns may differ from one another, but we shall deal here with their similarities, with what constitutes their general characteristics; their differences, which determine individual variations, we shall deal with elsewhere, when appropriate.

So to begin from the very roots, as it were, let it first be said that every column has a foundation. Once they had reached floor level, it was customary to build a little wall on top of the foundations which some may call a cushion but which we shall call a pedestal. On this would sit the base, on the base the column was set up, and above that the capital. Columns would be designed so that the lower half would swell out, and the upper contract, the bottom being one part thicker than the top.

In my opinion the column was originally developed to support the roof. Yet it is remarkable that mortals, once they had developed a passion for nobler things, grew concerned to construct buildings that would be permanent, and as far as possible immortal. They therefore built columns, beams, even entire floors and roofs out of marble. In this, ancient architects closely followed nature's example in their desire not to appear to deviate too far from common ways of building; at the same time they took every possible care to ensure that their work would be not only appropriate to its use and structurally sound, but also delightful in appearance. Certainly Nature first supplied us with columns that were round and of wood, but, later, utility demanded that in some places they should be quadrangular. And, if I judge correctly, noticing the bands of iron or bronze incorporated at either end of the wooden columns to prevent them from splitting under the continual load, the architects also attached a wide straplike ring to the very foot of the marble columns to protect them from the splash of raindrops. Likewise at the top they placed another strap, and above that a collar, devices that they had seen used to strengthen wooden columns. As for the bases of the columns, they would ensure that the lowest part would be rectilinear and rectangular, while the upper surface would follow the outline of the column diameter. Further, both the width and the depth of the base would be greater than its height, and proportionally greater than its top, while the

pedestal would be broader than the base, by the same amount that the foundations would exceed the pedestal; all of these would be positioned above one another, centered on a single plumb line. Meanwhile the capitals would be similar, in that their lower surface would follow the form of the column, and their upper one be rectangular; the top of capitals never fails to be broader than the bottom. So much for columns.

The wall follows the same rules as the column, in that if its height is to equal that of the column complete with capital, its width must equal that of the bottom of the column. They also avoided having any column, base, capital, or wall that did not correspond to the other elements of the same order, in height, width, or indeed any dimension and form. And yet, although it is wrong to make either the width or the height of a wall greater or less than reason and scale[94] demand, I would prefer to err in excess rather than to underprovide. Here it is worth mentioning a few building defects to heighten our own awareness of the matter. For to have no defect is the greatest honor.

I have noticed in the Basilica of St. Peter's in Rome a crass feature: an extremely long and high wall has been constructed over a continuous series of openings, with no curves to give it strength, and no buttresses to lend it support. It is worth noting that the whole stretch of wall has been pierced by too many openings and built too high, and positioned where it will bear the violence of Aquilo.[95] As a result, the continual force of the wind has already displaced the wall more than six feet from the vertical; I have no doubt that eventually some gentle pressure or slight movement will make it collapse. Indeed it is quite likely that, had it not been restrained by the roof trusses, it would have collapsed of its own accord already, once it had begun to lean. But perhaps the architect may be excused a little, since, being hemmed in by location and site, he may have considered the hill overlooking the temple sufficient protection from the winds. I would prefer, however, those whole sections of wall to be strengthened on both sides. ◆

II
16—17

Roofs are the most important elements; for not only do they help to maintain the good health of the residents by defending them from rain, and keeping out the night, and above all keeping out the summer sun, but they provide excellent protection for the whole building as well. Take away the roof, and the woodwork rots, the walls totter and their sides crack; gradually the whole structure falls apart. Even the very foundations, though you may hardly believe it, rely on the protection of the roof for strength. Nor have as many buildings fallen into ruin by fire, sword, enemy hands, or by any other calamity, as have tumbled down for no other reason than human neglect, when left naked and deprived of the roof covering. Indeed, in buildings the covers are the weapon with which they defend themselves against the harmful onslaught of weather.



Our ancestors then seem to have distinguished themselves here, as elsewhere, in attaching so much importance to the covering that they exhausted almost all their decorative skill in adorning it. For we have seen roofs made of copper, glass, and gold, and elegantly decorated with ceilings gilded or coffered in gold, and picked out with sculpted crowns and flowers, and even statues.

Roofs may be either exposed to the sky, or not. Those exposed to the sky are not intended for walking on, but serve simply to keep out the rain. Those not exposed to the sky are intermediate floors of trussed and vaulted construction, which seem as if one building has been built on top of another, so that what constitutes the roof for the members of the building below is also therefore the *area* for those above, although we should rightly call the covering that part of the flooring which is above our heads; this should also be called ceiling, while anywhere that we tread on should be termed flooring or paving. We shall deal elsewhere with the question of whether the outermost covering, which is exposed to the sky and intended to keep out the rain, may also serve as the pavement.

Although they may have a flat surface, coverings exposed to the sky ought never to be parallel to the floor that they cover, but should always slope and incline in one direction to throw off the rain. Coverings not exposed to the sky, however, ought to have a flat surface parallel to the floor. All roofs must follow the lines and angles of the *area* and the form of the walls which they are to cover; and since these vary—some are composed entirely of curves, others of straight lines, yet others of a mixture, and so on—the form of the roofs must also be manifold and varied. And indeed, roofs are varied of themselves, some being hemispherical, some groin-vaulted, some barrel-vaulted, others composed of several arches, and still others called "carinated" and others "double-pitched." Whatever its form, however, every roof ought to be so designed as to offer shelter to the pavement below and to keep all rainwater out of any part of the building it covers. For rain is always prepared to wreak mischief, and never fails to exploit even the least opening to do some harm: by its subtlety it infiltrates, by softening it corrupts, and by its persistence it undermines the whole strength of the building, until it eventually brings ruin and destruction on the entire work. For this reason the experienced architects have taken great care to provide rainwater with an unimpeded runoff and to ensure that it is nowhere allowed to stand or to leak through and cause damage. Therefore they recommended that roofs should be double-pitched and very steep in snowy places, to prevent the snow from building up and to allow it to fall off more easily; but in summery places, as it were, the roofs should be less sheer, and inclined at an oblique angle.

Finally, care must be taken to ensure that the covering is a single, even, and unbroken unit, and, while respecting the rights regarding ancient lights and

party walls, that it covers the whole building to an extent sufficient to prevent water dripping from the eaves and making any part damp; it should also be built so as not to drip onto another roof. The rainwater ought not to have too vast a surface to run down, as otherwise after a heavy shower it will overflow in the gutter beyond the tiles and drain back into the building, with devastating effect on the latter. So, when the *area* is to be very large, the roof ought to be divided up into several planes, so that the rain flows off in different places—a solution as elegant as it is practical. If any house is to have several roofs, they should be joined one to another, so that those who come into the shelter of one may wander through the whole house under cover. ◆

12 17—19 We now come to the opening. There are two types of opening, one for light and ventilation, and the other to allow man or object to enter or leave the building. Windows serve for light; for objects there are doors, stairs, and the spaces between columns. Also included among openings are the ways through which water and smoke may pass in or out, such as wells, drains, the mouths, as it were, of fireplaces, oven doors, and vents.

Every part of the house should have a window to allow the air within to breathe and be regularly renewed, otherwise it will decay and become stale. The historian Capitolinus relates the tale of the exceedingly old gold casket discovered in the temple of Apollo in Babylon; when it was broken open, the air within, which had become bad and extremely poisonous, escaped, and spreading abroad not only killed those immediately present, but infected the whole of Asia as far as Parthia with a most savage plague.[96] Similarly, we learn from the historian Ammianus Marcellinus that in Seleucia[97] in the time of Marc Anthony and Verus some soldiers, after plundering the temple and carrying off the statue of Apollo Conicus to Rome, discovered a narrow opening, previously blocked up by the Chaldean priests; when their desire for booty prompted them to open it up, an infectious vapor was emitted, so offensive and detestable that from Persia to Gaul everything was infested with loathsome and fatal disease.[98]

Each individual chamber, then, should have windows, to admit light and to allow a change of air; they should be appropriate to the requirements of the interior and should take into account the thickness of the wall, so that their frequency and the light they receive are no greater or less than utility demands.

Also to be considered are the winds to which the windows are exposed. Windows facing healthy breezes may be made quite large, and it is worth opening them sufficiently to allow the air to circulate around those within: the best way to achieve this is to have the sills of the windows so low that one can see and be seen by passersby on the street. Windows, however, exposed to the onslaught of those winds which are not always healthy



should be built to admit no less light than is convenient and no more than is needed, and should be positioned high enough for the wall to act as an obstruction and to protect those within from the wind. In this way there will be sufficient wind for a change of air, but it will be broken down, thereby losing much of its unhealthiness.

Another consideration is how the sun should enter the house, and how the requirements of the apartment should govern the size of windows. Summer apartments should have windows with generous dimensions if they face north; if they face south, they should be low and narrow, so as to freely admit the breezes but avoid the glare of the sun's rays. Anywhere that men go to seek shade rather than light, there the sun constantly shining from every direction will provide sufficient illumination. Meanwhile, winter apartments should have windows that are large, to receive the direct sun, and placed high up, to avoid exposure to the wind by denying it direct access to those standing within. Clearly any opening intended to admit light should also allow a view out to the sky, and any windows constructed for this purpose ought never to be given a low position: light is seen by the face, not by the feet. Furthermore, should one person or another obstruct the light, the rest of the room would be thrown into darkness. This never happens when the light comes from above.

Doors should follow the same rules as windows, their size and number depending on frequency of use and functional requirements. In public buildings, however, I have noticed that it was customary to have a large number of both types of opening: this is demonstrated by theaters, which, if I am not mistaken, are totally composed of either stairways or, more especially, windows and doors.

The method of locating openings should be to follow the demands of use, but do not incorporate small openings within too vast an expanse of wall, nor employ within short spaces those which are too large. Opinions may have differed on the lineaments of these openings, although the best architects used nothing but quadrangular and rectangular forms, wherever possible.[99] All, however, are agreed that the design should suit the building, whatever its size or shape. They recommend that doorways should always be higher than they are wide, the taller variety containing two whole circles, the shorter one with a height the diameter of a square whose baseline is the width of the door.

Doors would be positioned where they might afford access as conveniently as possible to every part of the building. Care had to be taken to give openings a graceful appearance, and those on the right and the left would have equal dimensions so that they balanced each other out. Although it was customary to give doors and windows an uneven number, those on one side would be equal to and would match those on the other, while those in the middle would be somewhat larger.

Great precaution was taken to preserve the strength of the structure, and therefore openings would be placed well away from corners and the points where columns sprang, particularly in sections of wall that were weak, although not incapable of bearing their load. They also ensured that as much of the wall as possible rose perpendicularly and complete, unbroken from ground to roof.

There is one particular type of opening that adopts the same positioning and form as doors and windows; it does not cut right through the whole thickness of the wall, however, but is carved out like a shell, and provides a dignified and appropriate setting for statues and paintings. We shall talk in greater detail about their placing, size, and frequency, when we deal with ornaments to a building; they contribute as much to reducing the cost, however, as they do to improving the appearance of the work, in that fewer stones and less cement are used to complete the wall. All that is worth mentioning here is that niches should be arranged in a correct number, in moderate scale, and with pleasant appearance, in that their arrangement closely follows the rules for windows.

I notice that it was customary in the works of the ancients never to allow openings of any kind to occupy more than a seventh or less than a ninth of a wall's surface.

The spaces between the columns should certainly be considered among the most important of openings. Their composition varies according to the type of building, but we shall deal with this more thoroughly in the appropriate place, in particular when we consider the furnishing of sacred buildings. Let it suffice here to bear in mind that openings should be positioned with particular regard for the properties of columns, whose purpose it is to hold up the roof: columns should be neither narrower nor farther apart than is required for them to be easily capable of bearing the weight of the roof; nor should they be wider or closer together than what allows the interior spaces and entrances to remain unimpeded for every event and circumstance. Furthermore, the form of the openings will depend on the distance that the columns are apart: if close together they will be connected by beams, if far apart, by arches. But for any arched opening, care should be taken to avoid having an arch of less than a semicircle with one seventh of the radius added. The experienced agree that, as regards durability, this is the most suitable form of all; every other they consider inefficient at bearing loads and prone to collapse.[100] Moreover, the semicircular arch is the only one thought not to require ties or other means of support. All others, when on their own and without the restraint of ties and opposing weights, seem to crack and give way. I shall mention here a remarkable technique that I have noticed employed by the ancients, and that deserves particular praise: the best architects constructed the openings and vaulted arches of their temples so that even when all the interior columns had



been removed, the arches of the openings and the vaults of the roof would still remain and not collapse. All the arches bearing the weight had been drawn down to the ground with such admirable and uncommon skill that the work remained standing supported by the arches alone. Is it any wonder that these arches, with the solid earth for their tie, should be so solid themselves, and stand on their own for ever? ◆

13
19—20

The task of constructing a stairway is so demanding that it may be done correctly only by someone with much experience and a thorough understanding. For within a single stairway are included three openings, the first being the door providing entry to the stairs, the second the window admitting light to make each tread visible, and the third the opening within the joists of the ceiling, giving access to the floor above. For this reason staircases are considered an awkward element within the whole design; but anyone not wishing to find the stairs an obstacle should not in his turn create any for them: they should be allotted their own section of the floor, running free and unimpeded right up as far as the outermost *area*, the roof that is exposed to the sky. That the stairs should occupy so much of the plan ought not to give cause for concern: their convenience is greatest when they least inconvenience other parts of the building; what is more, the vaults and spaces left over below the stairs can be used to great advantage.

We have two types of staircase (I do not intend to deal with those for military campaigns and defense here): one ascended not by stairs but by an inclined ramp, the other by steps. Our ancestors used to make their ramps as easy and gentle as possible. According to my own observations of their buildings, it was considered acceptable to have their ramps at an incline of one part in height along the vertical to six in length along the baseline. They preferred an odd number of steps for their temples, claiming that this would ensure that they would be entered on the right foot, as was considered religious. I notice here that the best architects almost always avoided having an unbroken flight of more than seven or nine steps (representing, I imagine, the number of planets, or the heavens); instead, after every seventh or ninth step they wisely provided a landing to give the weary or infirm a place to rest from the task of climbing the stairs, and, should anyone happen to stumble while ascending, to offer a place to check his fall, and to recover and gather himself.

Personally, I strongly approve of stairs broken up by well-lit landings, and given ample and spacious dimensions, appropriate to the importance of the building. The ancients considered that stairs should be constructed so that their risers are no higher than three fourths of a foot, no lower than one sixth, their treads no shallower than one and a half, no deeper than two.[101] The fewer the stairs in a building and the less room they take up, the less of an inconvenience they will be.

Outlets for smoke and water ought to be free of any obstruction, and their ducts designed to avoid stagnation and overflow, and to prevent them from becoming soiled and offensive or endangering the fabric of the building. For this reason fireplaces need to be far away from any woodwork, lest sparks or the heat of the fire set light to nearby beams and timbers. Drains for water should be designed to draw off any overflow without damage to the building through corrosion or damp; for if any harm is done, no matter how little, the march of time and continual wear and tear will produce further deterioration. As regards drainage, I have observed that the best architects ensured that rainwater was either drawn off by drainpipes, to prevent it from dripping on anyone entering, or collected in impluvia to be either stored for human use or forced to flow somewhere to wash away human filth, making it less offensive to the noses and eyes of mankind. It seems to me that one of their greatest concerns was keeping rainwater out of the building, and draining it off far away, in particular to avoid the ground about becoming damp.

They seem to me to have placed every opening in the most suitable position, where it would most advantage the whole building. Wells, in particular, should be built in a public or accessible part of the house, provided the site they occupy is not too important or inappropriate. The naturalists maintain that those open to the sky produce the purest and most natural water; but in whatever part of the building wells are dug or drains laid, or wherever water and liquid are chaneled, openings should be made to allow sufficient ventilation for the circulation of air and breeze to keep the pavement free of damp vapors.

We have said enough on the lineaments of buildings, drawing on observations that seem relevant to the work as a whole, and noting the individual topics to be discussed. We must now speak of the way the building is put together, but first we shall deal with materials and the necessary preparations for construction. ◆



# Here Begins the Second Book on the Art of Building by Leon Battista Alberti. Materials.

I
20—21v

In my opinion, the labor and expense of building should not be undertaken lightly: apart from everything else that may be at stake, one's esteem and good name may suffer. A well-constructed building will enhance the renown of anyone who has invested understanding, attention, and enthusiasm in the matter; yet equally, should the wisdom of the designer or the competence of the workman be found wanting anywhere, it will greatly detract from his reputation and good name. Merits and defects are particularly obvious and striking in public buildings, though (for some reason, I do not understand) criticism of impropriety is more readily given than approval for a work elegantly constructed and with no imperfections. It is remarkable how some natural instinct allows each of us, learned and ignorant alike, to sense immediately what is right or wrong in the execution and design of a work. It is precisely with regard to such matters that sight shows itself the keenest of all the senses; consequently, if presented with anything in any way inadequate, unstable, redundant, useless, or imperfect, we are immediately struck by the desire to make it more agreeable. How this happens, we do not all understand, though were we to inquire, no one would deny that you can make improvements and corrections. By what method this should be done is not given to everybody to resolve, only to those well versed in such matters.

It is the mark of considerable experience to have so thoroughly thought out everything and determined it in the mind beforehand, that in the course of construction, or on completion of the work, one is not forced to admit, "I wish I had not done this: I would have preferred it done otherwise." And the penalty to be paid for poorly constructed work is surprisingly heavy: with time we eventually realize the rashness and foolishness of any move not considered carefully enough at the outset; if the work is not taken down or amended, the mistake committed is the source of continual grievance, and if it is demolished, we are tormented at the thought of the loss and expense, and full of remorse for the lightness and fickleness of our opinion.

Suetonius tells us that Julius Caesar completely demolished a house on his estate at Nemi, because it did not totally meet with his approval, although he had begun it from the foundations and had it finished at vast expense.[1] In this he deserves censure even from us, his descendants, either for his failure to take sufficient prior account of the relevant considerations, or perhaps for his fickleness, which allowed him to dislike an executed building, although it had been correctly constructed.

For this reason I will always commend the time-honored custom, practiced by the best builders, of preparing not only drawings and sketches but also