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GREEK ARCHITECTURE

ARCHITECTURE

BY

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To

E. C. M.

PREFACE

In publishing this treatise on Greek Architecture I wish to acknowledge my obligations to many writers. These are all recorded in the List of Abbreviations at the end of the volume and in the references given in the text. But a more special acknowledgment is due to the scholars whose work has appeared in the publications of the German Government on Olympia, Pergamon, Priene, and Magnesia, and in that of the French Government on Delphi, which have furnished much material for both text and illustrations. The general treatises of most assistance have been those of Boetticher, Durm, and Choisy, while the more specialized works of Penrose, Haussoullier, Lechat, Krell, Koldewey, Puchstein, Wiegand, and Doerpfeld, as well as many articles published in periodicals, have greatly facilitated my task. I am also indebted to Professor Harold N. Fowler for a careful revision of the manuscript, to Dr. Oliver S. Tonks for much valuable assistance in reading the proofs and preparing the indexes, to Clarence Ward for making the illustrations for Chapters I, II, and IV, and to William B. Dinsmoor for those of Chapters V and VI.

ALLAN MARQUAND.

Princeton University,
January 15, 1909.

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CHAPTER I

MATERIALS AND CONSTRUCTION

THE Greeks in their architecture made use of wood, clay, stucco, stone, and sparingly of metal, glass and other substances. It is useless to discuss which of these materials is to be ranked as the earliest or most fundamental. As far back as we can trace their history, the Greeks employed all of these materials, and they never altogether dispensed with them. But while we may not hope to trace the evolution of Greek architectural forms from the exclusive employment of any one material, it is necessary that we should consider what materials the Greeks had at their disposal and how they made use of them, before we study their architectural forms, decoration and the character of their monuments.

1. WOOD. — In regard to a material so perishable as wood, little can be expected from actual remains. Yet several dowels from the columns of the Parthenon are preserved in the Acropolis Museum at Athens; various objects made of walnut, oak, box, chestnut, fir and pine have survived in charred condition from the buildings of Pompeii; and piles from Roman buildings and

bridges still exist which have derived extraordinary strength from their position under water.[1] More may be learned from ancient representations of wooden structures, especially from the rock-cut tombs of Etruria[2] and Asia Minor,[3] and from vase-paintings. The Etruscan tombs preserve for us several types of roofs which cannot have differed greatly from contemporary roofs in Greece. Asia Minor, especially Phrygia, Lycia and Paphlagonia, is rich in tombs which reveal methods of construction closely related to, or derived from, those of the Greeks. From the remains of buildings in Greece proper, much may be inferred concerning the use of wooden columns, wooden entablatures and roofs. But more extended and detailed information is to be sought in classic literature and inscriptions. Vitruvius, in his *De Architectura*, reflects the technical knowledge of Greek architectural writers in what he has to say in regard to the use of wood as building material. Theophrastos, in his *History of Plants*,[4] describes the different kinds of trees and throws out many hints concerning their specific uses in architecture. Pliny, in his *Historia Naturalis*, reflects the knowledge possessed by Theophrastos and other Greek writers. Among modern writings, H. Blümner's *Technologie und Terminologie der Gewerbe und Künste bei Griechen und Römer* deserves especial mention for its admirable treatment of the ancient technical methods, while A. Choisy, in his *Études épigraphiques sur l'architecture grecque*, has commented with technical acumen on Greek inscriptions relating to the Arsenal at the Peiraieus, the Wall of Athens, and the Erechtheion.

[1] Keller, *Mitt. ant. Gesellsch. zu Zürich*, XII, 308. [2] Martha, Ch. VII.
[3] Perrot et Chipiez, V, 361–384. [4] *περὶ φυτῶν ἱστορία*, in ten books.

The Greeks used a variety of woods for architectural purposes. They recognized that woods differed in hardness, in durability, in resistance to pressure or flexure, and that they acted in different ways when exposed to moisture or dryness. They knew that even the same wood varied in value according to its age, or the season of the year when it was cut, or the region from which it came. They not only made broad distinctions, as between wood suitable for houses and wood suitable for ships, but they applied with nice discrimination the different woods for specific purposes. Theophrastos[1] mentions as specially adapted for building purposes, pine, fir, cedar, cypress, oak and juniper. Of these, the pine and fir were highly valued as supports, whether vertical or horizontal; cedar and cypress were prized for roofs and floors of houses and for ships; the oak, several varieties of which were known, was used for thresholds, door-posts, keels of ships and other purposes; and the juniper, on account of its durability, was employed with equal satisfaction above or below ground. Many other woods were employed by the Greek architects. Thus from the acacia were made roofing beams of great length; rafters made from the date-palm were supposed all over the Greek world to warp in a direction directly opposed to the pressure laid upon them. The alder was found to be serviceable for foundation piles, water-pipes, ships and bridges; the wild fig, for curved objects, such as the ribs of boats. Ash, chestnut, black or white poplar, elm and walnut were also used for architectural purposes, as also, in lesser degree, olive, box and ebony.

Various implements were employed for wood construc-

[1] Theophrastos, V, 7, 4.

tion. The primitive architect who constructed a log cabin required but few tools. A knife or axe sufficed for his purpose. But more complicated constructions demanded a greater variety of implements. The Greek carpenter's outfit did not differ greatly from that of to-day. He had his knives and chisels, his axe, which might be single or double, and his curved adze (Fig. 1). He had his single and double hammer, his pick hammer and his hammer for extracting nails. His saw existed in several varieties, and was differently made according to its use by one or more persons. He had various gimlets and augers, and the time-honored drill, to be used with a bow. He used a plane and the file, compasses of various kinds, a linear measure, a levelling implement, a square and angle measure. He marked his straight lines with a stretched string, smeared with red or white chalk, and he gauged his perpendiculars by means of a plumb-line, to which was attached a leaden weight cast in attractive form. Such implements may not have been adapted for rapid workmanship, but they answered every ordinary demand.

FIG. 1. Curved adze.

The methods of construction were not always the same. With the implements mentioned above, wood for building purposes was either pared of its bark, so as to form rounded logs,[1] or hewn into squared blocks or beams, or split or sawed into planks. These elements were combined in various ways so as to form fixed structures. In the case of very heavy logs or beams, gravity sometimes sufficed to hold them in place. But ordinarily some device was required to bind the separate parts together. We may distinguish five different methods: (1) splicing, (2) nailing, (3) clamping, (4) notching, (5) gluing. Splicing, by means of withes or cords, had perhaps a limited application. But it was undoubtedly employed for combining slender materials into stronger units. The torus moulding of the Egyptian cornice was almost invariably painted with a winding band; the annuli of the Doric capital seem to represent the cord or ring which held together reeds which formed the original columns; and to this day in Greece and Italy scaffoldings are usually constructed of rounded timbers held together by cords.

Nailing was accomplished either with wooden pegs, or nails of metal, which might be of iron, bronze or even silver. These pegs and nails were of various forms and sizes, and were applied sometimes directly and sometimes through a reglet, which separated as well as united the members to which it was applied.

Clamping, by means of wooden or metal clamps (*δέματα*, *βλῆτρα*), was a method of bonding applied to wooden as well as stone construction. Dove-tailed clamps, resembling a double axe and called, therefore, *πελεκῖνοι*, were often employed.

[1] Blümner, II, 300.

Notching, as a means of bonding, is peculiarly adapted to wooden construction, and must have been employed from earliest times. The primitive sanctuary of Poseidon Hippios,[1] near Mantineia, built by Agamedes and Trophonios, was made of oak logs, "fashioned and fitted together," doubtless by notching. Notched timber construction was imitated in many of the marble tombs of Lycia. It was naturally common in the construction of roofs, where the rafters were scarfed and abutted against notches in the wall plates. Beams uniting to form a right angle were either mitred together or fastened by a tenon (*περιτομίς*) and mortise (*χελώνιον*).

Gluing, as a means of bonding wood, was known to Greek carpenters in Homeric times, and experience soon taught them which woods were, and which were not, adapted to receive this treatment. When great adhesive strength was required, a glue made from the hides and hoofs of cattle (*ταυρόκολλα*) was used.

The principles of framing once understood, the applications were many. Houses, temples, and other buildings, especially in early times, were often constructed entirely of wood. Even when built of brick or stone, wood was still required for portions of the buildings. In the building of houses, the foundations, walls, floors, roofs, columns, entablatures, doors, windows and decorative mouldings might be of wood. Ships called for even more complicated carpentry.

The foundations of wooden houses on dry soil were usually of stone; on damp soil they consisted of piles. For this purpose the elder, elm and oak are recommended by Vitruvius.[2]

[1] Paus. VIII, 10, 2. [2] Vitruvius, II, 9, 10–11.

Floors (*κάτω ὀροφαί*) consisted of a system of girders (*δοκοί, διερείσματα*), which supported the joists (*σφηκίσκοι, ἐπίβλητοι*), on which were laid the boards (*σανίδες, πίνακες*). The girders were usually set into niches in the walls, but sometimes rested on independent supports (Fig. 2). The boards were securely put together and fastened, probably by grooving, and were then covered with clay or tiles.

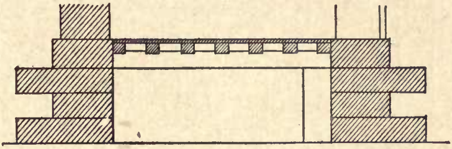


Fig. 2.—Floor of Arsenal at Peiraieus.

Walls, when made of wood, were constructed with corner posts (*σταθμοί*) and intervening studs (*ἰκριωτῆρες*) without braces, mortised into the lower sills, and held together at the top by a wall plate. An exterior covering of boards may sometimes have been given, but it was an early and general practice to fill up the spaces between the uprights with rubble, after the fashion of the European half-timbered house. This seems to be the construction indicated in Lycian tombs. An interesting survival of this type of construction may be found in Roman and Byzantine walls of Algeria[1] and Tunis, where the wooden uprights are replaced by stone (Fig. 3).

Doors were usually made of wood. Their sills (*ὑποτόναια, οὐδοί*), jambs (*σταθμοί*), lintels (*ὑπερτόναια, ὑπέρθυρα*) and hinge posts (*στρόφιγγες*), when of wood, were made of carefully selected materials. The doors of the Temple of Artemis at Ephesos were made of materials which had "lain treasured up" for four generations, according to Theophrastos,[2] and lasted for four hundred years, according to the tradition preserved by Pliny.[3] Door

[1] Gsell. II, 30. [2] Theophrastos, V, 4, 2. [3] Pliny, XVI, 79, 1.

frames of wood were used not only in the ancient buildings at Troy and Tiryns, but also were employed even in such perfect marble structures as the Parthenon and the Propylaea.

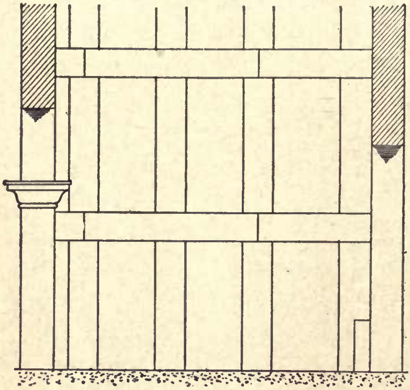


Fig. 3. — Wall of a building at Bir Sgaoun, Algeria.

Columns and their entablatures were often of wood. From the ruined palaces at Troy and Tiryns, the stone bases which once bore the wooden columns still survive. At Olympia, as late as the time of Pausanias, there remained one of the old oak columns of the Heraion and others from the house of Oinomaos. The columns of the Temple of Hera at Metapontum and the stairway in the Temple of Artemis at Ephesos were made of grape wood.[1] It is not strange that the wooden entablatures, which must have crowned many a Greek as well as Etruscan and Asiatic colonnade, have now disappeared, although their forms have been preserved in stone and marble. In the Arsenal at Peiraieus the wooden epistyle (*ἐπιστύλιον ξύλινον*) consisted of a series of single blocks, extending from pier to pier and fastened together probably by clamps. Frequently, however, the epistyles were made of two or three beams set side by side, *trabes compactiles*, as directed by Vitruvius,[2] with air spaces between them for their preservation; or of epistyles superposed once or twice,

[1] Pliny, XIV, 2. [2] Vitruvius, IV, 7, 4.

each upper series projecting slightly beyond the series immediately below it. This method of construction was peculiar to countries where massive wood was scarce. It

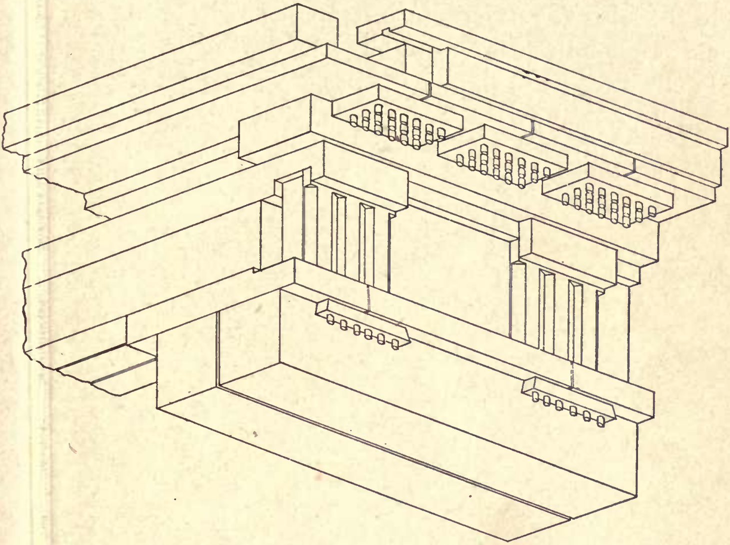


FIG. 4. — Restoration of Proto-Doric Entablature.

was especially current in Persia and Ionian Greece. Above the epistyle the fixed forms of the Doric and Ionic entablature preserved many reminiscences of wooden construction. The mutules and reglets in stone and marble buildings cannot be satisfactorily explained except as survivals of wooden members which once served a useful purpose. In wooden buildings we may believe that they were employed as bonding members. Thus, the mutules united and kept from warping the boards of the roof, and the reglets performed a similar service for the boards above the epistyle (Fig. 4). Triglyphs and dentils are also most satisfactorily explained as representing the ends of horizontal ceiling beams. Sufficient proof of this is furnished by the tombs of Lycia (Fig. 5). The fact that in the later Greek buildings triglyphs and dentils did not correspond in position or number to the actual ceiling beams, is of little significance.

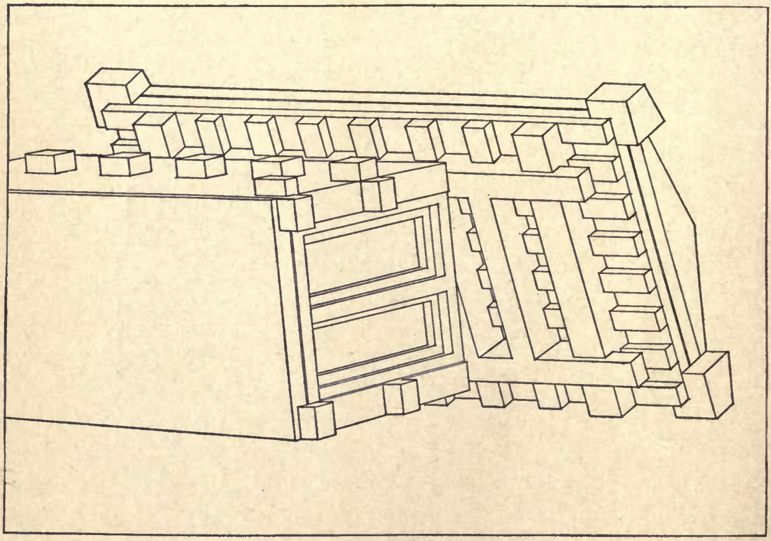


Fig. 5. — Sarcophagus from Gjölbaschi-Trysa.

The construction of roofs varied in character. Complicated, interpenetrating roofs were always avoided and the simpler forms of roofs adopted. The pyramidal roof of the log huts of the inhabitants of Colchis,[1] made by a

[1] Vitruvius, II, 1, 4.

gradual contraction of the crossing timbers of the walls, required little aid from carpentry. Slight notches near the angles were sufficient to hold the logs together. The horizontal and pent roof differed but little in construction from ordinary floors, but the gable or saddle roof demanded new methods of construction. This consisted of a ridge-beam (*κορυφαῖον*) and the rafters (*σφηκίσκοι*). These were bonded together by means of purlins (*ἱμάντες*), which carried the battens or sheathing (*καλύμματα*). Such a roof as this sufficed for covering small spaces, when the ridge-pole might extend from gable to gable. But it could not be applied to long spaces, like the central nave of a temple or basilica. Even if ridge-pieces of sufficient length could be found or put together they must needs be of extraordinary thickness to carry the great weight of a long roof. Supports were accordingly given to the ridge-beam at definite intervals. These consisted sometimes of a single row of columns or piers, more frequently of a double row of columns. The double colonnade carried cross-beams (*μεσόμναι*), and upon each of these rested a block or king-post (*ὑπόθημα*), the sole function of which seems to have been to support the ridge-beam (Fig. 6).

The cross-beams in Philon's Arsenal at the Peiraieus, of the fourth century, were quite as heavy as those we find represented in Phrygian and Etruscan tombs, and the raking rafters seem to have been of corresponding heaviness. The cross-beams resisted the weight of the roof by their massiveness and indisposition to flexure. Between this method of roofing and the system of employing a series of trussed frames with their ties and braces there is little difference in outward appearance, except that the

Greek frames were more massive; but there is a wide difference in principle. Trussed frames were possibly known to the Greeks,[1] but they can hardly have come into general use except with the steeper sloping roofs of the Romans.

Horizontal ceilings were common in Greek buildings, but were sometimes omitted, as in some of the Sicilian temples and possibly in a portion of the Erechtheion.[2] Wooden ceilings (ξυλώροφαι) exhibited a series of power-

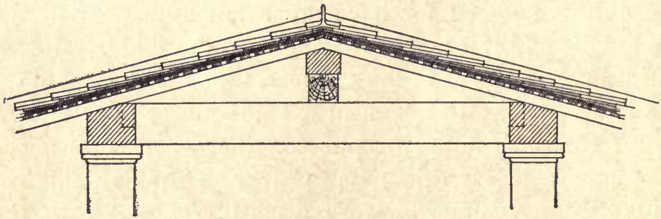


Fig. 6. — Roof construction of Arsenal at Peiraieus.

ful beams, upon which smaller cross-beams were laid so as to form square coffered openings. Upon these were built smaller coffers, closed by square panels. At the Temple of Artemis at Ephesos, the ceiling beams were of cedar[3] and the cofferings of cypress.[4] Coffered wooden ceilings may be presumed for the interiors of most Greek temples.

2. Clay, Concrete and Stucco. — The ancient Egyptians, Babylonians, Assyrians, Persians and Phoenicians made use of sun-dried brick for building purposes. It is only in recent years that historians of architecture have realized the extensive use made of this

[1] Choisy, *Études*, 155.
[2] *Ibid.* 147.
[3] Pliny, XVI, 79, 1.
[4] Vitruvius, II, 9, 13.

material by the Greeks. In the Mycenaean period it was almost universally employed for the walls of palaces and private houses. The excavations at Argos[1] and at Olympia[2] show that the walls of the Temple of Hera in both places were of sun-dried brick. Later structures, such as the walls of Athens and of Mantineia, the palaces of Croesus at Sardes, of Mausolos at Halikarnassos, of the Attalids at Tralles[3] and the Palaestra at Olympia, were of the same material. Sun-dried brick was preferred in the late period to stone for fortification walls, on account of its capacity for resisting the blows of the battering-ram,[4] but it offered a feeble resistance to water, as was proved by the fall of Mantineia. In their selection and preparation of clay the Greeks took great care. Vitruvius[5] lays down principles as to which clays should be selected and which avoided in making bricks. A long experience in brick building need not be assumed before one learns that the sandy soils are unfitted, and the more compact, calcareous soils better adapted, for brickmaking. The crude or sun-dried brick (*πλίνθος* or *πλίνθος ὠμή*) was made of clay mixed with straw, was moulded in frames, and exposed for a long time to the sun. The inhabitants of Utica are said to have exposed bricks to the sun for five years before using them for building purposes. Vitruvius recommends two years as sufficient. In Egypt, under a more uniform and powerful heat from the sun, the time was still further reduced.

The sizes of bricks differed under different circumstances. Vitruvius[6] mentions three sizes for Greek bricks:

[1] Waldstein, I, 111.
[2] *Olympia*, II, 31.
[3] Vitruvius, II, 8, 9–10.
[4] Paus., VIII, 8, 7–8.
[5] Vitruvius, II, 3, 1.
[6] *Ibid.*, II, 3, 3.

the Lydian, which corresponded to the Roman *later sesquipedalis*, or brick, a foot and a half in length; the *πεντάδωρος*, five palms in length, used in public; the *τετράδωρος*, four palms long, used in private buildings. In earlier days the bricks differed materially in size from those classified by Vitruvius.

In laying crude bricks of uniform sizes, it followed as a mechanical consequence that they should be laid in regular courses (*στοῖχοι, ἐπιβολαί*), and that their vertical joints (*ἁρμοὶ ἀπιόντες*) should not be directly superposed, otherwise the walls would tend to separate along the line of the joints. When of greater thickness than that of a single brick, the bricks were laid *φορμηδὸν καὶ κατὰ μῆκος*, by "stretchers and headers," some of the bricks stretching in the direction of the length of the wall, others heading at right angles to the face and penetrating into the body of the wall. There are many possible variations in the arrangement of courses of bricks with reference to headers and stretchers. A wall may consist of bricks laid all as headers or all as stretchers, or partly of headers and partly of stretchers. In the latter case the headers may occur at more or less regular intervals in the same course with the stretchers, or they may be arranged all in the same courses and at more or less regular intervals above the stretchers. In modern brickwork it is customary in England and the United States to lay a course of headers above every five or six or even ten courses of stretchers. What the practice of the Greeks was in this regard, and how it varied, is not a matter of general knowledge. In Etruscan stonework, which may have reflected the methods of early Greek bricklaying, the headers and stretchers were arranged in alternate courses. The same alternation seems to be implied in the term ἐναλλάξ, used concerning the courses of headers and stretchers in the walls of the Arsenal at the Peiraieus.[1] The device of laying courses of headers at regular intervals was in effect a method of bonding the face to the body of a wall. A wall thus constructed could not warp or split into a series of vertical slices. But the device, effective enough for comparatively thin walls, was less efficient in bonding walls of considerable thickness. In such cases the Greeks adopted a very ancient practice of substituting large bonding members of wood for the smaller ones of clay. Palisades, built by primitive peoples, of logs laid crosswise, with the intervening spaces filled in with sand or clay or rubble, preceded walls built of sun-dried brick. The Egyptians,[2] and probably also the Babylonians and Assyrians,[3] laid beams of wood both longitudinally and transversely in the core of their brick walls. We find this construction also in the second prehistoric settlement at Troy, about 2200 B.C. (Fig. 7).

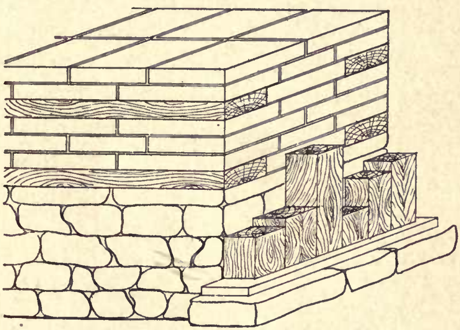


FIG. 7. — Brick wall bonded with wood.

In later days the same method of bonding walls of sun-dried brick was employed. In the specifications for the walls of Athens,[4]

[1] Choisy, *Études*, 6.
[2] Perrot et Chipiez, I, 501.
[3] Choisy, I, 87.
[4] Choisy, *Études*, 51.

we read of the insertion of longitudinal beams (θρᾶνοι) and of transverse beams (ἔνδεσμοι). Philon of Byzantium[1] praises this method of bonding walls of fortresses, and Vitruvius[2] advises the laying transversely of olive beams into walls and foundations as frequently as possible, on the ground that they pin together the outer and inner faces of the walls and thus increase their durability. Similar building methods prevail in Greece down to the present day. Sometimes mere laths are sunken into the face of a wall and the actual bonding beams omitted. This is a decorative survival of abandoned structural methods.

It seems strange to us that the Greeks made little or no use of baked brick for the walls of buildings. Pausanias, in his detailed descriptions of what he saw in Greece, twice mentions buildings of burnt brick (πλίνθος ὀπτή). One of these buildings was a temple within the sanctuary of the Mysian Demeter,[3] on the way from Mycenae to Argos, the other, the Philippeion at Olympia.[4] The sanctuary of the Mysian Demeter has not been identified and the Philippeion has been shown to have been made of poros and marble. It is a noteworthy circumstance, however, that the poros walls of the Philippeion were covered with stucco and painted in imitation of brick construction.[5] We might be inclined to consider this imitation of brickwork to be a Roman decoration added several centuries after the building was constructed, were it not that a still earlier imitation of brickwork may be found again in Olympia. This forms part of the decorations of the sima of the sixth century Treasury of Gela.[6] The painted

[1] *De re fortificat.*, III, 3; De Rochas, 36.
[2] Vitruvius, I, 5, 3.
[3] Paus., II, 18, 3.
[4] *Ibid.*, V, 20, 10.
[5] *Olympia*, II, 131–132.
[6] *Ibid.*, II, 193.

decoration here suggests two courses of brick above the rest of the wall. At this position, baked brick would be useful as a protection from the waters of the roof and is specifically recommended by Vitruvius.[1] It is thus possible that walls of baked bricks were used, though sparingly, by the Greeks.

The superiority of baked to sun-dried brick for such portions of buildings as were especially exposed to moisture was thoroughly appreciated by the Greeks. They employed terra-cotta tiles (*κέραμος*) of various shapes and sizes for water conduits and drains, for pavements and roof covering, and they moulded into ornamental forms terra-cotta revetments for cornices, including the simae, antefixes and acroteria. Considerable experimentation was no doubt necessary before the conditions of baking clay were fully understood, and yet we are amazed at the intelligence displayed by the Greeks in their earliest efforts in the manufacture of architectural terra-cottas. The huge acroterion that crowned the gable of the Heraion at Olympia has a hole in the middle, apparently to allow the great disk to contract in the baking. It is cradled on the back,[2] evidently to prevent warping. The mouldings with which it is decorated are made of a finer clay applied before the baking. It was soon learned that the more compact clays were subject to crack in the baking, hence rougher clays, which were more porous and elastic, were used as a background. On the fine slip applied to the exterior the ornamentation was incised and painted. In the case of roofing and drain tiles this exterior coating was almost a vitreous glaze.

The problem of constructing with tiles was solved in

[1] Vitruvius, II, 8, 18. [2] *Olympia*, II, 191.

various ways. Sometimes all bonding devices were avoided and the tiles laid upon each other with dry joints. When the walls or covers of drains were thus constructed the superincumbent mass of earth was utilized to bond the tiles together. When tiles were applied to a sloping roof some device was necessary to prevent the mass of tiles from sliding. This was accomplished by hooking the tiles together.

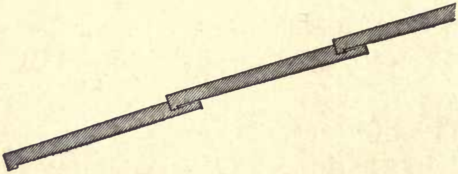


FIG. 8. — Roofing tiles hooked together.

The joints were not cemented, consequently there was considerable elasticity in a Greek roof (Fig. 8). Occasionally tiles were bonded together by means of a very hard lime mortar. This is the case in the brick portion of the oldest water conduit in Olympia, the one which brought water for the use of the priests of the Heraion.[1] We cannot therefore explain the absence of buildings of baked brick amongst the Greeks by their ignorance of lime mortar. They may have distrusted the oven as a means of thoroughly and uniformly hardening bricks of clay, a distrust shared even by Vitruvius, or may have preferred the time-honored method of building without mortar. Had they felt the necessity for it, it was certainly within their power to erect buildings of baked bricks bonded by the very best of lime mortar.

In bonding the terra-cotta revetments to wood or stone, nails of copper, bronze and iron were employed. Clamps of lead were also used. Terra-cotta revetments, as economical and useful substitutes for stone and marble, are

[1] *Olympia*, II, 174.

not confined to Etruscan and Roman buildings. Friezes, cornices, antefixes and acroteria of this material are found in Greek buildings in southern Italy and Sicily, at Olympia, Delos and Athens.[1]

Concrete was used for pavements, floors and roofs, and the finer stucco for covering walls, columns, ceilings and for ornamental mouldings. Pavements (στρῶματα, ἐδάφη) of fine cement laid upon a coarse concrete have been found in various Mycenaean palaces, a noteworthy example being that in the courtyard and in the large megaron at Tiryns.[2] One of the earliest of the water conduits at Olympia, dating from the seventh century B.C., and leading to the Altar of the Nymphs, was made of a hard cement composed of lime and small pebbles. The pavements of the Temple of Zeus at Olympia and of many other temples were similarly constructed. Vitruvius[3] lays down the rules for pavements of this kind. They consisted of a fundamental *rudus*, of coarse stones and lime, a central *nucleus* of broken potsherds and lime, upon which was laid the *exactum pavimentum*. With slight variations, the same methods had been employed by the Greeks during the whole course of their history. When pavements of concrete were laid upon the wooden floors of a building, precautions were taken to spread first upon the wooden planks a layer of straw, so that the lime might not injure the wooden frame. When such floors were exposed to the open, and had to withstand dampness and heat and frost, special expedients were necessary to prevent the cracking of the cement through the expansion or contrac-

[1] Borrmann, *Architektonische Terracotten*, in *Olympia*, II, 187–203; *Die Keramik in der Baukunst*, 28–51; Frazer, *Paus.*, II, 59.

[2] Schliemann, *Tiryns*, 203, 214, 224.

[3] Vitruvius, VII, 1.

tion of its wooden support. In such cases, Vitruvius recommends a second sheathing of planks at right angles to the first; a *statumen*, or foundation, composed of stones as large as a man's fist, and clay; a *nucleus* not less than a foot thick; and, if necessary, a double tile covering, which should have a slight incline. An interesting variety of concrete pavement is that described by Vitruvius [1] as used by the Greeks for winter dining rooms. It was composed of ashes mixed with lime and sand. It was not cold to the feet, and water spilled upon it readily evaporated.

Stucco (*κονία*, *κονίαμα*, *opus albarium*), made of marble dust or gypsum, when applied to wet plaster made a surface more durable than that of marble itself. It was used as a covering to protect sun-dried brick and the coarse stones, sometimes applied to baked brick and even to marble. The walls of the ancient palaces at Tiryns, Mycenae and Knossos were plastered and covered with a fine stucco, fragments of which still retain their polychromatic decoration. The poros columns and entablatures of archaic buildings in Greece, Italy and southern Italy received, as did the sandstone columns of Egypt, a covering of fine stucco. Stucco was sometimes applied, as in the Treasury of the Megarians at Olympia,[2] to the surfaces of blocks of stone so that they might be more closely fitted together. Stucco ornaments, though in reality a cheap substitute for carved wood or stone, came in the classic period to be considered as signs of extravagance. After the days of Alkibiades, however, this luxury and that of having wall paintings on stuccoed walls was widely spread. Vitruvius,[3] in giving directions for constructing cornices and vaults of stucco, is concerned that they should be

[1] Vitruvius, VII, 4, 5. [2] *Olympia*, II, 53. [3] Vitruvius, VII. 3.

made without much overhang and as light as possible. The walls were also a source of anxiety. Various precautions were taken to secure dry walls, and on these, after the first coarse plastering, no less than three coats of fine sand mortar and three of stucco were recommended.

3. Stone and Marble. Greece was well provided with stone and marble, admirably adapted for building purposes. It was inevitable, with the advance of civilization, that a more substantial material should be substituted for wood and clay. The substitution of stone for wood is admirably illustrated by the Heraion at Olympia. This temple, dating from the eighth or ninth century, B.C., was built, like Mycenaean palaces, with walls of sun-dried brick, and columns and entablature of wood. The old oaken columns were here gradually replaced by stone columns whose capitals show a succession of archaic, developed and decadent forms, until in the day of Pausanias only one of the oaken columns remained. In the Greek towns of southern Italy, wooden entablatures upon stone columns were in use for centuries; but inevitably Greek logic demanded entablatures and walls, as well as columns, of stone. Not merely the demand for more enduring temples and civic buildings, but also for more substantial roads and bridges, aqueducts and tombs, led to a rapid development of the art of the stone-cutter and mason.

The most common building stone was called poros (*πῶρος* or *λίθος πώρινος*). Both ancient and modern writers use the term with great laxity.[1] In this connection, H. S. Washington, the geologist, says:[2] "There is great lack of definiteness in the use of the word poros, which is made to include almost all soft, light colored

[1] Frazer, *Paus.*, III, 502–503. [2] *A.J.A.* 1891, 395, note 1.

stones, not palpably marble or hard limestone. In the majority of cases, it is a sort of travertine, again a shell conglomerate, and occasionally a sandstone or some decomposed rock containing serpentine or other hydrated mineral." When such breadth of significance is allowed, it is not surprising that so-called poros should vary greatly in character. At Syracuse, the columns of the temple have weathered very badly, while those at Corinth, Ægina and Assos still retain much of their original form. Poros figured prominently in the chief buildings of Greece and her colonies from the eighth to the middle of the fifth century, and in some cases even later. It was rendered practically weather-proof by a covering of fine, hard stucco.

White marble (λίθος λευκός) was used sparingly in the sixth century and abundantly in and after the fifth century. Being more compact and durable than poros, it seems to have been first employed for decorative sculpture on such portions of buildings as were especially exposed to the weather. Thus, at the Old Temple of Athena on the Acropolis at Athens, some of the metopes, the cornice, the gable sculptures and presumably the tiles, were of marble, the remainder of the building being constructed of Peiraieus stone and local limestone.[1]

The island quarries seem to have been opened first. Byzes of Naxos in the sixth century, B.C., has the credit of having first made roofing tiles of marble.[2] Parian marble was imported at Athens for architectural purposes at least a century before her own local marbles were discovered. Anaphe, Tenos and Andros also fur-

[1] Wiegand, 59–60. [2] Paus., V, 10, 3.

nished white marble. From Thasos came the marble used in the buildings at Samothrace. At various points in the Peloponnesos, white marble was found. Special mention may be made of the quarries at Doliana near Tegea. In the immediate vicinity of Athens, Mt. Hymettos furnished a coarse blue-streaked marble and Mt. Pentelikon the fine grained white marble, the surface of which in time acquires a golden sheen, due, it is said, to the fine grains of iron which this marble contains. Of Pentelic marble were built the principal Athenian buildings of the age of Pericles and succeeding centuries; it was imported by Augustus and Domitian into Rome. From Laurion came the marble used in the temple at Sounion. Boeotia had a marble which became white with exposure, used at Orchomenos and at Lebadeia, and Laconia had several quarries of white marble. In western Asia Minor, there were also deposits of white marble at Ephesos, Herakleia and Mylasa, and in Italy at the well-known quarries of Carrara.

Dark, more or less uniformly colored, marbles were found at Eleusis, in Arcadia, Laconia, Lesbos, Melos and Chios and at Alabanda and Miletos.

Variegated, polychromatic marbles, though used more abundantly by the Romans, were employed by the Greeks as early as the fourth century in the palace of Mausolos at Halikarnassos and more freely in the Hellenistic period, especially at Alexandria. Attica and Laconia had polychromatic marbles, but the better-known varieties were the green *cipollino* from Karystos, in Euboea (λίθος Εὐβοϊκός); the variegated marble from Chios (λίθος Χῖος) of which the people of that island built their city walls; the purple and white *pavonizetto* from Phrygia (λίθος

Φρύγιος); and the yellow *giallo antico*, from Numidia (λίθος Λιβυκός). Besides these, Rhodes, Skyros, Lydia, Caria, Keltis (France), and Italy possessed polychromatic marbles.[1]

The Greek quarry, whether subterranean or not, differed little from the quarries of Egypt. When subterranean and large, various devices, such as piers and curved ceilings, were employed to prevent the superincumbent mass from falling in. Directions for quarrying were given by Heron of Alexandria.[2] Like the Egyptians, the Greeks made deep cuttings and inserted wedges. The wedges were probably of wood; their simultaneous expansion, when wet, making the rift in the rock. In the quarries at Selinous and Syracuse may be seen evidence of the cross cuttings for quadrated blocks and the broader, circular cutting for the drums of columns.

There were many implements used by the stone-cutter in common with the carpenter, but he had also implements peculiarly his own. His hammer and his chisels had to be adapted for heavier work. He had his pick or pointer, his smooth-edged chisel, and his toothed chisels, some adapted for rough work and others for finer work; also a graving tool. For deep cutting he required a drill, and for the final polish he used the file and Egyptian sand or Naxian corundum. In fine jointing it was necessary that the surfaces of the joints should be as nearly as possible absolutely plane surfaces. A washing with nitre and water (*ἐκνίτρωσις*) made the surfaces absolutely clean.

[1] For a study of marbles the reader may be referred to: Lepsius, *Griechische Marmorstudien*, *Abh. k. p. Akad. Wiss.*, Berlin, 1890; Blümner, III, 26–57; Middleton, *Remains of Ancient Rome*, I, 14–22.

[2] *Μηχανικαὶ ἰσογωγαί.*

The transportation of stone blocks from the quarry to the building was not always an easy matter. Wagons and sledges sufficed for smaller blocks, but special devices are said to have been invented by Chersiphron for rolling columns and by Metagenes for revolving epistyles to the Temple of Artemis at Ephesos. Similar devices are thought by Koldewey to have been used at Selinous. Columns, or drums of columns, were dragged like a modern roller, being held to a frame by means of small cylinders, which served as axles. In transporting epistyles the framework was provided with wheels.[1] To elevate the largest blocks to their places, inclined planes were employed by Metagenes at Ephesos; but ordinarily, cranes and derricks sufficed. The derricks consisted of one or more beams set on end and provided with ropes, pulleys and a windlass. A derrick with two beams and one with four beams were used during the second century restorations of the Temple of Apollo near Miletos. The derricks were stayed by means of ropes and carried pulleys. The pulleys contained usually three wheels, but not infrequently five or more. Windlasses of various forms were used, of which one of the most interesting, figured on a relief from Capua,[2] is in the form of a treadmill.

Various devices were employed in preparing the blocks, so that they could be easily lifted by means of the derricks. Sometimes projecting tenons were left (*ὦτα, ἀγκῶνες*), so that the blocks could be easily caught by a sling (Fig. 9). Sometimes, as at Akragas, grooves were cut on the outside of the blocks into which the lifting ropes might be fitted;[3] sometimes a channel was cut into the heart of the block,

[1] Blümner, III, 129, 131. [2] *Ibid.*, III, 126.
[3] Durm, 80, No. 2.

as in the Sikyonian Treasury at Olympia;[1] sometimes, as in the same Treasury at Olympia, they were lifted by means of a gripping implement;[2] and finally, at Akragas and Selinous, Olympia and Athens, the lewis was frequently employed.[3]

FIG. 9. — Tenons for lifting drums of columns.

The stone-mason's art involved cutting the blocks of stone (ἐργασία τοῦ λίθου), setting them (σύνθεσις), and finally the various operations involved in their dressing. The difference between rough and finished masonry consists chiefly in the way in which individual units are prepared before being set in place. We may

[1] *Olympia*, II, 43. [2] *Ibid.* [3] Durm, 80, No. 3.

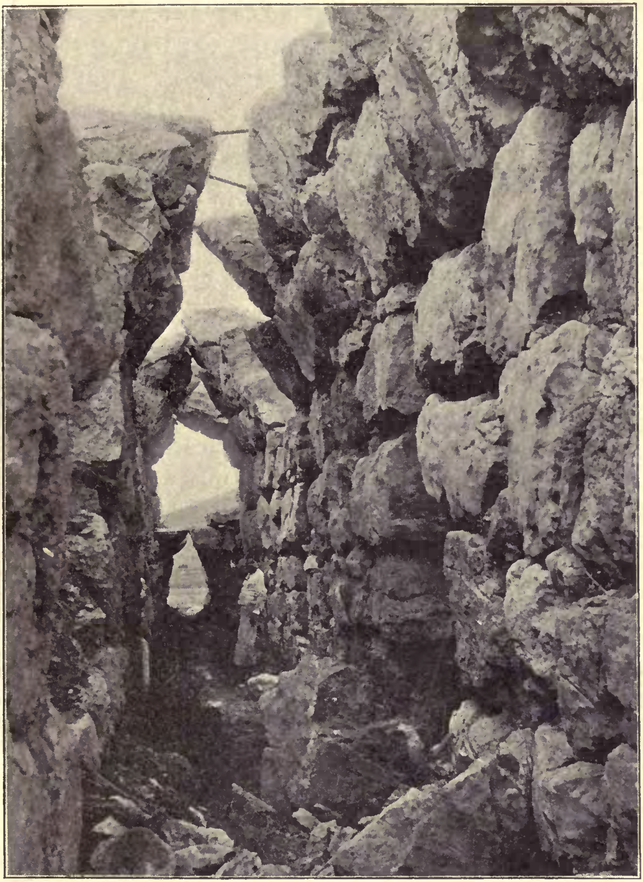


FIG. 10. — Gallery of South Wall, Tiryns.

accordingly distinguish masonry as primitive or roughly cut, polygonal, tetragonal and sphenoidal. Primitive or rough masonry makes use of unhewn or roughly hewn stones (λίθοι λογάδες), as distinguished from close-fitting masonry (*λίθοι σύννομοι*). Primitive masonry occurs in the so-called Cyclopean walls of Tiryns. In this construction the blocks were sometimes very large and again quite small. In many cases no bonding agent was used to hold the blocks in place. Sometimes small stones and clay were employed to fill up the rough joints (Fig. 10).

When unstratified rock was used, regularity in stone setting is not to be expected, but when stratified or roughly hewn blocks were employed, they were naturally set in more or less horizontal courses. Besides city walls, retaining walls and the substructures of ordinary houses, when of stone, were usually of primitive or roughly cut masonry. The retaining wall of the Temple of Apollo at Delphi was made of blocks whose joints were roughly cut surfaces, the outlines of which are more frequently curvilinear than polygonal (Fig. 11).

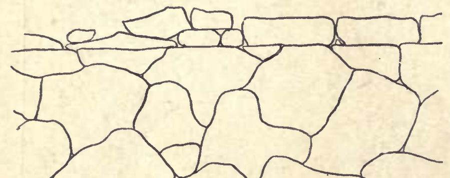


FIG. 11. — Retaining wall of Temple of Apollo, Delphi.

Such masonry is not altogether primitive and presents possibilities of great refinement, but the labor of fashioning blocks with joints so curved as to make contact with adjoining blocks was too great to be generally adopted. Polygonal masonry (*λίθος πολύγωνος*) is found in all periods and over a wide range of the Greek world. At Mycenae, at Samikon (Fig. 12) and elsewhere, it occurs associated with more primitive masonry in the city walls and towers; at Rhamnous, polygonal masonry is used for the cella walls of the Temple of Themis; at Knidos it is found in the upper part of a wall, the lower por-

FIG. 12.—Polygonal masonry from Samikon.

tion of which is constructed of the most regular quadrangular units. The Greeks of southern Italy and Sicily avoided it,[1] but it was much used in Etruria, especially in and about Latium.[2] As opposed to the curvilinear type of masonry which we have observed at Delphi, the joints in this class of masonry are plane surfaces which cut each other at an angle, so that the faces of the blocks form more or less regular polygons. From the point of view

[1] Koldewey und Puchstein, 214. [2] Martha, 140.

of construction, walls of polygonal masonry were in most cases very substantial. The joints meeting each other at varying angles left no continuous lines, horizontal or vertical, in which the walls could be easily fractured. From the point of view of economy, this type of masonry was limited chiefly to districts provided with igneous rocks. Even here the form of the blocks did not lend itself to rapid work.

Tetragonal or quadrangular masonry (*λίθος τετράγωνος*) was the type which finally came to be employed for heavy as well as light walls. It was not a product of the classic times, for we find it already in pre-Mycenaean buildings at Knossos, Phaistos and Hagia Triada in Crete,

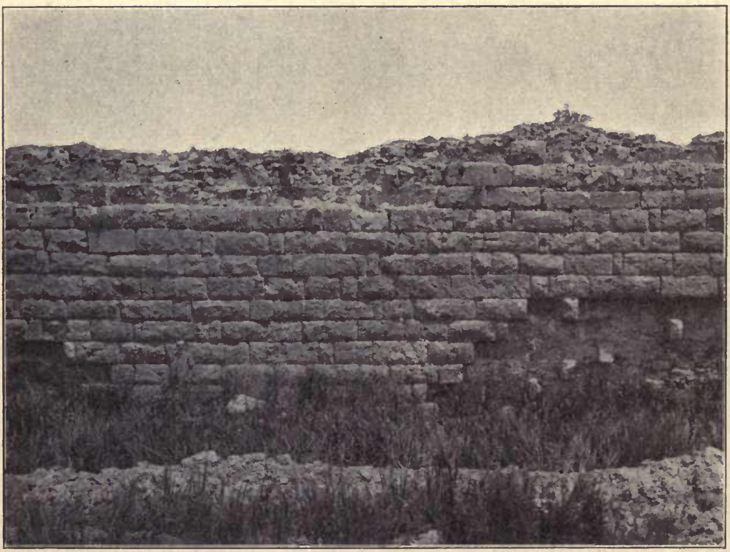


Fig. 13. — Equal coursed masonry at Magnesia.

as well as in constructions of the Mycenaean period at Troy.[1] It was the natural type for a people who were provided with an abundant supply of stratified rock. One consequence of the use of such rock and of the tetragonal unit was masonry in horizontal courses (δόμοι). When the blocks were uniformly of the same height, the successive courses were superposed with great regularity. This kind of masonry was called the equal-coursed (λίθος ἰσόδομος) (Fig. 13). Equal-coursed masonry is usually thought of as implying not only blocks of uniform height, but also of uniform breadth, and set so as to break joints. But other varieties of this type of masonry were employed by the Greeks. Sometimes the blocks were of uniform height, but not of uniform length, or the joints were some vertical and some inclined, as in the case of the walls of Messene or in the exterior wall of the theatre at Delos.

Even polygonal masonry might be constructed of blocks of equal height, as, in fact, seems to have been the case with some tombs at Sardes[2] and elsewhere.

A further variety, known as *pseudisodomum* (λίθος ψευδισόδομος), is usually described as composed of blocks set in regular courses of at least two different heights. Thus, the walls at Isionda in Pamphylia[3] and the Agrippa Monument at Athens (Fig. 14) are composed with great regularity of courses, alternately high and low. The western and eastern wall of the Great Altar at Pergamon exhibit respectively two and three high courses set between the low ones.[4] Four high courses between two

[1] Doerpfeld, *Troja*, 1893, 41.
[2] Choisy, *Rev. Arch.*, XXXII (1876), 75.
[3] Perrot et Chipiez, VII, 330.
[4] *Pergamon*, III, Taf. 7, Taf. 5.

low ones are found in the retaining wall of the Temple of Athena at Priene.[1]

Imperfectly tetragonal masonry, or stonework composed only partially of quadrangular blocks set in courses which may be described as irregularly horizontal, is a common type of masonry in Greece. We see it in the *dromos* of the tomb of Atreus and in the foundations of the walls of Athens.[2] Egyptian, Persian and Etruscan stonework was frequently of this type. Stonework of this character stands halfway between polygonal and regular tetragonal masonry. It is not to be regarded merely as an easy method of utilizing blocks of different sizes, or as a survival of megalithic methods; it represents also an attempt to secure greater strength, or at least the appearance of it, by interlocking joints and irregular courses.

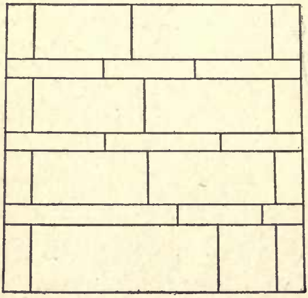


FIG. 14.—Regular, but unequal, coursed masonry from Agrippa Monument, Athens.

Sphenoidal masonry (*λίθος σφηνοειδής*), a term which we employ here for convenience of classification only, implies the use of wedge-shaped blocks, such as are used in arched construction. It is a common observation that the Greeks made little or no use of this form of masonry. When they built domical chambers, as at Mycenae and Orchomenos, or arched portals, as at Assos, the blocks were usually tetragonal or nearly tetragonal, laid in horizontal courses and overlapping until they met

[1] *Priene*, Fig. 99. [2] Durm, 64.

at the top. This system of construction did not require wedge-shaped blocks. The Etruscans, however, who made use of wedge-shaped blocks in constructing portals and subterranean canals, derived their knowledge of all the arts almost exclusively from the Greeks, and it is difficult for us to believe that they did not learn from them also the use of this type of masonry. It would seem that the Greeks did make use of sphenoidal masonry, especially in the case of portals, such as the principal gate at Kekropoula in Acarnania,[1] or the Eastern and Western Gates at Priene,[2] or the gate at Oinoanda;[3] in niches, as at Knidos;[4] between the buttresses of retaining walls, as at Athens and at Pergamon; in subterranean canals, such as those at Athens,[5] and in vaulted passages, as in the theatre of Sikyon;[6] and for bridges, such as that at Kerokampi in Laconia. It seems hardly probable that Democritus of Abdera[7] should have written out a theory of the vault unless he had been familiar with existing examples.

Besides the blocks of the geometrical shapes above described, the builder in stone used also cylindrical blocks for columns and sculptured blocks for capitals, bases, friezes, cornices and other decorative mouldings, the structural character of which will receive specific attention.

In megalithic masonry no specific bonding was necessary, as gravity suffices to hold large blocks together. But in

[1] Heuzey, *Mont Olympe*, pl. 9.
[2] *Priene*, 43–44.
[3] Petersen und von Luschan, Taf. 28.
[4] Texier, III, pl. 160.
[5] Ziller, in *Ath. Mitt.*, II, 107–131, Taf. 6–9.
[6] Frazer, *Paus.*, III, 50.
[7] Burckhardt, III, 413–414.

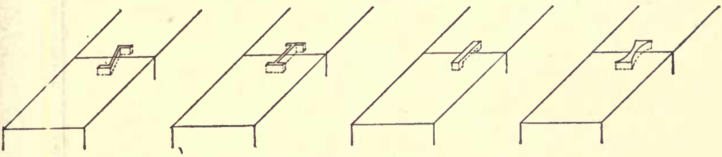
small stone construction, various devices were required to bond the stonework into a mass sufficiently strong to resist disturbance. Clay mortar (πηλός) was used in primitive masonry as a bonding device; but it had no great tenacity, and its value ceased when smaller building blocks prevailed. Lime mortar (*ἀμμοκονία*, *λιθόκολλα*) was known to the Phoenicians and used occasionally by the Greeks. It was probably Greek experience that led the way for the rules laid down by Vitruvius for making mortar. Lime mortar is found in the socle of the wall of the Stoa of Eumenes at Pergamon,[1] and a very tenacious quality of it in subterranean and subaqueous construction, as, for example, in the drains at Olympia and in the moles of the Peiraieus. But in general the Greeks, from force of habit or from choice, preferred dry masonry and bonded their stonework by wooden or metallic clamps. Dowels (πόλοι) of wood or metal were employed in bonding together the drums of columns. These were cylindrical in form and mortised into cubical blocks (*ἐμπόλια*) of wood or metal, which being set in the drum below, permitted an expansion of the dowel without injury to the drum. Frequently the *ἐμπόλια* were omitted.[2] Wooden clamps were sometimes used, as in the Temple of Athena at Pergamon, for horizontal bonding, but metallic clamps were usually preferred. Metal clamps had been used by Hittites, Persians and Phoenicians, and in Greek lands were more common in the East than in the West. They were frequently made of iron, or of iron cased in bronze, and were held in place by a solder of lead (*μολυβδοχοΐα*). These clamps were of various shapes

[1] *Pergamon*, II, 74.

[2] Koldewey und Puchstein, 225–226.

(Figs. 15–18), all of which occur in the sixth-century work and continued to be used with local variations and preferences through the classic period. It was not until the Hellenistic period that mortar began to be substituted for metallic clamps.

Another bonding method in stone construction is that of notching. This occurred in walls and also in entablatures. At the Amykleion, near Sparta, founda-



Figs. 15–18. — Clamps of various shapes.

tions are still visible where several blocks are notched into a course of larger blocks at right angles to them. At Eretria, the city walls show courses of stone bonded together by notching (Fig. 19). When cornices of stone were substituted for wood, these continued to be notched to receive the rafters of the roof. The corner pieces of the raking cornice of the gable were also notched to prevent the sliding of the gable cornice. The triglyphs were often notched so as to hold the metopes in place.

Stone-masons sometimes borrowed from builders in brick the old method of inserting horizontal and transverse blocks of wood, to bond together the separate units in the construction of a wall. This type of bonding occurs at Mycenae, Thera and elsewhere, but it was not a practical method for stonework and was soon abandoned.

Dry masonry could not have reached the perfection it did among the Greeks, had they not expended great care upon dressing the faces and joints of each separate block. The faces were only roughly dressed when put in place.

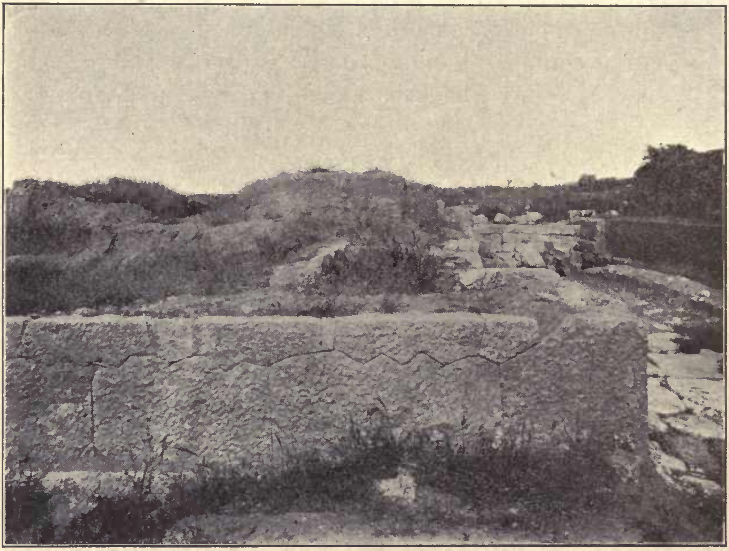


Fig. 19. — Notched masonry at Eretria.

The unfinished temple at Segesta shows us stylobate blocks whose undressed faces still retain even the tenons by means of which the blocks were lifted to their places, columns whose channellings have never been executed and abaci which still retain their edge protectors (*περιτένεια*). The risk of damaging the edges of the blocks during the process of setting them in place was thus avoided. When a building was erected in the rough, the upper part seems to have been dressed first and the lower part last. The horizontal bed joints (*βάσεις*) and the lateral or vertical joints (*'απιόντες 'αρμοί*) were dressed so as to fit as closely as possible. In the case of poros masonry, stucco was sometimes employed, as in the Treasury of Megara at Olympia, to make the rough joints smooth, but in marble buildings the dressing was done by fine chiselling. At the Treasury of Megara, the entire surface of each horizontal joint was dressed, but in the vertical joints an economy of effort was reached by dressing only near the edges. This marginal drafting, or frame-like dressing (*'αναθύρωρις*), occurs throughout the whole history of Greek stonework. In pre-Mycenaean masonry at Palaiokastro in Crete, at the Heraion, Olympia,[1] and at the Amkyleion near Sparta, the blocks barely touch each other at the edges.

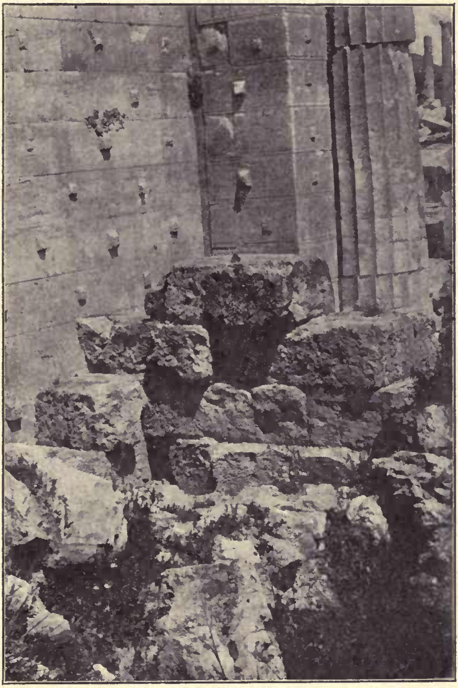


FIG. 20.—Anathyrosis from wall of Propylaia, Athens.

In the archaic and classic period this drafting shows sometimes a narrow and sometimes a wider band (Fig. 20).

[1] *Olympia*, II, 35.

The joints were carefully washed with nitre and water and then by various devices pushed into close contact before the blocks were clamped.[1] The extreme concern which the Greeks gave to the matter of dressing the joints is well exhibited in the very detailed specifications for enlarging the pavement about the Temple of Zeus at Lebadeia.[2] Here we find indicated the character of the tooling, the measurements for the marginal dressing and a manifest anxiety for close-fitting joints.

Similar care was exhibited in all Greek marble construction during the classic and Hellenistic period.

4. METALS. Metals, though not extensively used in Greek architecture, were nevertheless of importance for constructive as well as for decorative purposes. In stone and marble buildings metal clamps and dowels were employed from a very early period. These were usually made of iron, sometimes of bronze, and held in place by means of molten lead. The holes through which the lead was poured may be readily discovered upon blocks from ruined buildings. Iron was also occasionally used for the reënforcement of stone when insufficiently strong. An excellent example of this may be found at the Olympieion at Akragas.[3] In this gigantic structure the epistyle blocks were not long enough or strong enough to bear the superincumbent weight. Hence, between the intercolumniations bars of iron were employed to aid in the support of the entablature. Wrought iron-work of a high quality was used by the Greeks who, from the days of Homer,[4]

[1] Choisy, I, 274.

[2] Choisy, *Études*, 170–211; Fabricius, 5–16.

[3] Hittorff et Zanth, 566; Koldewey und Puchstein, 163.

[4] *Od.*, IX, 391–393.

appear to have known how to temper iron so as to increase its strength.

Of iron and of bronze were the coverings for door-posts and the channels or tracks in which the doors swung. Bronze was sometimes used for door-sills, as in the Parthenon; in decoration, as in the *oculi* of Ionic capitals and rosettes of ceiling cofferings in the Erechtheion; or for the adornment of walls, as in the Tholos of Atreus at Mycenae. The decoration of the engaged columns at the Tholos of Atreus suggests also the prevalence of coverings of hammered bronze as a protection for wooden columns. Doors adorned either with hammered reliefs, as the Gates at Balawat,[1] or with moulded ornaments, as in Roman and Byzantine times, appear to have been used by the Greeks. Such were the gates of the Temple of Artemis at Miletos.[2] According to Babin,[3] who described Athens in 1672, the doors of the Theseion were made of iron, but it is very unlikely that these dated from the classic Greek period.

Metal was not infrequently used for grilles (*κιγκλίδες*, *καγκέλλοι*, *φραγμοί*), which served as barriers in a colonnade or to replace solid doors.

5. Foundations and Pavements. The foundations of buildings varied in many ways. The ground, whether rocky or otherwise, had first to be cleared. Foundations were then laid either of sand, as in the Treasury of Sybaris at Olympia; or of pebbles, as in the Heraion; or of ashes, as in the Temple of Artemis at Ephesos; or of polygonal masonry, as in the Treasury of Syracuse at Olympia; or of imperfectly tetragonal masonry, as in the

[1] Perrot et Chipiez, II, Pl. 12. [2] *C.I.G.* 2885 d, p. 1121.
[3] Quoted by Hittorff et Zanth, 568.

Treasury of Megara at Olympia; or of regular tetragonal masonry, as in the Temple of Concordia at Akragas. In most buildings we may distinguish the structural foundations (θεμέλια) placed beneath walls and columns from the mere filling (χοή) beneath the voids. The filling might be of earth or of the splinters left by the stone-cutters. Foundations were sometimes concealed, sometimes visible. Thus the base upon which a Greek temple rested consisted of the subterranean foundation (στερεοβάτης, ὑπευθυντηρία, ὑποδομαί), and the visible portion, likened to a boot (κρηπίδωμα, κρηπιδαῖον, κρηπίς), and generally of finer masonry, consisted of a series of steps or platforms. It is often convenient to distinguish that portion of the krepidoma which stands beneath a row of columns as the stylobate (στυλοβάτης), that beneath the walls as the toichobate (τοιχοβάτης), and that beneath the pavement as the stromatobate (στρωματοβάτης). Stylobates may be classified, according to the constructive methods employed, as megalithic, monolithic, dilithic and polylithic.[1] Megalithic stylobates consist of huge blocks, each bearing several columns. Monolithic stylobates, as in Temple C, Selinous, consist of blocks equal in length to the interaxial spacing of the column. The advantage of this system is that the columns act as cover joints and thus protect in a measure the substructure. Dilithic stylobates, however, consisting of one block beneath each column and one beneath each intercolumniation, were more economical and became the canonical type in the classic period. At first the subcolumnar blocks were the larger, but later subcolumnar and intercolumnar blocks were equal. The Temple of Athena at Pergamon exhibits a trilithic system

[1] This classification is employed by Koldewey und Puchstein.

with one subcolumnar to two intercolumnar blocks. Polylithic stylobates, in which no regular system was followed, occur chiefly in the archaic period.

In the construction of the krepidoma, megalithic methods sometimes prevailed, and two or more steps were cut from the same block. The usual method, however, was to build up the bases in courses in which each step corresponded to a single course of masonry. The blocks constituting the visible steps were naturally more carefully cut and finished than the core of the masonry.

Pavements of stone (*λιθόστρωτα, στρώματα, ἐδάφη*) were of various kinds. There were cobble-stone pavements, as in the large courtyard at Tiryns; irregular blocks, as in the palace of Minos at Knossos; quadrangular and square slabs, like those of the peristyles and courts of temples; and marble mosaic pavements, like those favored by the kings of Pergamon. The more regular kinds of pavements required regular foundations. The earliest mosaic pavements corresponded in technique to primitive masonry, being composed of uncut pebbles of various colors. In the classic period, mosaics composed of small cubical blocks, *opus tesselatum*, or of thin slabs cut irregularly in accordance with a design, *opus Alexandrinum*, were frequently substituted for the earlier type.

6. WALLS, DOORWAYS AND WINDOWS. The construction of walls (*τείχη, τοῖχοι*) varied according to circumstances. Walls of towns (*τείχη*) were necessarily heavy and called for massive construction. In the Mycenaean period they were sometimes broad enough to permit of galleries and casements within the solid portion of the walls. But it was soon discovered that walls might be more economically constructed of outer revetments of masonry and an inner

core of earth or rubble (ἔμπλεκτον). Such was the polygonal Themistoklean wall as well as the later wall of tetragonal masonry, remains of which are found between the Dipylon and the Sacred Gate of Athens.[1]

The same constructive principle is seen in the much narrower walls of the Temple of Zeus at Labranda.[2] Here the central space between the two revetments was too narrow to require filling. This wall also illustrates the type called *diatonikon* (διατονικόν), the two faces being bonded together by tie blocks (λιθοὶ διάτοιχοι) which penetrate the entire thickness of the wall (Fig. 21).

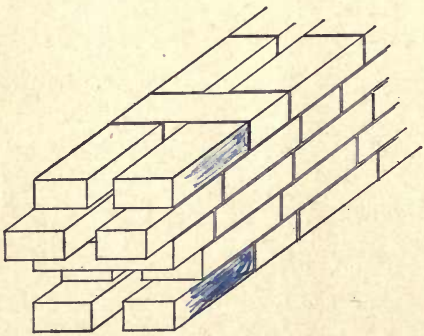


FIG. 21. — Diatonikon masonry.

Walls of houses (τοῖχοι) were thin enough to consist, except at the base, of single, solid rows of tetragonal blocks. At the base was ordinarily a levelling course or socle (εὐθυντηρία), above which was a high course of slabs of stone set on edge ('ορθοστάτης)[3]. From a constructive point of view, this did not strengthen the base of the wall, and may be best explained as a survival in appearance only of heavy courses of stone which in earlier days were laid at the base of crude brick walls.[4] Above

[1] Frazer, *Paus.*, II, 44.

[2] Lebas, *Arch. As. Min.*, II, Pl. 8.

[3] See Fig. 39.

[4] This must have been a very ancient practice, since orthostatai as revetments occur in Assyrian, Persian, Hittite, and Jewish, as well as in Greek, architecture (cf. Koldewey, *Ausgrabungen in Sendschirli*, p. 195).

the orthostatai were laid course upon course of blocks resembling bricks and, in fact, bearing the same name (*πλίνθος*). In the classic period the jointing of these blocks was perfectly regular and definitely related to that of the orthostatai. Besides a base, many walls had also a capital (*'επίκρανον*, *'επικρανῖτις*) in the form of a frieze or cornice. The jointing of the wall was also related to the jointing of its capital.

Curved walls required specifically shaped blocks. The most common type, that of the circular buildings, demanded wedge-shaped blocks with curved faces, but involved no new constructive principle.

Pilasters, and the projecting ends of walls known as parastades (*παραστάδες*) or *antae*, show two structural types. One is represented in the Porch of the Maidens at Athens. Here the pilasters are single slabs of marble, mere revetments, resembling the wooden posts or boards by which the ends of crude brick walls were protected. At the Pinakotheke of the Propylaia at Athens, they are built up of large blocks, each of which corresponds in height to that of two courses in the wall. In the Temple of Athena Nike and in the Erechtheion, a second type of construction is exhibited. Here the parastades are actually the ends of walls and composed of the same number of courses.

Doorways (*θυρώματα*) and windows (*θυρίδες*, *ὀπαί*), from a constructive point of view, may be classed as either framed or unframed. The framed variety consisted of sill (*ὑποτόναιον*, *οὐδός*, *βηλός*), jambs (*σταθμοί*, *φλιαί*, *παραστάδες*) and lintel (*ὑπερτόναιον*, *ὑπερθύριον*). Wooden frames, the natural protectors of openings in walls of crude construction, are found also in many walls of regularly cut masonry. Not only in Troy and Tiryns and Mycenae do we find evidence of doorways with wooden jambs and lintels, but also in some stone buildings of the classic period. However, stone and marble frames for doorways were usually substituted for wood in stone and marble buildings. On the island of Naxos there stands a huge marble door-frame (Fig. 22) whose jambs are heavy enough to serve as supports of the lintel, but ordinarily door-jambs were mere revetments. Many doorways, especially in fortification walls, were left unframed. Of this type the gateways at Assos furnish several excellent examples. When constructed of finely jointed masonry, doorways had no need of protecting revetments. Even the lintel was sometimes replaced by an arch. When the wall was extended above the door-frame, two devices were employed to relieve the lintel. The first was to leave an opening above it. The city gate and the entrance to the beehive tombs at Mycenae were thus constructed. The second device was to set the lintel itself with its planes

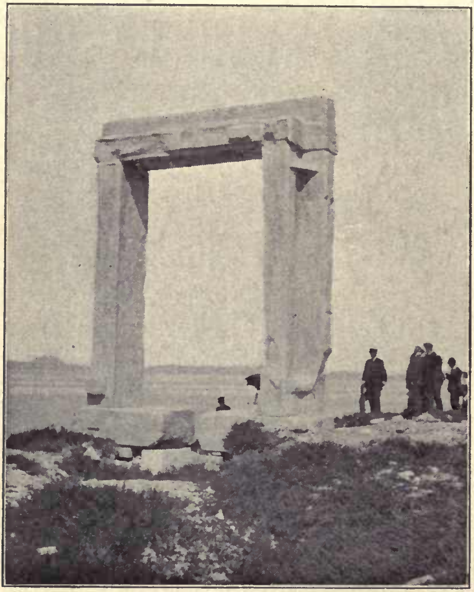


Fig. 22. — Door-frame at Naxos.

of stratification posed vertically, since in this position its resistance to flexure was greater.

Doors (*πύλαι*, *θύραι*, *σανίδες*, *θύρετρα*) were either single or double (*δικλίδες*), and might be further subdivided by folding. When double they sometimes closed against a central post (*μέτωπον*) which, as in the Arsenal at the Peiraieus, might be of considerable depth. In their construction they consisted of vertical stiles (*σκῆπτρα*) with horizontal rails (*ζυγά*) enclosing rectangular panels (*τύμπανα*). That each door, or wing of a door, should contain no more than two panels seems to have been the rule throughout the classic period. Later, a larger number of panellings were introduced. In a wall decoration from the house of Sallust [1] three superposed panels are exhibited; in a Roman relief in the Lateran Museum [2] we see a door with four superposed panels. In the Byzantine and Mediaeval period the number of panels was greatly increased. In the Renaissance period they were again diminished. Doors revolved upon posts (*ἄξονες*, *στρόφιγγες*, *θαιροί*) clad with metal and set in metal-clad sockets (*στροφεῖς*, *ὀλμίσκοι*). This system flourished in Greece in all periods.[3] They were fastened by bars (*μανδαλοί*, *κλῇθρα*, *μοχλοί*), also by lock and key (*κλεῖδες*), and were provided with door handles or knockers (*ἐπισπαστῆρες*, *κόρακες*, *κορώνη*, *ῥόπτρα*). Some doors in the Erechtheion seem to have been made partly of marble and partly of Eleusinian stone; those of the Temple of Artemis at Miletos were of bronze; at Ephesos, Eleusis and Epidauros, the temple doors were of wood.[4]

[1] Mau, 450.
[2] Schreiber, Taf. 9, Fig. 5.
[3] Schliemann, *Tiryns*, 281; Heuzey et Daumet, 230, 254, Pl. 21.
[4] Daremberg et Saglio, *s.v.* Janua.

7. Columns and Entablatures, Ceilings and Roofs. The column (κίων, στῦλος) consisted of base, shaft and capital, and carried an entablature composed of epistyle, frieze and cornice. Stone bases existed from prehistoric times. Flat stones served as foundations for wooden columns in the palaces at Troy, Tiryns and Mycenae. Flat blocks of regular form composed the Doric stylobate, the construction of which has been already considered. Another type of base of cylindrical form existed in the Mycenaean period and became the canonic type for Ionic architecture. Its varieties of form do not concern us here. Constructively, the entire base was seldom a part of the shaft, as in the Ionic niche in the Stoa at Pergamon.[1] Occasionally, as in the bases of the Erechtheion, the upper torus is constructed as a part of the shaft (Fig. 23). But

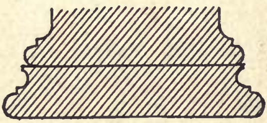


Fig. 23. — Base from Erechtheion, Athens.

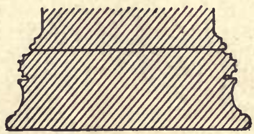


Fig. 24. — Base from Temple of Nike, Athens.

ordinarily, as in the Temple of Athena Nike (Fig. 24), the upper torus is made a part of the base, a mode of construction which is more economical of material, but which overlooks the functional nature of the base as a distributer of the superincumbent weight over a wider surface.

The shaft of the column (καυλίον, σῶμα) was sometimes monolithic, as in the Temple of Apollo at Corinth and in some of the columns of the Temple of Aphaia at Aegina,

[1] *Pergamon*, II, Taf. 27.

in those of the Temple of Athena Nike at Athens, and in the Temple of Zeus at Aizanoi; but more frequently the shaft was composed of a series of drums (*σφόνδυλοι*). Archaic columns, especially such as were covered with stucco, were composed of few drums of irregular height. In the classic and Hellenistic periods the drums were more numerous and exhibit more uniformity in respect to height. Doric drums were bonded together, as has been already indicated, by wooden, and Ionic drums usually by iron, dowels. The joints were dressed only near the edges. The lowest drum of a Doric column ordinarily rested on its stylobate without the assistance of dowels. Sometimes, however, as in the Temples of Herakles at Akragas and of Athena Polias at Pergamon, the columns were dowelled to their stylobates. Ionic shafts were usually dowelled to their bases, but the bases rest on their foundations without artificial fastening.

The capital of a column (*κιόκρανον, ἐπίκρανον, κεφαλή*) was almost invariably monolithic. The Doric capital, including the abacus, echinus, neck and a portion of the shaft, was carved from a single block. Polylithic capitals, being functionally imperfect, were rarely employed; but in the so-called Basilica at Paestum [1] there are columns in which an abacus of rougher stone rests upon an echinus carved from a separate block. In gigantic structures like the Temple of Zeus at Akragas the capitals were necessarily polylithic. The means by which the complex curves of the Doric echinus were obtained is not certainly known, but the use of a lathe [2] seems probable.

[1] An inscription recently found indicates that the so-called Basilica was probably a temple of Poseidon. See *Rev. Arch*, IX (1907), 167.

[2] Penrose, 48, note 1.

Grooves or channellings were carved on the lower part of the capital block before it was put in place, but the channellings of the shaft were usually deferred until after the erection of the column. This precaution insured sharp profiles. In order to protect the arrises of the channellings from injury, the capital block, before being set in place, was bevelled at its base. The drum nearest the capital was also bevelled, thus producing an incised ring below the neck of the capital.

The Ionic capital, including its abacus, volutes and echinus, was occasionally carved from the same block as the uppermost part of the shaft, as in the capitals of Temple B, Selinous.[1] In the Eastern porch of the Erechtheion the echinus and decorated necking are constructively part of the shaft. But in the capitals of the Propylaia at Athens, at the Temple of Nike, and elsewhere, the echinus is carved as part of the capital block.

The entablature, consisting of epistyle, frieze and cornice, exhibits many variations in construction. The monolithic type, in which all the members would appear in each block, is rare, and confined to small buildings, as the interior order of the Philippeion at Olympia[2] or the niches in the Stoa at Pergamon.[3] A combination of epistyle and frieze occurs more frequently in interiors and in buildings of late date, as in the upper order of the Stoa at Pergamon. Ordinarily, epistyle, frieze and cornice were constructed separately, and artificially bonded together. Each of these members was in its construction more frequently complex than simple. The epistyle was seldom monolithic, as in Temple F, Selinous and in the Temple of

[1] Hittorff et Zanth, Pl. 19; Choisy, I, 354. [2] *Olympia*, II, 81.
[3] *Pergamon*, II, Taf. 26, 27.

Apollo at Corinth. It was usually, in respect to depth, divided into two or more slabs and not infrequently built up in courses. The epistyle of the Temple of Concordia at Akragas was composed of two such slabs, that of the Parthenon of three (Fig. 25). Such epistyles in large buildings were more practical than heavy monoliths. In Paestum, Selinous (Fig. 26) and elsewhere epistyles were constructed of two or more courses. In very large buildings, such as the Temple of Zeus at Akragas, single-coursed epistyles were impossible. Even in smaller buildings it was more economical to adopt two-coursed epistyles and thus reduce the size of the upper blocks which were of finer quality. In marble buildings Doric epistyles were usually single coursed, their crowning mouldings being carved on the epistyle blocks. Ionic epistyles, not only by their overhanging fasciae preserved the form of epistyles built up in successive courses, but also had their crowning mouldings carved from separate blocks.

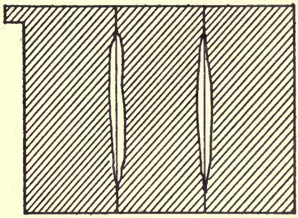


FIG. 25. — Epistyle from Parthenon.

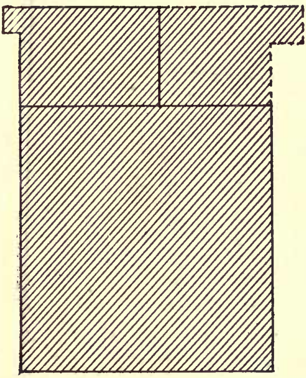


FIG. 26. — Epistyle of Temple D, Selinous.

The frieze rested upon the epistyle. It was almost invariably decorated, sometimes with figured decoration. Constructively, the frieze was a complex member, built up in a variety of ways. It was, in the archaic period, often composed of at least two courses, which might be equal or unequal in height. In the Old Temple of Athena at Athens[1] the triglyphs were built up in courses; at Temple F, Selinous, metopes, as well as triglyphs, were thus constructed. When covered with stucco the horizontal joints would be concealed, but in marble buildings, which were not so covered, these joints would be visible. Hence in the classic period friezes were usually on the exterior monolithic in respect to height, though sometimes built up in courses on the back.

In its horizontal aspect the Ionic frieze was as continuous as was practicable. It was regarded as a girdle (*διάζωμα*) encircling a building, undivided, except by such joints as were inevitable, and which were as far as possible concealed from view. The Doric frieze was, however, divided into triglyphs (*τρίγλυφοι*) and metopes (*μετόπαι*), and these appear in the earliest temples to have been composed of separate blocks, artificially bonded. In the so-called Temple of Demeter at Paestum triglyphs and metopes were so loosely juxtaposed that the triglyphs have now disappeared altogether. A step in the direction of greater unity of construction is seen in the Temple of Concordia, Akragas, where each triglyph was formed from the same block as the adjoining metope. At Pergamon two triglyphs and a metope or two metopes and a triglyph were sometimes united in a single block. In smaller buildings it was practicable to carry this fusion further still. However, the normal method of constructing a triglyphal frieze, especially when the metopes were decorated with relief sculpture, is ex-

[1] Wiegand, 8.

hibited in the Parthenon (Fig. 27). Here the metopes are relatively thin slabs which are mortised into rectangular grooves cut into the sides of the triglyph blocks. In the Choragic Monument of Nikias at Athens,[1] marble metopes were similarly mortised into poros triglyphs. Viewed in respect to depth or thickness, the frieze is

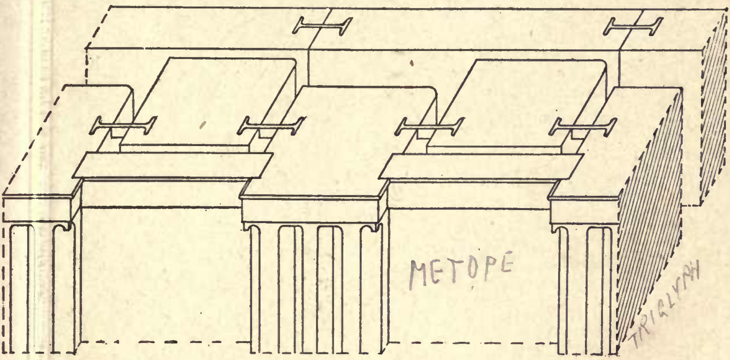


FIG. 27.—Triglyphal frieze of Parthenon.

composed of an external decorated face or kosmophoros, and an antithema or back (ʼαντίθημα), usually undecorated except by a cap moulding. The antithema usually consisted of two courses, especially when capped by a sculptured moulding. It was in the earlier buildings set into immediate juxtaposition to the kosmophoros, with or without interlocking joints; but as this involved a waste of material and weighted the colonnade unnecessarily, the kosmophoros and antithema in marble buildings were usually separated a short distance from each other.

The construction of the cornice (γεῖσον) exhibited also

[1] Doerpfeld, in *Ath. Mitt.*, X (1885), 222.

its own peculiarities. It frequently consisted of two or more courses of masonry. In Doric buildings the lower cornice block was of considerable depth. This permitted the cornice to project well beyond the face of the building, and bound together the kosmophoros and antithema of the frieze. The upper portion of the cornice was usually built up in two or more courses, the upper block carrying the cap moulding (Fig. 28).

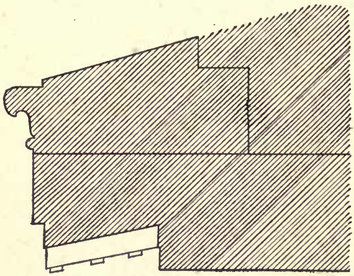


FIG. 28.—Cornice of Temple D, Selinous.

In Ionic buildings, such as the Temple of Athena at Priene,[1] dentils (γεισίποδες), geison and sima were all composed of separate blocks. In smaller buildings a fusion was usually made of these separate members. Thus, in the Temple of Asklepios at Priene,[2] geison and sima, and in the Propylon at Priene,[3] dentils and geison, are carved from a single block. In the altar of the Temple of Athena,[4] dentils, geison and sima are all carved from one block.

The blocks composing the cornice were, in early times, irregular as to length. Thus, the joints of an archaic Doric cornice might fall in the middle of a mutule, or of the space between two mutules. The classic builders more carefully regulated the lengths of the cornice blocks. Thus, they usually arranged that the cornice block of the Doric order should carry one mutule and one *via*.[5] Owing to the unequal divisions of the tri-

[1] *Priene*, Fig. 72. [2] *Ibid.*, Fig. 113, 117. [3] *Ibid.*, Fig. 105.
[4] *Ibid.*, Fig. 98. [5] Middleton, *J.H.S.*, Suppl. 3 (1900), 9, Pl. 5.

glyphal frieze, the cornice blocks were only approximately uniform in length.

The soffits of the Doric cornice in the form of mutules with trunnels were in early examples carved from the same block as the cornice. Later the trunnels usually, and the mutules occasionally, were carved separately and fastened securely in place.

Whereas wooden ceilings continued to be used for closed structures, stone and marble ceilings were often employed to cover the peristyle and other porches exposed to the air. The construction of such ceilings followed the precedents of wooden construction, exhibiting the large beams and cofferings closed by panels. The beams were notched so as to hold the coffered blocks secure. Sometimes, as at the Theseion and the Parthenon (Fig. 29), large slabs carried many cofferings. Again, as at Priene, large and deep cofferings were built up like a series of superposed boxes.

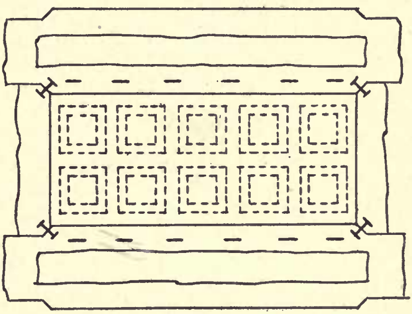


FIG. 29. — Parthenon coffering.

The roof (στέγη, ἐπωροφία), except on small buildings like the Tower of the Winds, was never constructed entirely of stone or marble. The substitution of wooden beams and rafters and purlins remained, while marble was substituted for terra-cotta for the roofing tiles, gable cornices, acroteria and simae. The substitution of marble for terra-cotta tiles introduced no new problems. The stone and marble gable cornice, however, must have given the early architects some anxiety lest the blocks should slide down the inclined wall of the tympanon. In some cases this danger was averted by building portions of the cornice into the tympanon wall.

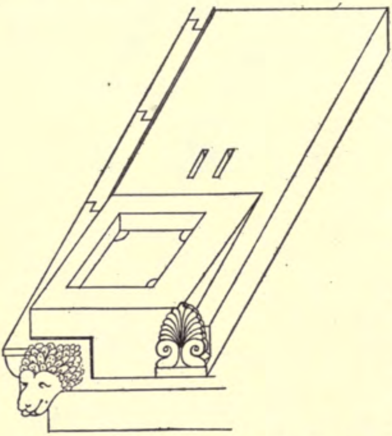


FIG. 30. — Acroterion block of the Parthenon.

At the apex of the gable (ἀετός, ἀέτωμα), the cornice block was cut to a saddle, and at the lower extremities of the saddle large blocks were horizontally posed and weighted with acroteria, which resisted the thrust of the cornice (Fig. 30).

CHAPTER II

ARCHITECTURAL FORMS

1. Foundations. — The form of subterranean foundations (στερεοβάται) vary chiefly in their plan, although it may be noted that foundation walls are usually thicker at the base than at the summit.

In plan, they were rarely continuous structures like those of the pyramids of Egypt or the ziggurats of Babylonia. Palaces of the Mycenaean age, as well as the oldest temples, like the Heraion at Olympia,[1] already exhibit the distinction between structural foundations (θεμέλια) placed beneath walls and columns, and the mere filling (χοή) beneath the voids.

Column foundations, or stylobates (στυλοβάται), differed sometimes in size from the wall foundations, being usually of greater thickness than the wall foundations in the same buildings. Exterior peristyles, especially when provided with a series of steps, had continuous foundations, but interior colonnades did not require them. In the case of Philon's Arsenal at the Peiraieus, as well as in the Hellenistic porticos at Athens and Pergamon, each column had its own special foundation,[2] nevertheless temples show continuous foundations for interior colonnades throughout the whole history of Greek architecture.

[1] *Olympia*, I, Taf. 18.

[2] Doerpfeld, in *Ath. Mitt.*, VIII (1883), 150.

Wall foundations, toichobates or teichobates (*τοιχοβάται, τειχοβάται*), extended in many cases above ground and were variously fashioned. The simplest method of giving emphasis to the foundation is to leave visible the uppermost course. This may be identical with the base or socle of the superstructure. A socle of this nature was designed for Philon's Arsenal. On account of its smoothed and levelled character it was known as the *εὐθυντηρία*, and its constituent blocks as *ὑποβατῆρες*, or *λίθοι βασμιαῖοι*. Viewed in elevation, this socle becomes the base for the wall and has, consequently, been designated by Koldewey[1] as the toichobate.

A second and more marked form is the high, stepped base, the krepidoma (*κρηπίδωμα, κρηπιδαῖον, κρηπίς*), upon which Greek temples usually rested. Rarely, as in Stratos (Fig. 31), were the steps of the krepidoma low enough to be used as stairs. For this purpose sometimes a ramp was constructed in front of the temple, as in the later Heraion at Argos[2] and the Temple of Zeus at Olympia,[3] but more frequently either the entire front or the central portion of the front of the krepidoma was converted into a practical stairway by the introduction of steps of convenient height.

As a whole, however, the krepidoma was not a stairway, but a visible foundation, the form and proportions of which were not determined by considerations of mere practical convenience. The number of steps or platforms composing the krepidoma was not uniformly the same. There was no sacred number of platforms, as in the ziggurats of Mesopotamia. The Temple of Hera at

[1] Koldewey und Puchstein, 203. [2] Waldstein, Pl. 17.
[3] *Olympia*, I, Taf. 9.

Olympia and the Old Temple of Athena at Athens had each a krepidoma consisting of a single step or platform; the so-called Temple of Theseus at Athens had a krepidoma of two steps; the common type, exemplified in the Temple of Zeus at Olympia and in the Parthenon,

FIG. 31. — Base of Temple at Stratos in Akarnania.

displayed three steps and was accordingly known as the τριβασμός. A larger number of steps was sometimes reached. Temple D at Selinous had a krepidoma of four steps and the old Greek Temple at Pompeii[1] one of five steps, that of the Temple of Apollo Smintheus in the Troad[2] had eleven steps. When a temple was placed upon a hillside, the number of steps on the side toward

[1] Von Duhn, Taf. 2. [2] *Ion. Ant.*, IV, Pl. 26.

the lower level of the hill was, naturally, greater than the number on the upper level.

From the point of view of elevation, the krepidoma may be considered as composed of the stylobate or upper step and of one or more lower steps. If a term were needed to distinguish these from the stylobate on the one hand and the invisible stereobate on the other, the lower steps might well be designated the substylobates.

An interesting peculiarity in the krepidoma of some Greek temples is its convex character. The apparently horizontal edges of the stylobate and lower steps are found, in these cases, to follow the boundary line of a regular polygon which is large enough to be considered the arc of a circle. This curvature of horizontal surfaces is found in the Temple of Apollo at Corinth and in the so-called Temple of Poseidon at Paestum; in many buildings of the classic period, such as the Theseion, the Parthenon and the Propylaia at Athens; and in a few Hellenistic and Roman buildings, such as the Temple of Athena at Pergamon and in the Maison Carrée at Nîmes. That this curvature was intentional seems to be proved by its occurrence in the rock-cut base of the Temple of Apollo at Corinth,[1] and by its survival in Mediaeval architecture.[2] In some cases, as at Corinth, it was confined to the façades; in others, as in the Temple of Athena at Pergamon,[3] it was restricted to the long sides; more frequently, when found at all, it occurs both in the long and in the short sides of the krepidoma.

A third form of visible foundation for buildings, the podium, may be seen in the Temple of Despoina at

[1] Doerpfeld, in *Ath. Mitt.*, XI (1886), 303.

[2] Goodyear, *Arch. Rec.*, VI (1897), 481.

[3] *Pergamon*, II, 23.

Lykosoura (Fig. 32). The pseudo-peripteral Temple of Zeus at Akragas is set upon a base which may be described as a compromise between a podium and a stepped krepidoma.[1] Tombs, such as the Mausoleion at Halikarnassos, were

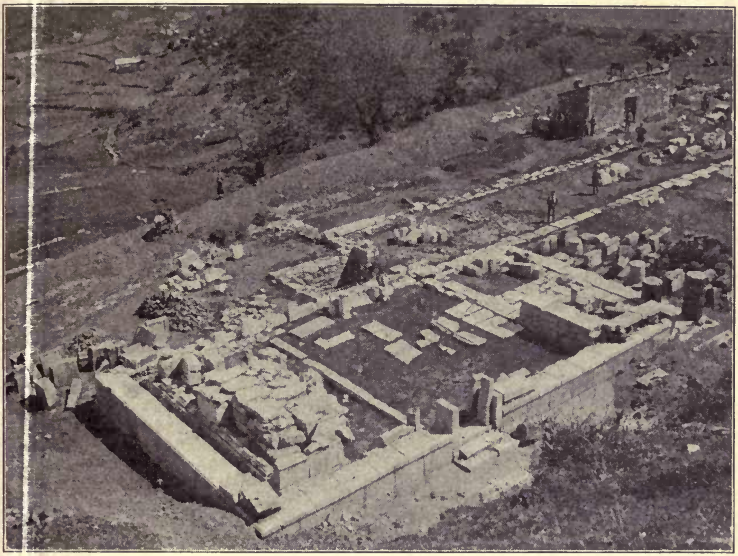


FIG. 32. — Podium of Temple of Despoina at Lykosoura.

sometimes set upon lofty podia. Such was also the disposition of the Choragic Monument of Lysicrates at Athens. According to Vitruvius,[2] the podium may be described from the base upward as consisting of the plinth, base moulding, the body or die, the cap or cornice moulding, and sometimes a *lysis* to connect the podium with the superstructure.

The refinements of curvature which were introduced into the krepidoma seem also to have been applied to

[1] Koldewey und Puchstein, 161.

[2] Vitruvius, III, 4, 5.

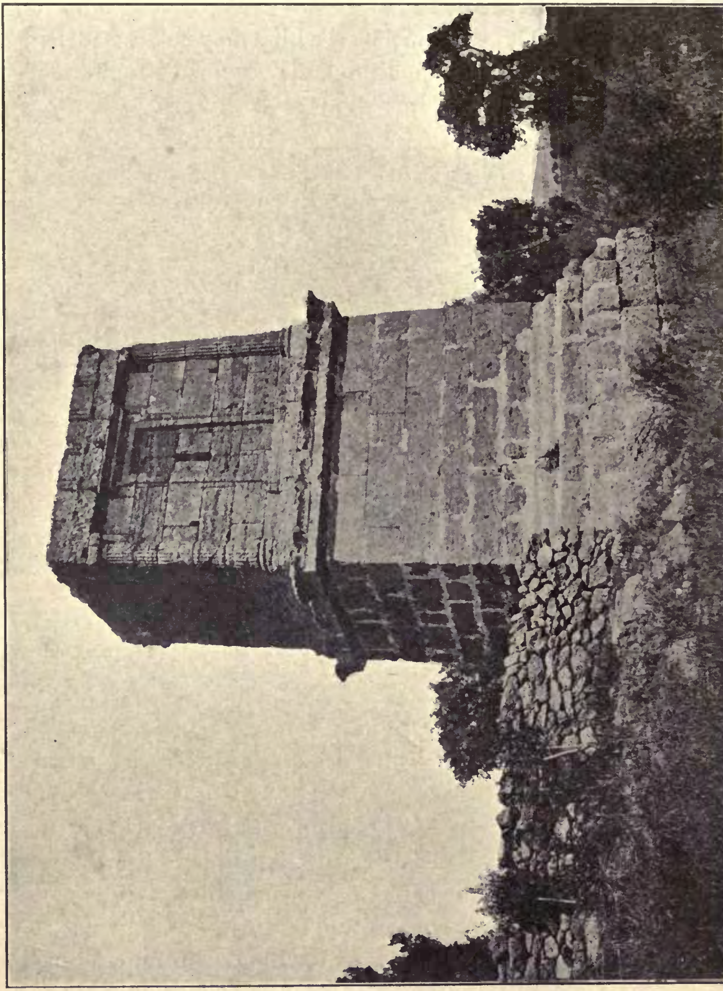


FIG. 33. — Podium of Theron's Tomb, Akragas.

podia. The die of the podium of the so-called Tomb of Theron at Akragas[1] not only diminishes in breadth from base to summit, but its outer angles, seen in clear profile against the sky, are distinctly curved (Fig. 33). In the case of a long low podium, the eye would be attracted by the horizontal, rather than by the vertical, lines. This is the case with the podium of the Maison Carrée at Nîmes, which shows a convex curvature in plan.[2]

The form of pavement foundations (*στρωματοβάται*), being concealed from view, are of archaeological, rather than architectural, interest. It is, however, not uninteresting to observe that pavement foundations, when not a formless mass of rubble or sand, were constructed sometimes as a series of piers and sometimes as continuous series of parallel walls. Both of the latter types are displayed in the foundations of the Altar of Zeus at Akragas.[3]

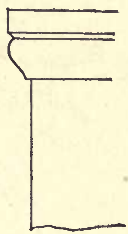
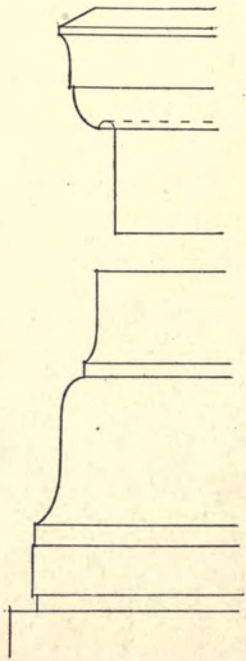


FIG. 34. — Base of Kyniskos statue.

Parallel in form and development to temple bases were the bases of statues and other votive offerings. A series of these bases (*βάθρα*), found at Olympia, have been described by Purgold.[4] In the archaic period, such bases were usually devoid of mouldings, as, for example, the stepped rectangular base erected by a certain Praxiteles at Olympia about 500 B.C., and the stepped circular base for the statue of Nestor by Onatas. During the fifth century, however, profiled bases began to appear. The pedestal for the statue of Kyniskos (Fig. 34) by Polykleitos the elder, is a good

[1] Basile, 43.
[2] Goodyear, in *A.J.A.*, 1895, 1–12.
[3] Koldewey und Puchstein, 154.
[4] *Olympia*, II, 144–161. Cf. Wernicke, in *Jhb.*, IX (1894), 101 ff.

example. That of the statue of Nike (Fig. 35) by Paionios, exhibits a predilection for more graceful mouldings during the latter half of the fifth century. Later



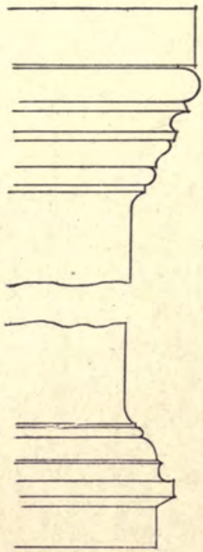


FIG. 35. — Base of statue of Nike. FIG. 36. — Base of Roman statue.

the mouldings became more complicated in form. During the Roman period the basal and crowning mouldings of such pedestals were frequently constructed from the same block as the central die (Fig. 36).

2. WALLS. — The forms of walls may be considered in respect to plan, profile or front elevation. Some walls

were extremely irregular in plan. This was the case in the fortification walls of an acropolis, like that of Tiryns, where an irregular space was enclosed by a wall which follows the natural conformation of the ground. Normally, however, walls were regular in plan. They were built in straight lines, squares, rectangles, polygons, circles or ellipses. Of these forms, the rectangle was preferred by the Greeks. Such was the form of the megaron of the Mycenaean palace, and the almost universal form of temples and of domestic buildings. Polygons, like that of the Tower of the Winds, are rare. The circular disposition of walls was not avoided when useful, as in fortifications, or agreeable, in other buildings. The beehive tombs of the Mycenaean period, the Choragic Monument of Lysicrates, the Tholos of Epidauros, the Philippeion of Olympia, are well-known examples of buildings with walls disposed on a circular plan. The South Wing of the Bouleuterion at Olympia[1] is a notable example of walls which follow the plan of an ellipse. In buildings which show great refinements of curvature it might be expected that some curvature in plan would be found. Burnouf[2] pointed out, in 1875, that the columns of the Parthenon were not set in straight lines, but on a slightly curved plan. The logical sequence to this is that the walls should also show curvature in plan. As a matter of fact, the long cella walls were not set in straight lines, but were bent in at the extremities. Boetticher[3] declares that this was done for economical purposes, to give relief to the parastades. Walls of slight curvature have been

[1] *Olympia*, II, 77. For other examples, see Pfuhl in *Ath. Mitt.*, XXX (1905), 360–374. [2] *Rev. de l'Arch.* quoted by Goodyear in *Arch. Rec.*, VI (1897), 482. [3] Boetticher, 195.

pointed out by Professor Goodyear in the case of the Maison Carrée at Nîmes and in some Mediaeval and Renaissance Italian churches,[1] which appear to have derived this refinement from Byzantine sources. A wall of a tomb, apparently of the time of Augustus, built upon a wave-like plan, may be seen on the Appian Way. It may also be noted that the Greeks did not admire unbroken regularity, and that continuous walls without breaks appeared monotonous. Hence, fortification walls sometimes were provided with towers or bastions in places where they could serve no useful purpose, or walls were broken by vertical or horizontal retreats where they had only a decorative significance.[2] Colonnettes and pilasters appear at an early period in the palace at Arne in Boeotia,[3] but were more common in later times.

In elevation walls exhibit a variety of forms. They may be vertical, inclined, escarped, stepped, curved in profile, and with or without base and cornice. Vertical walls, being almost universal, need no special consideration. Terrace walls and fortification walls were sometimes inclined for obvious reasons. But the inclination of walls towards or away from the centre of a building is a remarkable disposition found in some of the buildings of the classic period. In the case of the Parthenon, the side walls, although having nearly the same thickness above as below, incline towards the interior of the building. The tympana of the gables also lean inward. The walls and antae of the Propylaia at Athens exhibit similar peculiarities.[4]

[1] Goodyear in *Brooklyn Museum Memoir*, Nos. 2 and 4; *J.R.I. Br. Architects*, 3d series, Vol. XV, No. 1.

[2] Doerpfeld, Beilage 24; Pernier, *Mon. Ant.*, XIV (1904), 347, Fig. 13.

[3] A. de Ridder, in *B.C.H.*, XVIII (1894), 294.

[4] Penrose, 38, 62.

Escarpment, or the building of walls with an outward slope at the base, is found in prehistoric and Mycenaean

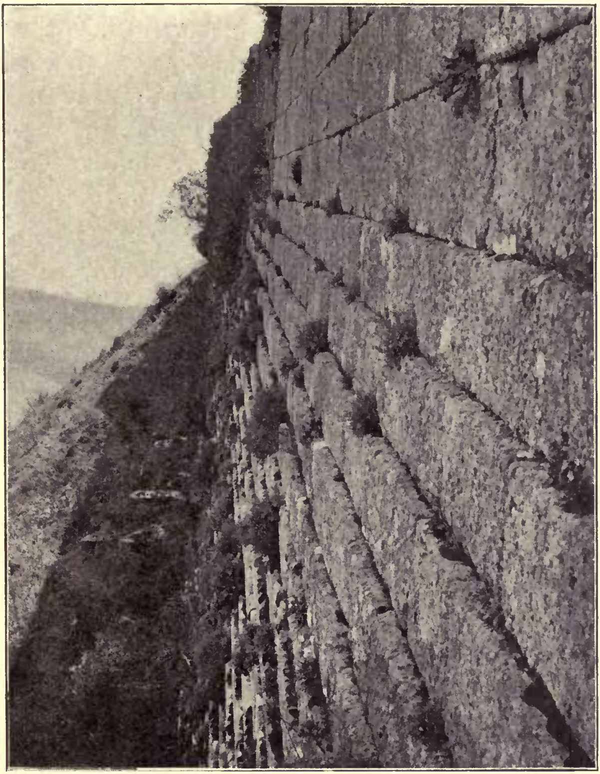


FIG. 37. — Acropolis wall showing set-backs. Pergamon.

Troy, in the earliest walls of Athens and elsewhere. This form of wall was used in Egyptian fortresses and was intended to strengthen the walls at the point where they were likely to suffer most. It also had the effect of making missiles dropped from the top of the

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wall ricochet into the face of an attacking party. But for some reason it did not appeal strongly to the builders of fortifications in Greece and in the historic period it was seldom employed. Walls which in elevation show a series of horizontal set-backs were far from rare. This was not confined to terrace and city walls, like those at Olympia, Pergamon (Fig. 37) and Pompeii, but walls of treasuries and temples, of stoae and other buildings, almost universally exhibited on the exterior a series of set-backs. Thus the orthostatai were not flush with the socle but were set back, and the body of the wall was set back of the orthostatai. A noteworthy outgrowth of this practice may be seen in the apsidal wall of the Byzantine church at Olympia (Fig. 38). This form of wall presents the appearance of great stability and strength.

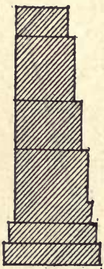


FIG. 38. — Apsidal wall of Byzantine church.

We have already observed in the base of the so-called Tomb of Theron at Akragas an example of a wall surface with curved profile, and we are inclined to ask whether pulvinated walls, or walls with an entasis, do not occur sometimes in the case of peripteral buildings. Given a portico lined on one side with a row of columns all of whose shafts have curved profiles, would not a perfectly vertical or inclined wall produce a sharp contrast which would invite softening by the introduction of a corresponding or a reverse curvature? If such an entasis ever occurred in the walls of a Greek portico, it must have been exceedingly rare; but later, in the Byzantine and Mediaeval periods, walls, towers and spires with an entasis were not uncommon.[1]

[1] Goodyear, *Arch. Rec.*, VII (1897), 63–96.

A final modification in the forms of walls arose when they were given a base, body and capital. Sometimes utility dictated such forms, as when fortification walls of sun-dried brick were set upon continuous bases of stone and capped with variously formed battlements. The walls of Knidos,[1] although composed entirely of stone, have a base of tetragonal, and a body of polygonal, masonry and a rectangular crowning moulding. In fortification walls made entirely of stone, the base, as a visible form, was usually absent, but some kind of a cap or crown was regarded as a formal, if not a practical, necessity.

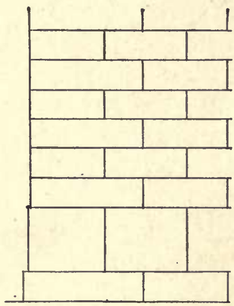


FIG. 39. — Arsenal Wall at Peiraieus.

Walls of temples and other buildings were usually provided with both base and crown. The orthostatai were set off from the vertical face of the wall (Fig. 39), and, even when the entire wall was covered with stucco, formed a more or less visible base. In Ionic buildings, projecting mouldings, analogous to column bases were carved beneath the orthostatai, still further emphasizing the base of the walls (Figs. 40, 41). This wall base, like that of the columns, was usually set upon a socle or plinth (*εὐθυντηρία*). Below this we sometimes find the crown of the stereobate left visible. Thus the toichobate became a complicated combination of simpler members, each one of which in more primitive times served the same practical, or aesthetic, end.

The epikranitis (*ἐπικρανῖτις*), or wall crown, was usually present, especially in Doric buildings. It varied in form

[1] Texier, III, Pl. 160.

from a plain rectangular abacus moulding, as in the Treasury of the Megarians, or a plain beak moulding,

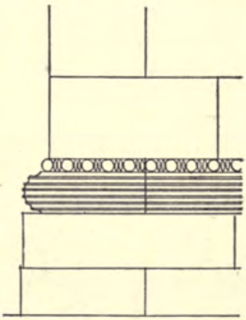


FIG. 40. — Wall of Treasury of Phocaeans, Delphi.

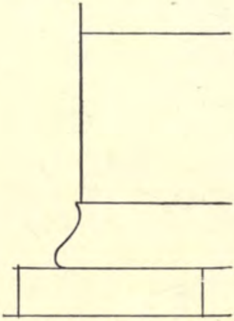


FIG. 41. — Wall of circular building at the Marmoria, Delphi.

as in the Temple of Zeus at Olympia (Fig. 42), to the rich mouldings which crowned the cella walls of Ionic

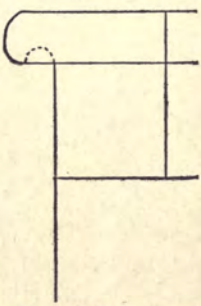


FIG. 42. — Wall crown from Temple of Zeus, Olympia.

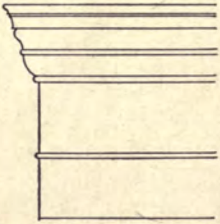


FIG. 43. — Wall crown of Erechtheion, Athens.

buildings in classic as well as Hellenistic times. In the Temple of Athena Nike, the wall crown consisted of a painted platband broken into two fasciae and surmounted by a series of projecting mouldings. The wall crown of the Erechtheion (Fig. 43) was equally emphatic with an elaborately carved neck and cornice moulding.

The use of string courses, or projecting mouldings, to indicate on the exterior of buildings the position of the upper floors, or for no other purpose than pure decoration, is in accordance with the Greek spirit, although ancient examples may be few in number.[1] So striking and universal, however, are these string courses in Central-Syrian architecture[2] and in Greek and Asiatic buildings of the present day as to make it highly probable that they were employed also by the ancient Greeks.

3. Parastades or Antae. — The projecting ends of walls were often used as columns to carry, or to assist in carrying, a superincumbent entablature. Their forms, therefore, were derived in part from wall and in part from column forms. Pilasters and engaged columns derived their forms from the same sources.

These projecting wall ends frequently formed the side walls of a porch, and hence were known as *παραστάδες*.

In the Mycenaean period anta bases appear sometimes to have been flush with the wall (Fig. 44) and, therefore, had no formal value. In such cases the anta base was a mere terminus of the wall base. Sometimes it was given a slight projection (Fig. 45). What form may have been given to the body and capital of antae and pilasters in the Mycenaean period is, at present, a matter of mere conjecture.

[1] *E.g.* Temple at Aizanoi, Lebas, *Arch. As. Min.*, I, Pl. 23; Arsinoeion at Samothrace, Conze-Hauser-Niemann, I, Taf. 54.

[2] H. C. Butler, 194, 238, 244, 260.

A study of the plans of antae of the archaic period will show sometimes, as in the Heraion at Olympia (Fig. 46), a form approximating the Mycenaean type. Sometimes it was a cubical block projecting beyond the wall, as in the Enneastylos (the so-called Basilica) at Paestum (Fig. 47). Again, the form imitates a column, as in the case of

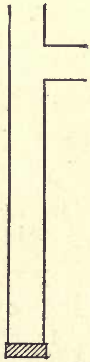


FIG. 44. — Plan of Anta from Troy.

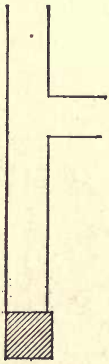


FIG. 45. — Plan of Anta from Tiryns.

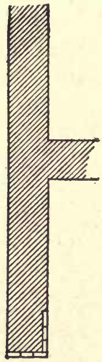


FIG. 46. — Plan of Anta from the Heraion, Olympia.

Temple D at Selinous (Fig. 48). But these forms, while they recognized the function of the anta as a support, did not express its character as a wall terminus. The classic form occurs in the so-called Temple of Poseidon at Paestum (Fig. 49), and more thoroughly developed in the Temple of Zeus at Olympia (Fig. 50). In the latter instance, and in buildings of the classic period generally, the anta is considerably narrower on the side where it unites with the exterior of the cella wall. It also became more closely assimilated to the wall in construction and in decoration.

In the Hellenistic period, we often find a reversion to the earlier type.[1]

Anta bases derived their forms sometimes from the wall

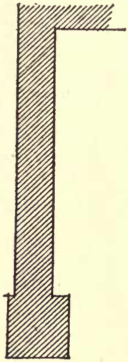


FIG. 47. — Plan of Anta from the Enneastylos, Paestum.

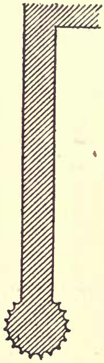


FIG. 48. — Plan of Anta from Temple D, Selinous.

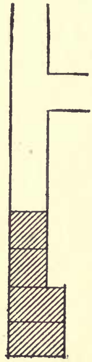


FIG. 49. — Plan of Anta from Temple of Poseidon, Paestum.

bases, sometimes from those of the columns. Thus, the anta bases of the Enneastylos at Paestum have the form of a rectangular plinth, similar to that of the walls; those of the Temple of Zeus at Olympia have socles and orthostatai; those of the Theseion (Fig. 52) have a wave moulding and taenia, while those of the Temple of Athena Nike (Fig. 53) and of the Erechtheion (Fig. 54) have mouldings and orthostatai similar to those

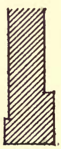


FIG. 50. — Plan of Anta from Temple of Zeus, Olympia.

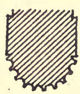


FIG. 51. — Plan of Anta base from the Stadion, Olympia.

1 Koldewey und Puchstein, 210.

of the columns and of the walls. When the end of a wall and a colonnade occur in the same plane, as in the portal

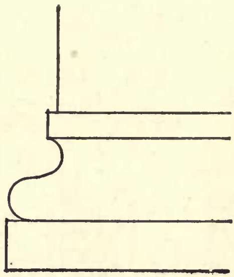


FIG. 52. — Anta base from the Theseion, Athens.

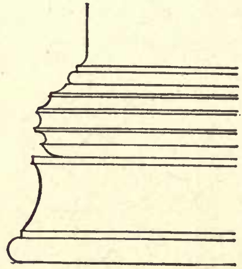


FIG. 53. — Anta base from the Temple of Nike, Athens.

of the Stadion at Olympia (Fig. 51) or in the peribolos of the Temple of Artemis at Kangovar,[1] a composite form

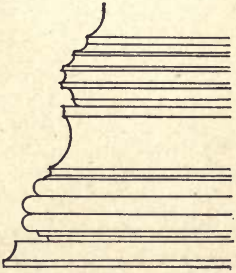


FIG. 54. — Anta base from the Erechtheion.

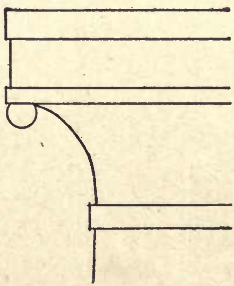


FIG. 55. — Anta capital from the Enneastylos, Paestum.

resulted, a portion of which is of rectangular, and the remainder of circular, section.

The body (σῶμα) of the anta shows also the influence

[1] Texier, *Arménie*, I, Pl. 66.

of both column and wall. Its structure has already received attention. The form shows columnar influence in having diminution and entasis. The body of the anta usually diminishes in width from base to summit so as to form a trapezoid with curved sides or entasis (ἔντασις). In the archaic period, these characters were sometimes very strong, as in the case of the Enneastylos at Paestum,

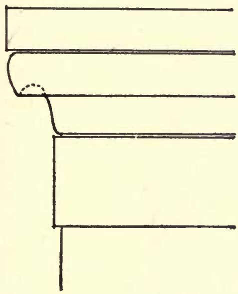


FIG. 56. — Anta capital from Temple G, Selinous.

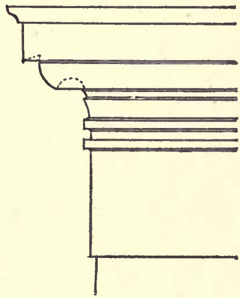


FIG. 57. — Anta capital from the Propylaia, Athens.

but in the classic period they were less strongly marked, and on the narrow side of the anta disappeared altogether.

The capitals of antae had characteristic forms, more or less similar to the crowning mouldings of walls. They may be considered as consisting of a neck (ὑποτραχήλιον), a kymation (κυμάτιον) and an abacus (ἄβαξ). The neck would appear to be the least important member and, although its absence would hardly be felt, it was almost invariably present. Even in the archaic period the anta was crowned with a capital suggestive of a wall cornice. One of the earliest forms may be seen in the Enneastylos at Paestum (Fig. 55), which recalls the well-known form of the Egyptian cornice. Similar forms are found at Tegea[1] and upon Athenian stelae.[2] From this early type was evolved the characteristic Doric anta capital with its broad neck, its beak moulding and its abacus. Temple G at Selinous (Fig. 56) affords a typical example. Doric buildings of the fifth century, especially those under Attic influence, show semi-Ionic forms, examples of which may be seen in the Parthenon, the Athenian Propylaia (Fig. 57) and the Temple of Poseidon at Sounion (Fig. 58).

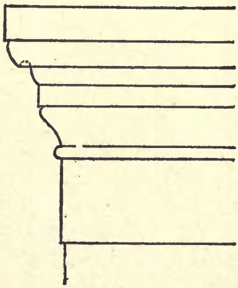


FIG. 58.— Anta capital from Temple of Poseidon, Sounion.

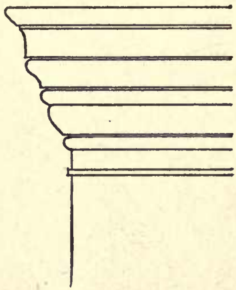


FIG. 59. — Anta capital from the Temple of Nike, Athens.

The Ionic anta capital differed from the Doric in the richness of its superposed mouldings. Here the roundel, the cyma reversa and the ovolo play the principal rôles. The anta capitals of Asia Minor sometimes show different forms for front and sides. Thus, at Priene,[3] the face of the anta shows a superposed series of roundel, cyma reversa, platband and ovolo, whereas the side exhibits only a small roundel and a high but shallow

[1] *Ath. Mitt.*, VIII (1883), Taf. 14. [2] *Jhb.*, III (1888), 272–273.

[3] *Priene*, Figs. 64, 65.

cavetto. The Temple of Athena Nike (Fig. 59) illustrates the theory of the mouldings of anta capitals. The affinity

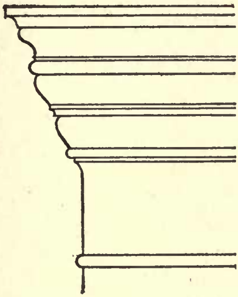


Fig. 60. — Anta capital from the Erechtheion.

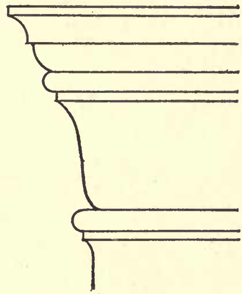


Fig. 61. — Anta capital from the Theatre at Epidauros.

of the anta with the walls is shown by the similarity of their mouldings, while their addition of an ovolo moulding links the anta also with the column. In the Erechtheion (Fig. 60), the unity of columns, antae and walls is carried a step farther and the ovolo moulding appears also in the crowning mouldings of the walls. In the portals of the theatre at Epidauros (Fig. 61), the necking is treated as the dominant factor of the capital. It was given the form of a cyma recta, above which the ovolo moulding appears as a part of the abacus.

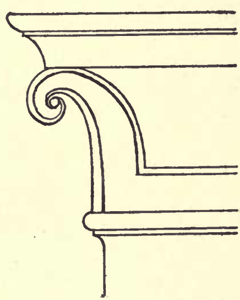


Fig. 62. — Anta capital from the Temple of Apollo, Miletos.

In these examples, the independence of the anta capital was preserved. They show no influence of the characteristic spirals of the column capital. This step appears to have been taken for the first time in, or shortly before, the Hellenistic period, in the pilaster capitals of the Temple of Apollo near Miletos (Fig. 62). In the Temple of Zeus at Aizanoi, the anta capitals are still more closely related to capitals of columns, as they exhibit the ovolo as well as lateral volutes.

4. Doors and Windows. — The forms of doorways[1] (*θυρώματα*) were determined by material as well as by aesthetic demands. Crude and irregular openings occur in early and in unimportant walls. But regularity in wall construction necessitated regularity in the openings. In plan, these openings generally have their sides parallel and at right angles to the adjoining walls, but occasionally the openings are set at an angle, as at Oiniadai in Akarnania.[2] The tower windows of the defences of Herakleia near Miletos[3] show considerable variety in plan. Some are set at right angles to the wall, others pierce the wall at an angle. Some are splayed simply, others doubly splayed.

In elevation, the form varies in accordance with the pose of the jambs and the method of crowning the opening. From very early days, door jambs (*σταθμοί*) were posed, sometimes vertically, sometimes at an inclination toward each other. Thus the jambs of the small northern doorway at Mycenae (Fig. 63) seem to have been set vertically.[4] This was doubtless a very general method for ordinary doors and windows. But inclined jambs also occur, especially in monumental constructions, throughout

[1] Daremberg et Saglio, *s.v.* Janua.

[2] Heuzey, *Mont Olympe*, 450, Pl. 16.

[3] De Rochas, 75.

[4] The slight inclination of 0.05 m. noted by Blouet, II, Pl. 65, may be disregarded.

all periods. Occasionally the jambs were continued until they met and enclosed an opening of triangular form. An opening of this character is found in the north wall at Mycenae.[1] A later example of such a triangular doorway is found at Elaios in Aetolia (Fig. 64). But ordinarily, the inclined jambs were truncated by a lintel (ὑπέρθυρα), leaving the opening of trapezoidal form. This relieved the lintel without narrowing the lower or more useful

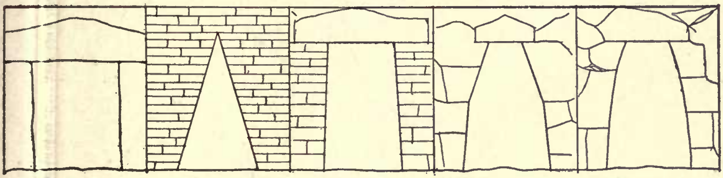


FIG. 63. FIG. 64. FIG. 65. FIG. 66. FIG. 67.

Fig. 63. — Gateway at Mycenae. Fig. 64. — Gateway of Elaios. Fig. 65. — Doorway of tomb at Orchomenos. Fig. 66. — Gateway at Oiniadai. Fig. 67. — Gateway at Oiniadai.

portion of the opening. Doorways of trapezoidal form are a marked feature of Mycenaean architecture, as may be seen in the Lion Gate at Mycenae and in the tomb at Orchomenos (Fig. 65); they are found in temples and tombs of the archaic and classic period, and are recognized by Vitruvius[2] as a characteristic feature of Ionic as well as of Doric architecture. The Hellenistic Greeks appear to have seen in this form a device for giving greater apparent height to doorways. When doorways were more than thirty feet in height, Vitruvius directed that the opening be not trapezoidal but rectangular. Occasionally the inclined jambs were not

[1] Schliemann, *Myken.*, Fig. 20. [2] Vitruvius, IV, 6.

continuous but broken, as in one of the gateways at Oiniadai (Fig. 66). A very unusual form occurs in two of the gateways at Oiniadai (Fig. 67), where the jambs are inclined toward each other, not in straight lines, but in gentle curves.

Many in number are the forms resulting from variations in the method of crowning the opening. The usual

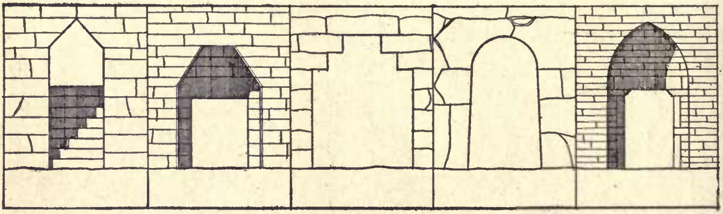


FIG. 68. FIG. 69. FIG. 70. FIG. 71. FIG. 72.

Fig. 68. — Gateway at Messene. Fig. 69. — Gateway at Assos. Fig. 70. — Gateway at Phigaleia. Fig. 71. — Gateway at Oiniadai. Fig. 72. — Gateway at Assos.

method consisted in the adoption of a lintel which closed the opening with a rectilinear and horizontal line. But the crown of the opening might be triangular, as at Messene (Fig. 68) or trapezoidal, as at Assos (Fig. 69), or a jogged rectangle, as at Phigaleia (Fig. 70), or a round arch, as at Oiniadai (Fig. 71), or a pointed arch, as at Assos (Fig. 72).

The forms of windows[1] (θυρίδες) may be said to repeat in general the forms of doorways. In fortresses they were often narrow loopholes, as in the towers at Samothrace and at Andros. In private houses, as may be

[1] Daremberg et Saglio, *s.v.* Fenestra.

judged from vase-paintings, they were nearly square, or long, rectangles divided by a central support. In temples the trapezoidal form was sometimes used, as in the west windows of the Erechtheion.[1] A very unusual, but ancient,[2] form may be seen in the openings to the roof of the Temple of Concordia at Akragas (Fig. 73).

5. PILLARS, COLUMNS AND PIERS. — We are accustomed to think of Greek architects as concerned with a single type of support, the column; but not infrequently they employed also tetragonal piers, composite pillars and supports of anthropomorphic form. Each type presented special problems, which we may indicate while considering in detail the forms of their bases, shafts and capitals.

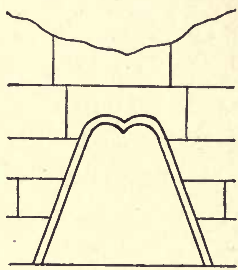


FIG. 73. — Window from Temple of Concordia, Akragas.

The bases of piers do not differ essentially from those of columns. Thus the tetragonal shafts of the Choragic Monument of Thrasyllos[3] are like the columns of the Doric type in having no independent bases. The same is true of the octagonal piers in the Abaton at Epidauros.[4] On the other hand, in the Temple of Athena Nike at Athens[5] and in the theatre at Epidauros,[6] the piers which divide the doorways have base mouldings

[1] The west windows are of Roman origin, but the windows of the east wall were also trapezoidal. Stevens, *A.J.A.*, X (1906), 47–71.

[2] Russell Sturgis (I, 157) is probably wrong in assigning these windows to the Middle Ages.

[3] Stuart and Revett, II, Ch. 4, Pl. 3.

[4] Cavvadias, Pl. 7, Fig. 4; Lechat, 135.

[5] Gardner, 373.

[6] Cavvadias, Pl. 3; Lechat, 205.

corresponding to those of the adjacent Ionic columns or engaged columns, and differ from them only in plan.

The general forms of column bases (*βάσεις*) are reducible to those of tetragonal, polygonal and circular plan. The tetragonal plinth (*πλίνθος τετράγωνος*), though in harmony with the forms of the pier, was less appropriate as a base for columns. That it may have been used for this purpose, however, especially for porches in antis, is suggested by the temple and fountain figured on the François vase.[1] In such cases similarity of form in the bases of shafts and antae contributed somewhat to the general harmony. In the case of prostyle and peripteral porches, however, the tetragonal base was not only aesthetically less justifiable, but it blocked the passageways with its sharp angles, and its edges were easily fractured. The filling up of the intercolumnar spaces with similar plinths obviated this inconvenience. The tetragonal plinth, therefore, as a column base, did not survive except as a factor in some composite bases.

Another method of adapting the rectangular plinth to closely spaced colonnades was to chamfer its angles, thus transforming the tetragonal into an octagonal plinth. This method may have been employed in some early buildings of Asia Minor. A later development of this type may be seen in the dodecagonal plinths occurring in two of the bases from the Temple of Apollo near Miletos.[2]

Bases of circular plan (*σπεῖραι, τροχίλοι*) constitute the normal form for columns. Their forms may be simple or composite. In Mycenaean buildings, we find low cylindrical bases of simple form. A similar base occurs in

[1] *Mon. ined.*, IV, Taf. 54–55; Furtwängler und Reichhold, Taf. 11–12.
[2] Haussoullier, 70.

the Greek Temple at Pompeii (Fig. 74), and in connection with an independent Doric shaft found at Assos.[1] Here the base is the frustum of a cone of the form common in Egypt. In the Apollonion at Naukratis the cone in the upper half of a composite base receives unusual prominence (Fig. 75).

The cylinder probably also occurred as a simple form in early Greek architecture. Such a base was published by

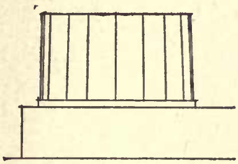


Fig. 74. — Low Doric base from Greek Temple at Pompeii.

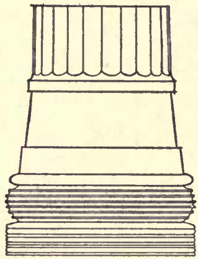


Fig. 75. — Base from Naukratis.

Labrouste[2] for the shaft of a column in the porch of the so-called Temple of Demeter at Paestum. It occurs, also, decorated with palmettes and lotuses in the upper half of two bases from the Temple of Apollo near Miletos.[3]

A torus, or convex moulding of semicircular or other curvilinear profile, constituted a third type. Egyptians and Asiatics found sharp edges and rectilinear profiles impractical and inharmonious, and substituted for them bases with rounded edges and curved profiles. Tradition and reason combined to commend this form to the Greeks.

[1] Clarke, in *A.J.A.*, II (1886), 267.
[2] Labrouste, Pl. 12.
[3] Haussoullier, 68.

Convex bases of simple, and also of composite, form are represented on Mycenaean gems.[1] A simple torus forms the base of an archaic column found at Kolumdado (Fig. 76).

The forms of convex base mouldings are by no means

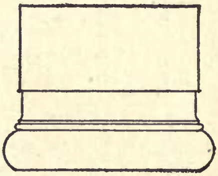


Fig. 76. — Base from Kolumdado, Lesbos.

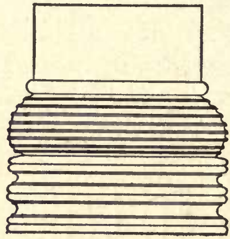


Fig. 77. — Base from archaic Temple of Artemis, Ephesos.

invariably the same. Sometimes, as in the archaic Temple of Artemis at Ephesos (Fig. 77), and in the Temple of Apollo at Phigaleia, curvature of the moulding is strongest near the base, and is like an inverted echinus; again, as in the Smintheion and in the Temple at Teos (Fig. 78), the curve resembles a regular echinus and is strongest near the top; more frequently, as in the Erechtheion, the curve was semicircular in profile, and in this form passed into Roman and later architecture. The cyma, or wave moulding, was used occasionally in columnar as well as in mural base mouldings. It occurs in one of the mouldings of the base of the Corinthian column at Phiga-

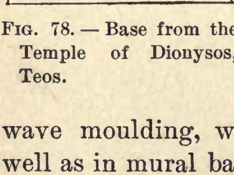


Fig. 78. — Base from the Temple of Dionysos, Teos.

[1] Evans, in *J.H.S.*, XXI (1901), Figs. 24, 33, 36, 40.

leia,[1] and in an independent support found in the Temple of Dionysos Bresaios in the island of Lesbos (Fig. 79). It may have figured more prominently in the archaic period in Ionian Greece, and from this source have been carried eastward to Persepolis.

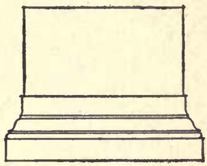


FIG. 79. — Base from the Temple of Dionysos Bresaios, Lesbos.

Composite circular bases were, as we have already observed, represented on Mycenaean gems, and became later much more common than the simple forms. They fall into two classes, the Asiatic-Ionic and the Attic-Ionic. The Asiatic-Ionic type consists of a torus set upon a truncated cone or cylinder called the trochilos (*τροχίλος*). The decoration and the complication of these forms by the addition of subsidiary mouldings need not concern us here. The trochilos was seldom left with a plane surface as in the Temple at Lokroi,[2] but was formed with a concave profile so as to contrast with the convex torus. Here, consequently, was produced a strip of shadow which threw into stronger relief the rounded torus. On account of this form and function, the trochilos was known also as the scotia (*σκοτία*). Many experiments were doubtless necessary before the form of this curve became fixed. In the Temple of Hera at Samos,[3] the scotia was profiled to a shallow arc of a circle. Stronger shadows were produced by doubling and deepening the scotia. A double scotia was carved in the bases of the archaic Temple of Artemis at Ephesos,[4] and continued to be popular in Asia Minor

[1] Cockerell, Pl. 15. [2] Petersen, in *Röm. Mitt.*, V (1890), 187–188.
[3] *Ion. Antiq.*, I, Ch. V, Pls. 3–5.
[4] Murray, in *J.H.S.*, X (1889), 8; Hogarth, Pls. 3–4.

in the fourth century. The deepening of the scotia also received attention. A typical example is found in the bases of the Temple of Athena at Priene (Fig. 80), where

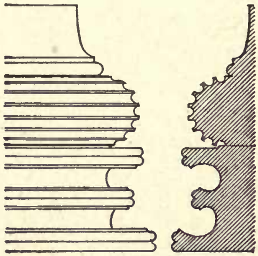


FIG. 80. — Base from the pronaos of the Temple of Athena, Priene.

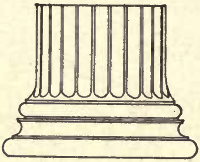


FIG. 81. — Base from the Erechtheion, Athens.

the curves are shallower toward the top and base of the trochilos and sharper near the middle.

The Attic-Ionic base of the classic period consisted of an upper and lower torus separated by a scotia. Attic architects of the fifth century were seeking for a normal type of base. In the Temple of Athena Nike, the scotia was disproportionately high and shallow. In the bases of the inner order of the Propylaia, it was profiled to an ellipse (Fig. 81). The canonical type appeared first in the Erechtheion, where the scotia showed the curve of a two-centred arc.[1] Mnesikles, in the Propylaia at Athens (Fig. 82), and Iktinos, in the Temple of Apollo

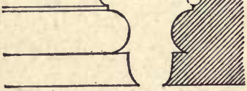


FIG. 82. — Base from inner order of the Propylaia, Athens.

[1] Iwanoff, I, Taf. 14.

at Phigaleia, seem to have felt that an additional plinth was required at the base. This they added, somewhat timidly. A base of considerable beauty is that of the Monument of Lysicrates, where the curves of the torus mouldings are especially noteworthy (Fig. 83). In the Hellenistic period, the forms of bases have less interesting profiles, and are likely to vary from the classic types. Thus, in the Temple of Dionysos at Pergamon, the base consisted of an inverted cyma and torus upon a plinth (Fig. 84); in the Leonidaion at Olympia, the lower torus was omitted and the plinth became a pedestal with base and crown mouldings (Fig. 85). The Romans made frequent use of the Attic-Ionic base and placed beneath it a plinth or pedestal.

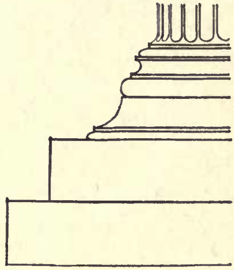


Fig. 83. — Base from Choragic Monument of Lysicrates, Athens.

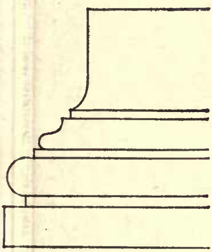


Fig. 84. — Base from the Temple of Dionysos, Pergamon.

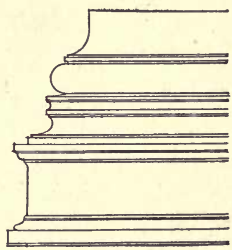


Fig. 85. — Base from the Leonidaion, Olympia.

The shaft or body (*σῶμα, καυλίον*) of a support is the portion comprehended between its base and capital. Its form may be, as we have already indicated, tetragonal or polygonal, cylindrical, composite or anthropomorphic. Tetragonal, free-standing supports, of immemorial antiquity in Egypt, occur also in Greece. In monuments of the classic period, as in the Temple of Athena Nike, or in the Choragic Monument of Thrasyllos at Athens, or in the Propylaia at Priene, they show refinements of form derived from the column. Octagonal shafts appear to have been employed at Bolymnos, at Troizen, at Epidauros and at Delos, and show at least one columnar character, that of diminution. Cylindrical, or more accurately, slender, truncated conical shafts constitute by far the largest class, as would naturally be the case in any country where the earliest shafts were made of wood. Various applications of the column, however, called for a modification of the cylindrical form, as, for example, in colonnades, where the intercolumniations were partially filled in with balustrades, or in the proskenia of theatres, where the intercolumniations were filled with pinakes. In such cases, the shafts were either oblong in plan with rounded ends, as in the Stoa at Pergamon,[1] or of a composite type, as in the theatre at Oropos.[2]

Anthropomorphic shafts (*κανηφόροι, καρυάτιδες, κόραι, ἄτλαντες, τελαμῶνες*), of which we have an archaic type in the Treasury of the Knidians at Delphi,[3] and a classic example in the Porch of the Maidens of the Erechtheion, do not call for special remark. In these cases, the entire figure, including the head, was treated as the shaft. Above the head is the crown or capital. Atlantes or Telamones, sculptured in relief, occur in the Olympieion at Akragas.[4]

Three formal modifications of cylindrical shafts call for special mention: their diminution, entasis and apophyge.

[1] *Pergamon*, II, 62.

[2] Doerpfeld und Reisch, 104.

[3] See Fig. 221. The Treasury of the Siphnians at Delphi had similar shafts. Perrot et Chipiez, VIII, 390, Pl. 8.

[4] Koldewey und Puchstein, Figs. 141, 143.

By the diminution of a shaft is understood its decrease in diameter from one end to the other. It has been almost the universal practice for architects from time immemorial to the present day to provide columns with diameters greater at the base than at the summit. This tapering from base to summit is analogous to the natural tapering of wooden shafts. It also breaks the mechanical effect produced by a perfect cylinder and increases the apparent stability of a column. In the Mycenaean period, columns were made of wood, and have long since disappeared. At Tiryns, however, the small diameter of the column bases as compared with the wide architraves, and at Mycenae the contemporary relief representations of columns in the Lions' Gate and on the façades of the two principal tholoi, have led archaeologists to believe that Mycenaean shafts diminished from summit to base (Fig. 86). Pictorial and sculptural evidence from Crete[1] and Attica[2] sometimes indicate the same peculiarity. In free-standing columns, however, such a diminution is found neither as a precedent in Egyptian, nor as a survival in Greek, architecture, and has not been conclusively established even as a general characteristic of Mycenaean architecture.[3] In the archaic period, Doric shafts show a strong diminution from base to summit (Fig. 87). The columns thus acquired apparent

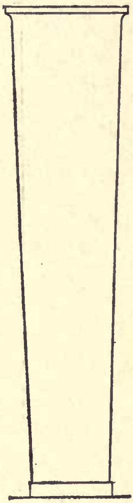


Fig. 86. — Shaft in relief from Lions' Gate, Mycenae.

[1] Evans, in *J.H.S.*, XXI (1901), 193.
[2] Perrot et Chipiez, VI, Figs. 202, 208.
[3] Durm, *Jhb. Oest. Arch. Inst.*, X (1907), 41–84.

stability in the same manner as did the walls. In the classic and Hellenistic periods, other ideals prevailed and both Doric and Ionic shafts were less conical and more cylindrical in form (Fig. 88). According to Vitruvius,[1]

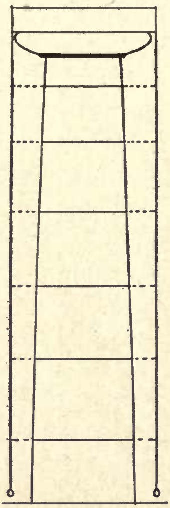


Fig. 87. — Shaft from Tavola dei Paladini, Metapontum.

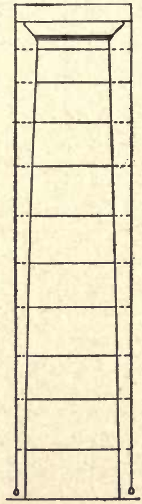


Fig. 88. — Shaft from the Propylaia, Athens.

the diminution of shafts varied inversely with their height, high shafts requiring less diminution than low ones.

The second modification of the Greek shaft was its entasis (*ἔντασις*). By this is meant that the vertical outlines of the shaft were pulled in at the extremities, so as to form curved profiles. In a very few instances, as in the Temple of Apollo at Phigaleia,[2] and in the Temple of Athena Nike at Athens, the shafts appear to be devoid of entasis,[3] but in general, Greek shafts had curved profiles.

[1] Vitruvius, III, 3, 12. [2] Cockerell, 49. [3] Penrose, 107.

Sometimes, as in the Enneastylos and the so-called Temple of Demeter at Paestum, the curve was very pronounced; again, as in the Temple of Apollo near Miletos,[1] it was confined to the upper two-thirds of the shaft. It was extremely delicate in some archaic examples like the Temple of Apollo at Corinth, as well as in classic buildings like the Parthenon and Erechtheion. Tall shafts required a greater amount of entasis than short ones, and smooth shafts more than those of rough surface. The nature of the curve has been shown by Penrose[2] to be the hyperbola, applied, however, in various ways. In the Parthenon, the vertex of the curve falls below the stylobate; hence the profile of the shaft exhibits a curve corresponding to one arm of a hyperbola. In the Propylaia, in the Erechtheion and in classic and post-classic buildings in general, the vertex of the curve occurs above the base of the column; hence a similar curvature is found above and below the vertex. This symmetrical character in the curve of the entasis was emphasized by Roman and Renaissance architects, and thereby much of the charm of the curved profile was lost. In order to secure this delicate curve in the profile of the shaft, a full-sized mould or templet was probably necessary.

What led the Greeks to this refinement is not obvious. Possibly it was to correct an optical effect. Heliodorus Damianus of Larissa[3] declared that a cylindrical column would appear to be concave and therefore must be made convex. Possibly the convex form passed over into stone architecture from a primitive reed-bundle column,[4] which would exhibit a similarly curved outline produced by superincumbent pressure. As a geometrical form, with-

[1] Haussoullier, 75.

[2] Penrose, 40.

[3] *De Opticis*, XIV.

[4] *A.J.A.*, VI (1890), 52.

out any indication of its origin, it occurs in the earliest period, as, for example, in the shaft of the stone candelabrum found in the Megaron at Phaestos,[1] also in representations of shafts on a Mycenaean cylinder.[2] In the archaic period, if not earlier, it entered into Greek architecture as a characteristic feature of the shaft.

The third modification of the shaft was its apophyge or apothesis (*ἀποφυγή*, *ἀπόφυσις*, *ἀπόθεσις*), and astragal (*ἀστράγαλος*). The apophyge, a short but sharply curved expansion of the shaft at its extremities, served to break the contrast between the vertical line of the shaft and the horizontal line of its base or capital (Fig. 89). The astragal, consisting of a fillet or roundel, emphasized the extremities of the shaft and aided the apophyge in its transitional function. These characters seem to have originated with the Ionian Greeks and were applied by them not only to shafts of columns, but also to walls, friezes and even to the abaci of capitals. They are found, perhaps as Achaean survivals, at the extremity of the shafts of the Enneastylos and the so-called Temple of Demeter at Paestum. In Doric columns of the best period they were usually absent, but reappear in some columns of the Hellenistic period. In some cases, as in the three-quarter columns in the Temple of Apollo at Phigaleia, the apophyge was very exaggerated (Fig. 90). Ordinarily it was so delicate as not to attract attention. The curve was ordinarily a hyperbola.

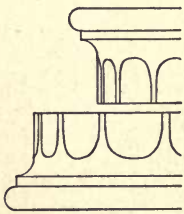


Fig. 89. — Apophyge on shaft from the Temple of Nike, Athens.

[1] *Mon. Ant.*, XIII (1903), 14.
[2] *J.H.S.*, XXI (1901), 141.

The capital (*ἐπίκρανον, κεφαλίς, κιόκρανον, κεφάλαιον*), or crowning member of the pier or column, consisted of three parts; a neck, a principal moulding and a plinth or abacus.

The neck (*τράχηλος* or *τραχήλιον* was probably the earlier, *ὑποτραχήλιον* the later designation) was nearest

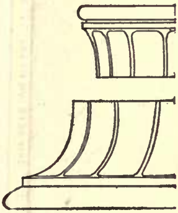


FIG. 90. — Apophyge on shafts from the Temple of Apollo, Phigaleia.

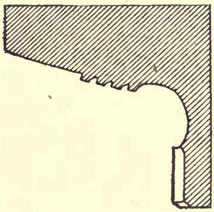


FIG. 91. — Concave necking on capital, from Temple D, Selinous.

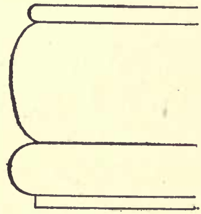


FIG. 92. — Convex necking on capital, from Neandreia.

the shaft, and in some cases, as at Naukratis[1] and Lokroi,[2] treated as belonging to the shaft rather than to the capital. In most cases it formed a part of the capital block. It occurs at Mycenae as a concave moulding sharply distinguished from the principal member of the capital and also from the cylindrical shaft. A concave necking reappears in many archaic capitals at Paestum and Selinous (Fig. 91). Convex neckings, common in the repeated roundels in capitals from Assyria, Asia Minor and Etruria, appear also in capitals represented on Mycenaean ivories,[3] and in the archaic capital from Neandreia (Fig. 92). The kymation or echinus of the Ionic capital and the annuli

[1] Petrie, *Naukratis*, I, Pl. 3.
[2] Petersen, in *Röm. Mitt.*, V (1890), 192–193.
[3] Perrot et Chipiez, VI, Figs. 202, 204.

of the Doric echinus are such neckings absorbed into the body of the capital. A platband, neither concave nor convex, occurs in the capitals of the Erechtheion (Fig. 93). The neck of the capital disappeared during the classic period, probably because it weakened the appearance of strength required for the support of the entablature. In the Hellenistic period it reappeared and became in the Vitruvian orders an important part of the capital.

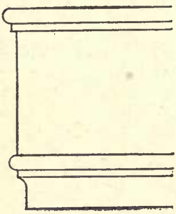


FIG. 93. — Platband necking on capital from the Erechtheion.

The principal moulding of the capital received a variety of forms, the plans of which were rectangular, circular, composite or miscellaneous.

Rectangular blocks served as capitals for polygonal shafts in the porches of Egyptian tombs at Benihassan. Two or three such blocks superposed would seem to have supplied the general masses of the Greek capital.[1] Square, or polygonal, shafts were given square, or polygonal, capitals.[2] Rectangular blocks were also used to crown columns, so as to make the transition to the rectangular entablature less abrupt.

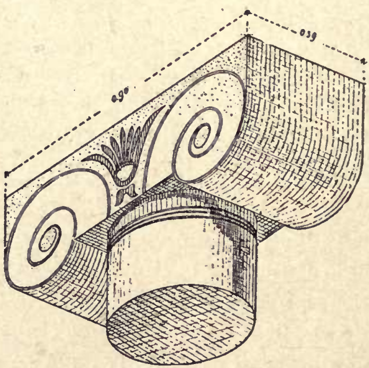


FIG. 94. — Archaic capital from Delos.

The essential rectangularity of the Ionic capital is most

[1] Hittorff et Zanth, 334–342, Pl. 82.

[2] Borrmann, *Jhb.*, III, 269, Figs. 2, 5, 8.

evident in an archaic example from Delos (Fig. 94), in which a single rectangular block has been but slightly modified in form. In an archaic capital from Athens[1] the principal moulding, or body of the capital, retains in great measure the rectangular form on the front and back, but on the sides assumes a cylindrical form with slightly raised edges (Fig. 95). The face of the normal Ionic capital was somewhat complicated, as it was fashioned from a rectangular block applied, not directly to the cylindrical shaft, but to a shaft capped by a large ring moulding. This ring moulding, which in Oriental examples decorated the shaft, in Ionic architecture was absorbed into the capital, and is known as the echinus of the capital. In some archaic examples it was undercut like a beak moulding (Fig. 96), but in the fully developed capital it had an elliptical or quarter round profile, and was carved with the egg and dart ornament. Its position, which in archaic times was near the shaft, was gradually raised, until, in the Hellenistic period,

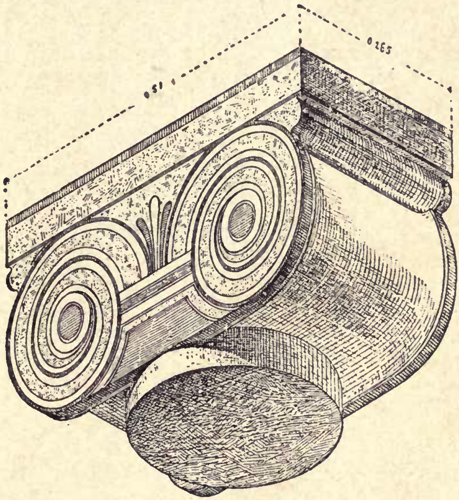


FIG. 95. — Archaic capital from Athens.

[1] Perrot et Chipiez, VII, Pl. 53, 4.

it was set above the level of the centre of the spirals. Thus the Ionic capital seems to be a fusion of two elements, an annular moulding or echinus, and a quadrangular block.[1]

At Phigaleia, Epidauros, and at Palatitza,[2] capitals of engaged columns show the spiral motive applied to the three sides of the capital, and at Pompeii[3] free standing columns exhibit the spiral motive on four sides of the capital. In all cases we perceive a more or less strongly marked trace of an original rectangular block.[4] This rectangularity of the Ionic capital made its application difficult in the case of buildings with peristyles, especially if of circular plan. The unusual form of capital found at Neandreia[5] in the Troad, and at Kolumdado[6] in Lesbos, are exceptional examples, in which rectangularity is to be recognized in the plan rather than in the face of the capital.

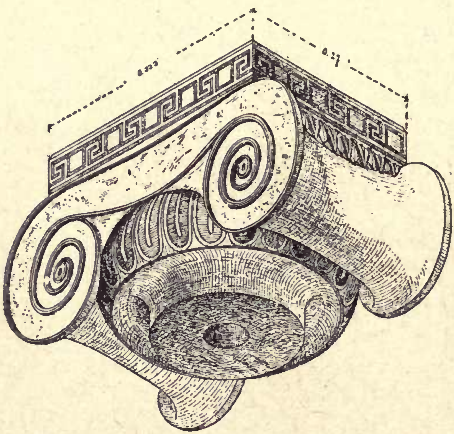


FIG. 96. — Archaic capital from Athens.

The form of the pulvinus on the side of the Ionic

[1] *A.J.A.*, IV (1888), 43. [2] Heuzey, Pl. 10. [3] Mau, Fig. 239.

[4] In the capitals from the south entrance of the Palaistra at Olympia (Fig. 228) the spirals spring from the centre of the capital block and are developed diagonally. This form may be described as transitional between a capital of rectangular and one of circular type.

[5] Clarke, in *A.J.A.*, II (1886), 3. [6] Koldewey, Taf. 16.

capital also taxed the ingenuity of the architects. In Lycia, in Etruria and in the column of the Naxians at Delphi, as well as in the examples cited from Delos and Athens, the form of the pulvinus preserved a cylindrical

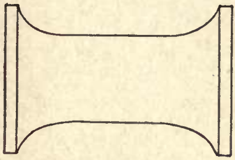


FIG. 97. — Pulvinus of archaic capital from Athens.

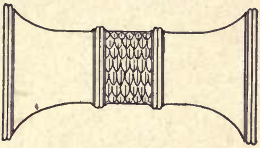


FIG. 98. — Pulvinus of capital from the Temple of Athena, Priene.

aspect. But at Athens archaic examples are found in which the pulvinus was given a concave profile, in form resembling a spool (Fig. 97). This form was further modified by the *balteus* (δεσμός or ξώνη), a band, or girdle,

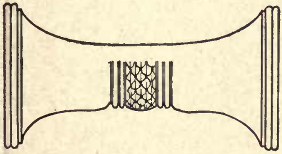


FIG. 99. — Pulvinus of capital from the Temple of Apollo, Miletos.

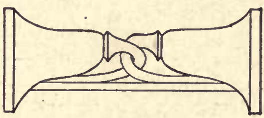


FIG. 100. — Pulvinus of capital from the Palaistra, Olympia.

which seemed to compress the centre of the pulvinus, as at Priene (Fig. 98), and sometimes had on either side curves of double curvature, as at Miletos (Fig. 99). Occasionally, as in the Palaistra at Olympia[1] (Fig. 100), the side of the capital lost its bolster shape and resembled

[1] *Olympia*, II, Taf. 74.

flowers interlocked by their stems. At this stage of development the form was certainly far removed from that of a rectangular block.

A second solution for the principal moulding of the capital was to construct it on a circular plan. Instead of a rectangular block, a cylindrical drum was selected as a

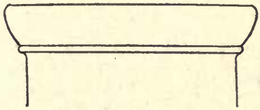


Fig. 101. — Echinus capital from the Heraion, Samos.

Fig. 102. — Conical capital from the Heraion, Olympia.

starting-point, and many types of capitals arose from a modification of its form. By rounding off its sharp edges the slightly rounded profile of the torus capital of the Tomb of Atreus at Mycenae was produced. An echinus appears to have served as the principal moulding of the capitals at the Heraion at Samos (Fig. 101), and became an essential part of the normal Ionic capital. The

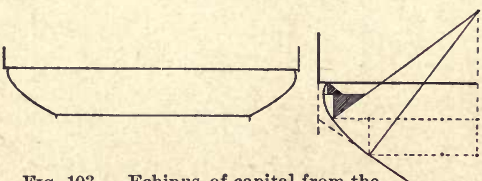


Fig. 103. — Echinus of capital from the Temple of Poseidon, Paestum.

frustum of a cone furnished also an appropriate capital. Hellenistic capitals were frequently of this form (Fig. 102). In the normal Doric capital the cone was given a convex profile. The echinus of the capitals of the so-called Temple of Poseidon at Paestum appears to have been constructed of three arcs of circles (Fig. 103); that of the Theseion, of five arcs of circles and a straight line.[1] The parabola furnished the form for the earlier capitals at Corinth[2] and at Metapontum, and the hyperbola was employed at Aegina and elsewhere. Penrose[3] finds in

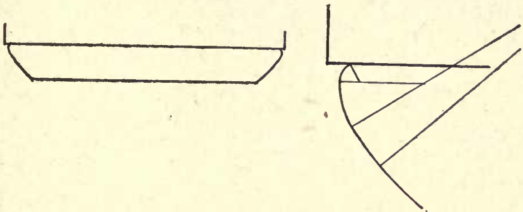


FIG. 104. — Echinus of capital from Parthenon.

the profiles of the echinus of the Parthenon capitals a succession of curves of three different kinds (Fig. 104), but such superfine products of curvature were by no means universal and led to the abandonment of curved for straight profiles. The concave profile, like that of the calyx capitals of Egypt, was introduced also into Greek architecture in the classic period, in the Corinthian capital at Phigaleia[4] and in the Tholos at Epidauros.[5] At a later period this general form was employed in the Olympieion, the Theatre of Dionysos, and the Tower of

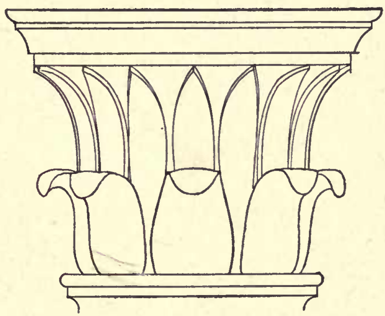


FIG. 105. — Bell-shaped capital from Tower of the Winds, Athens.

[1] Reinhardt, 8–9. [2] Cockerell, 91. [3] Penrose, 48.
[4] See Fig. 257. [5] See Fig. 258.

the Winds at Athens, in the Gymnasium Gate at Olympia, and in the Stoa of Eumenes at Pergamon.[1] The profile of such capitals was usually slightly convex at the base, thus suggesting the cyma recta (Fig. 105). A marked

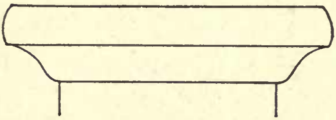


Fig. 106. — Cyma recta moulding on votive column, Athens.

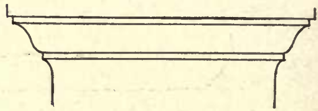


Fig. 107. — Cyma recta moulding on capital from the Temple of Dionysos, Pergamon.

cyma recta appears as the principal moulding in the capital of an archaic votive column from the Acropolis at Athens (Fig. 106). It occurs not infrequently at a late period, as, for example, in the Temple of Dionysos (Fig. 107) and in the Greek gymnasium at Pergamon, at Magnesia on the Maeander, and in the Leonidaion, Olympia.

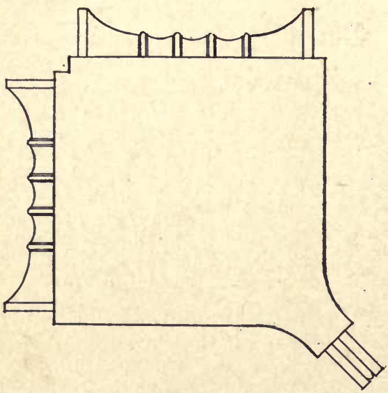


Fig. 108. — Plan of abacus of corner column, Erechtheion.

The uppermost member of the capital, the abacus (*ἄβαξ, πλίνθος*), might, in the case of isolated columns, be in plan round or square or polygonal, according to the nature of the capital, of which it was the crown; but when used for columns

[1] *Pergamon*, II, Taf. 24.

which supported entablatures, it received a rectangular plan. This form was modified in the case of a corner Ionic capital. In order to cover the diagonally posed corner volute, it took at the angles a slightly scalloped form (Fig. 108). When all four volutes were diagonally posed, as was the case with some Ionic and all Corinthian capitals, the scalloped abacus became the normal form (Fig. 109). In profile, the abacus received various forms. A rectilinear outline prevailed in the Doric abacus (Fig. 110), but curvilinear profiles were preferred for the Ionic. An elliptical or hyperbolic outline, like the Doric echinus, is found in the Erechtheion (Fig. 111), the Propylaia and

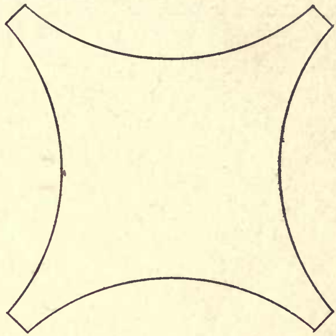


FIG. 109. — Plan of abacus of Monument of Lysicrates, Athens.

FIG. 110. — Abacus of the Parthenon.

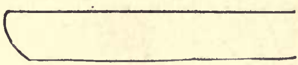


FIG. 111. — Abacus of the Erechtheion.

in other Ionic capitals of the classic period; a cyma reversa was preferred in Asia Minor at the Mausoleion at Halikarnassos (Fig. 112), in the Temple of Athena at Priene and elsewhere. The cavetto occurs frequently, as in the

FIG. 112. — Abacus of the Mausoleion at Halikarnassos.

FIG. 113. — Abacus of Monument of Lysicrates, Athens.

abaci of the Monument of Lysicrates (Fig. 113) and the Olympieion at Athens (Fig. 114), and in the Leonidaion at Olympia (Fig. 115). In some pilaster capitals from Cyprus the abacus derives its form from Ionic or Persian epistyles and is divided into a series of horizontal steps or fasciae.

FIG. 114. — Abacus of the Olympieion, Athens.

We have thus far considered the varieties of capitals of simple form. These offered abundant choice for all ordinary purposes. Complex forms of capitals, however, were sometimes preferred. Thus, in the Temple of Apollo at Neandreia[1] is found a capital which resembles the superposed capitals from Egypt and Persepolis. The superposition of one form upon another produced also the capitals which crown the heads of the Caryatids of the Treasury of the Knidians at Delphi.[2] In fact, the normal Ionic capital itself was not a simple, but a complex, form. The superposition of the rectangular block with its lateral volutes upon a circular echinus was not always a happy combination. Beneath the pulvinus the echinus had to be flattened or omitted; on the other hand, sometimes the volutes suffered from the combination. The juncture of echinus and volutes left an awkward corner which was covered by a half palmette. Ingenious as was this combination of forms it was too complex to appeal strongly to the practical minded Romans.

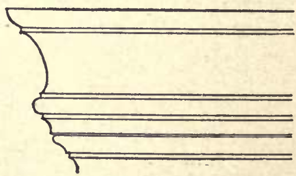


FIG. 115. — Abacus of the Leonidaion, Olympia.

[1] Koldewey, in *Winckelmannsprogramme*, No. 51, 34. [2] See Fig. 221.

The application of the Ionic type of capital to peristyles, to which it was ill adapted, gave rise to new complex forms. Various cases arose, each of which presented peculiar difficulties. Temples, or other rectangular buildings surrounded by a peristyle, required a modification of the corner capitals so that the volutes might appear on adjoining, instead of on opposite, sides of the capital. In Ionia and in Greece this was usually accomplished by twisting the corner volutes into a diagonal position. In Macedonia, Sicily and in southern Italy, the pulvinus was often omitted and a four-faced capital formed with all the volutes posed diagonally.

In the case of circular buildings with peristyles we might expect that the forms of capitals would be modified to a somewhat trapezoidal shape. This, however, appears not to have been the case with the Philippeion at Olympia.

A new problem was presented when the peristyle extended around an open court, as in market-places and private houses. Here, when the Ionic order is used, juxtaposed volutes form a reëntrant, not an external, angle. As this presented a form not altogether agreeable, we may well understand that the circular types of capitals were preferred for such courts, or that the awkward angle was avoided by the use of the square pillar with a rectangular capital.

Clustered columns with corresponding capitals were rare, although, in the case of antae, the half column and square pier were not infrequently combined. In the Pergamon Museum at Berlin there is an interesting triplex Doric capital which crowned a clustered shaft. The principal opening of the colonnade in front of the Temple of Isis at Pompeii[1] was between two massive piers with lateral at-

[1] Mau, Fig. 74.

tached columns. The capitals of such complex piers had complex capitals. In the long Stoa, or Macellum, at Delos[1] there are columns of which one side is channelled and the other plain. The channelled sides have echinus capitals, while the capitals of the plain sides consist of the *προτομαί* of bulls. In a private house at Delos, near the theatre,[2] two busts of lions as well as two busts of bulls crown shafts, the opposite sides of which are channelled and probably had echinus capitals.

A logical evolution led to the substitution of human, for geometric, floral and animal forms in the capitals of columns. This stage was reached in the capitals from the façade of the Temple of the Didymaean Apollo near Miletos,[3] where heads of Zeus and Apollo, probably also of Hera and Artemis, assume the position usually occupied by spirals.

6. ENTABLATURES. — The entablature (*ἐπιβολή*) usually consisted of three parts, epistyle, frieze and geison or cornice.

The epistyle (*ἐπιστύλιον*) was the beam, or series of beams, which rested upon and united a row of columns, and which originally supported the ceiling beams. Its general form was that of a parallelopipedon, the long surfaces of which fall in horizontal and vertical planes. In the more refined buildings of the classic period these surfaces were sometimes intentionally modified in form. Thus, in the Parthenon, the upper and lower surfaces were curved in a vertical plane to harmonize with the upward curvature of the stylobate. In the Temple of Poseidon at Paestum, however, we find a different modification. Here the face

[1] Blouet, III, Pl. 8; *B.C.H.*, VIII (1884), Pl. 17.
[2] *B.C.H.*, XIX (1895), 504–505.
[3] Haussoullier, Pls. 7, 8, 9, 16.

of the epistyle was curved outward, as was the case in the Temple of Medinet Habu in Egypt.[1] In the Temple of Herakles at Cori,[2] the epistyle was curved inward in plan. In general, however, it was in form a regular parallelopipedon.

The epistyle received other modifications of form, chiefly as an inheritance from methods of construction in wood. These may be considered separately according to their appearance upon the front, rear or soffit of the epistyle. The face of the epistyle, when representing colossal wooden beams, presented an unbroken face, except at the top, where it was crowned by one or more mouldings. Doric epistyles usually, and Ionic epistyles occasionally, as in the exterior order of the Temple on the Ilissos,[3] presented an unbroken face. But Ionic epistyles were generally banded or broken into a succession of three overlapping fasciae. Occasionally, as in the Philippeion at Olympia, the epistyle showed only two fasciae. At Suwêdā, in Syria,[4] the inner face of the epistyle of the pre-Roman temple has four fasciae. These banded epistyles suggest the superposition of smaller beams where the stronger unit was either difficult to obtain or not wanted. The crowning moulding was originally not a mere ornament but served a useful purpose. In wooden buildings it was probably, as Perrot[5] has suggested, a board designed to bind together the separate members of the epistyle and frieze, and to prevent disaster in case of warping of the principal beams.

[1] Pennethorne, Pt. 3, Pl. 1; Goodyear, in *A.J.A.*, X (1895), 10.

[2] Goodyear, *Arch. Rec.*, XXI (1907), 400.

[3] Stuart and Revett, I, Ch. 2. Pls. 1–6.

[4] Butler, 331.

[5] Perrot et Chipiez, VI, 712.

In the Old Temple of Athena at Athens it projected above the upper level of the epistyle block, as if it were also required to prevent the triglyphs from sliding forward (Fig. 116).

The form of the moulding which crowns the epistyle varied considerably. In rigidly Doric buildings it showed

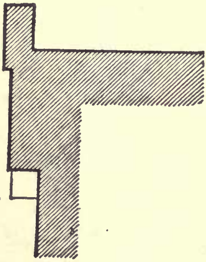


FIG. 116. — Crowning Moulding of Epistyle, Old Temple of Athena, Athens.

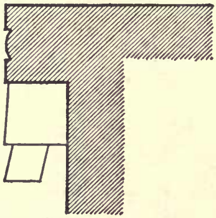


FIG. 117. — Crowning Moulding of Epistyle, Temple C, Selinous.

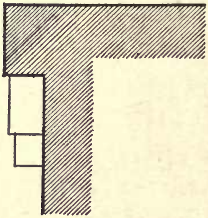


FIG. 118. — Crowning Moulding of Epistyle of Temple of Concordia, Akragas.

a rectangular profile and was known as the taenia (ταινία) or fillet-shaped moulding. Of similar rectangular form were the regulae or reglets (κανόνες), which were placed beneath it in line with the triglyphs and which were apparently held in place by large wooden trunnels (γόμφοι, ἧλοι), from their resemblance to rain drops known to the Romans as *guttae*. The trunnels also varied in form. In Temple C at Selinous they are detached from the background, incline forwards, and taper downwards (Fig. 117). Usually, however, they are attached to the background and in form are either cylin-

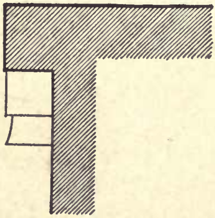


FIG. 119. — Crowning Moulding of Epistyle, Propylaia, Athens.

drical (Fig. 118) or taper upwards, sometimes with a curved profile (Fig. 119). The taenia moulding occasionally appears in a modified form, as in the Temple C, Selinous,[1] and the Treasury of Syracuse at Olympia,[2] where it has a roundel moulding imbedded in it. Even in an archaic Doric building, like the so-called Temple of Demeter at Paestum,[3] the epistyle may be crowned with curved mouldings. Here, on the outer face, the epistyle was crowned with a cyma reversa between a bead moulding and a fillet, and on the inner face with an ovolo between bead and fillet. In late Doric buildings, such as the Temple of Dionysos at Pergamon,[4] curved mouldings need not

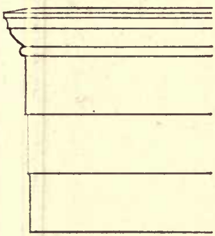


FIG. 120. — Crowning Moulding of Epistyle of Temple of Nike, Athens.

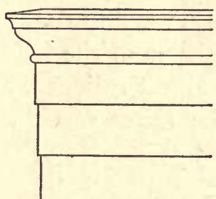


FIG. 121. — Crowning Moulding of Epistyle of Tholos at Epidauros.

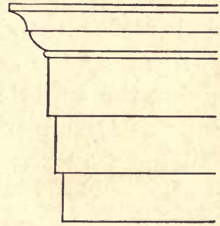


FIG. 122. — Crowning Moulding of Epistyle of the Temple of Artemis, Magnesia.

surprise us. In this case the epistyle was crowned by a rectangular taenia, or abacus moulding, beneath which the regulae have the curved form of a cyma reversa. In Ionic buildings, curved mouldings, as a rule, crown the epistyle. Here we find convex and concave mouldings, or the cyma reversa, terminated by bead or fillet mouldings (Figs. 120–122). In Ionic epistyles of the classic period multiple

[1] See Fig. 117.

[2] *Olympia*, I, Taf. 34.

[3] Koldewey und Puchstein, 19.

[4] Bohn, *Temp. Dion. Perg.*, 6–7.

mouldings already appear. In later buildings, simple mouldings were occasionally employed, as in the bead and ovolo of the Temple of Athena at Priene; but in general these mouldings were not only strikingly decorated, but complex in form. In Roman and Early Christian architecture they sometimes absorbed the entire face of the architrave and all the trace of a massive beam or even of a banded epistyle disappeared.[1]

The antithema (*ἀντίθημα*), or rear of the epistyle, was not a replica of the outer face. In Doric buildings the massive epistyle usually retained the same height as in the outer face, and was combined with the antithema of the frieze so as to present the appearance of a low wall rather than an entablature. In the case of the Parthenon,[2] the antithema of the frieze was set back, thus giving the epistyle a slight salience, but in the Temple of Zeus at Olympia,[3] the frieze was flush with the epistyle, and the wall-like appearance emphasized. At Sounion,

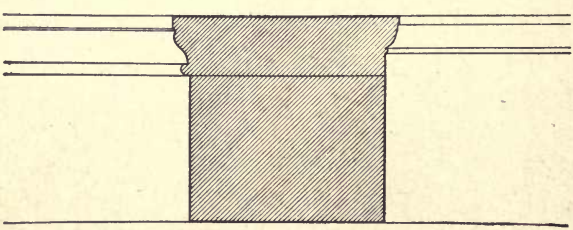


FIG. 123. — Antithema of Epistyle, Temple of Demeter, Paestum.

Rhamnous and elsewhere, the epistyle and frieze were separated from each other by mouldings, and thus the inner face was more or less a reflection of the exterior. The separating mouldings, for the sake of variety, and perhaps

[1] Butler, 39. [2] Penrose, Pl. 16. [3] *Olympia*, I, Taf. 11.

owing to the different conditions in regard to light, were given profiles different from those of the exterior (Fig. 123). In Ionic buildings the ceiling beams rested directly upon the inner block of the epistyle, which did not reach the same height as the exterior block. The antithema of the epistyle was accordingly formed so as to present two bands, or fasciae, instead of three. The process of diminishing the height of the epistyle on its reverse face was carried so far in the Olympieion at Athens (Fig. 124) that the combined frieze and epistyle of the inner face equalled in height the epistyle alone of the exterior.

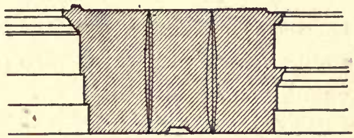


FIG. 124. — Antithema of Epistyle from the Olympieion, Athens.

The under surface or soffit of the epistyle was, in the earlier and simpler varieties of Greek architecture, a plane surface. It remained so in Greece proper even when the epistyle was constructed of two or three juxtaposed blocks. In the architecture of Asia Minor, however, the soffit of the epistyle was frequently panelled. At the Temple of Athena at Priene, the Temple of Artemis at Magnesia and the Temple of Apollo near Miletos (Fig. 125), where the epistyles consisted of two juxtaposed blocks, the panelling was effected in such a way as to divert the attention from the joints. The main object of the panelling, however, was to bring these broad surfaces into closer harmony with the coffered ceilings. Consequently, in the

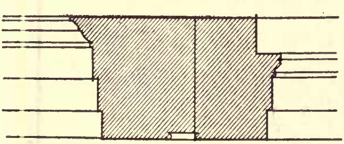


FIG. 125. — Antithema of Epistyle from the Temple of Artemis, Magnesia.

Temple at Messa,[1] the panelling seems to have been introduced without regard to the intervening joint, and in the Olympieion at Athens,[2] was sunk in the middle block regardless of the joints on either side. Once established, this form of epistyle soffit survived in Orient and Occident alike. Similar panellings were sunk in the soffits of archivolts, in spite of their being crossed at intervals by the joints of the voussoirs.

The second member of the entablature was the frieze, known from its crowning function as *θριγκός* or *θριγχός*, and from its encircling character as *διάζωμα* or *ζώνη*. When divided into triglyphs and metopes it was known as *τρίγλυφος* or *τρίγλυφον*; when continuously decorated with geometric or floral designs as *κοσμοφόρος*; when with figured sculpture as *ζῳοφόρος*, *ζωφόρος*.

The divided frieze may be conceived as suggesting the ceiling beams by means of its triglyphs or dentils; when continuous, as in the Ionic, it was treated as a second epistyle to elevate the ceiling structure, or as a covering to hide it from view. In the Doric temple, the actual ceiling beams were raised so as to rest, not on the epistyle, but on the frieze. Hence, triglyphs and dentils ceased to be structural and were mere decorative forms.

The general form of the frieze agreed with that of the epistyle in being a regular parallelopipedon, sometimes modified by a slight curvature in plan or elevation. It had a visible front and back, but no soffit. It was, moreover, connected with the epistyle by a taenia or other moulding which served as a base for the frieze as well as a crown for the epistyle. It had its own crowning moulding. Its function differed from that of the epistyle in being

[1] Koldewey, Taf. 21. [2] Durm, 293.

more closely related to ceiling and roof. Hence we may classify the forms of friezes as:—

(*a*) Those which symbolize the ceiling beams.

(*b*) Those which do not symbolize the ceiling beams.

The Doric triglyphon (τρίγλυφον) may be regarded as of the former class. As a decoration it matters little whether it corresponds or not with the actual position

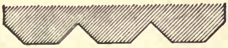


FIG. 126.—Triangular grooves, Temple of Poseidon, Paestum.

FIG. 127.—Semicircular grooves, Temple of Apollo, Metapontum.

of the ceiling beams. Nor need we concern ourselves as to whether the name originated because each free standing triglyph was channelled on three sides,[1] or because the channels were triangular in shape,[2] or because each triglyph may be considered as having two whole and two half channellings.[3] The latter interpretation is the more convenient, as it enables us to designate as monoglyphs,[4] diglyphs,[5] triglyphs and tetraglyphs,[6] forms which exhibit a smaller or larger number of channellings. The form of the channelling was usually triangular in plan (Fig. 126), although semicircular in the triglyphs of the Temple of Apollo at Metapontum (Fig. 127). The channellings of the archaic period were terminated with a pointed

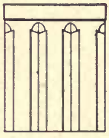


FIG. 128.—Triglyph from the Treasury of Metapontum, Olympia.

[1] Boetticher, 206.

[2] Krell, 10.

[3] Laloux, 74.

[4] Cf. Schliemann, *Tiryns*, Pl. 4.

[5] Cf. Tomb at Norchia, Durm, *Bauk. Etr. Röm.*, Fig. 68.

[6] Cf. Temple E, Selinous, Koldewey und Puchstein, 209.

(Fig. 128) or round arch (Fig. 129); in the classic period with a depressed arch (Figs. 130, 131). In the Tholos at Epidauros and in Hellenistic triglyphs, a rectilinear termination prevailed (Fig. 132). The origin and significance

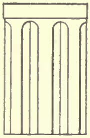


FIG. 129. — Triglyph from Temple C, Selinous.

FIG. 130. — Triglyph from the Propylaia, Athens.

FIG. 131. — Triglyph from the Temple of Concordia, Akragas.

of triglyphal channelling is not self-evident. But if we are right in assuming that triglyphs symbolize the ends of ceiling beams, we have but to go a step farther to see in the channelling an indication that such beams were often composite in character, being made up of two or three narrow beams in close juxtaposition. Their independence was emphasized by chamfering their exposed joints and their union by the abacus crown. The semicircular and pointed terminations of the channellings call to mind well established forms of decoration in Egyptian cornices,[1] which may not have been without influence in the formation of the early Doric types. The influence of the scotia of the Egyptian cornice is perhaps to be seen in the slightly curved face of the Doric triglyphs of the Temple C, Selinous.[2] The vertical bars between the grooves are known as shanks (μηροί).

FIG. 132. — Triglyph from the Tholos, at Epidauros.

[1] Perrot et Chipiez, I, Figs. 390, 393.

[2] Photograph, No. 155, by G. Incorpora, Palermo.

The second variety of frieze retained in its decoration no reference to roof or ceiling structure. It had its crowning mouldings, but no independent base moulding. The crowning moulding might be a simple taenia, but usually consisted of an echinus, a Lesbian cyma or a scotia, separated by a taenia and astragal. The body of the frieze was rectilinear in profile until the end of the classic period. Then curved and pulvinated friezes abound. In the Propylon before the Temple of Athena at Priene (Fig. 133), and in the Tower of the Winds at Athens, the face of the frieze was sharply concave at the top. In the Stoa of Hadrian at Athens (Fig. 134), and in the Baths of Diocletian at Rome, the concavity occurs at the base of the frieze. A convex frieze occurs at the Temple of Zeus at Labranda (Fig. 135), in tombs at Myra and Mylasa and in many monuments of Syria.

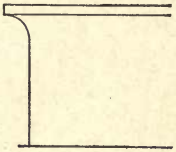


Fig. 133. — Frieze of the Propylon, Priene.

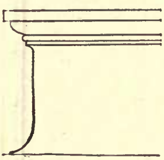


Fig. 134. — Frieze of Stoa of Hadrian, Athens.

The cyma recta appeared timidly, possibly for the first time, in the Tholos at Epidauros (Fig. 136). More pronounced cymas are found at Palaiopolis in Andros,[1] at Salonica[2] and elsewhere. Friezes with curved profiles became very popular under the Byzantine empire. The antithema of the frieze seldom duplicated the face of the frieze. It was frequently lower and crowned by different mouldings.

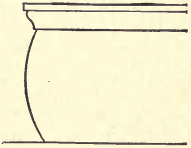


Fig. 135. — Convex Frieze from the Temple of Zeus, Labranda.

The crowning member of the entablature is the cornice

[1] Stuart and Revett, IV, Ch. 6, Pl. 6. [2] *Ibid.*, III, Ch. 9, Pl. 3.

(γεῖσον). It is distinguished by its pronounced overhang, and its devices for checking and controlling the rainfall on the roof. The main body of the cornice was usually a strongly marked platband in archaic and classic cornices, though narrow and unimportant in many cornices of a late period. Over the side walls of the Treasury of the Megarians at Olympia[1] projected a cornice of simplest form, merely a platband without modification at base or summit. But Greek cornices were seldom as simple as this. They usually exhibited some reminder of the carpentry of the roof, such as mutules, dentils, brackets or panels, and were provided with a crowning moulding (ἀκρογείσιον).

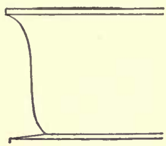


Fig. 136. — Cyma recta Frieze from the Tholos at Epidauros.

The cornice with mutules, which is found in almost every structure of the Doric order, is not easy to explain. The mutules are apparently survivals of wooden forms, and probably represent boards which served as cover joints beneath the sheathing of the roof.[2] The narrow bands above and below the mutules, which occur so invariably

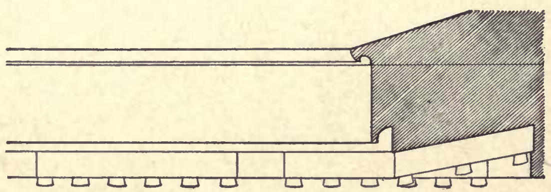


Fig. 137. — Cornice with mutules from the Temple of Zeus, Olympia.

in the Doric cornice, thus also receive a rational explanation, as does also the crowning moulding. A marked

[1] *Olympia*, I, Taf. 38. [2] See Fig. 4.

character of this type of cornice is the downward and outward inclination of the mutules, an indication that it was formed in a country where pitched roofs were common. Cornices in which the mutules are posed horizontally do not occur prior to the Hellenistic period. A

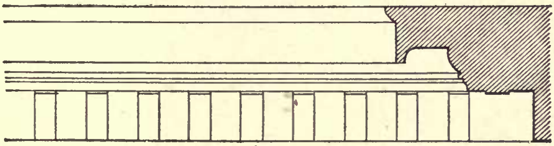


FIG. 138. — Cornice with dentils from Priene.

typical Doric cornice, as in the Temple of Zeus at Olympia (Fig. 137), shows, by its form, a careful protection of lower surfaces by means of crowning drip mouldings. Thus, a sharply pointed beak moulding caps the principal platband. This again overhangs the narrow band above the mutules, and the uniting surface is sharply undercut. Sometimes, as in Temple C at Selinous, the

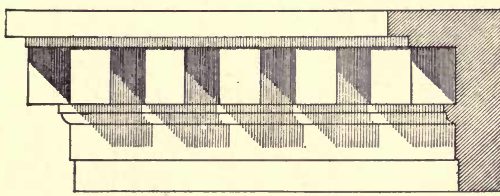


FIG. 139. — Dentil frieze from Tomb of Amyntas, Telmessos.

mutules, and even the trunnels, were shaped so as to throw the drip outward as far as possible.

The antithema, or back of the cornice, was variously adjusted so as to unite with the horizontal ceiling beams or sloping rafters of the roof.

The cornice with dentils (γεισήποδες, κλινόποδες) was characteristic of Ionic buildings of Asia Minor (Fig. 138) where, as we have seen, the dentil band was sometimes important enough to be ranked as a frieze (Fig. 139). When, however, a kosmophoros or a zophoros was introduced above the epistyle, the dentils became the crowning moulding of the frieze, or, as their Greek name, γεισήποδες,

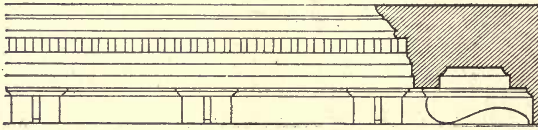


Fig. 140. — Cornice with consoles from interior of Tower of Winds, Athens.

their construction and diminished size imply, the bed mould or supports of the cornice. Their appearance also in the raking cornice (*κατάγεισον*) of the gable strengthened the association with the cornice. The cornice with brackets or consoles, much used by Roman and Byzantine architects, occurs in the interior of the Tower of the Winds at Athens (Fig. 140). In this case, the dentils

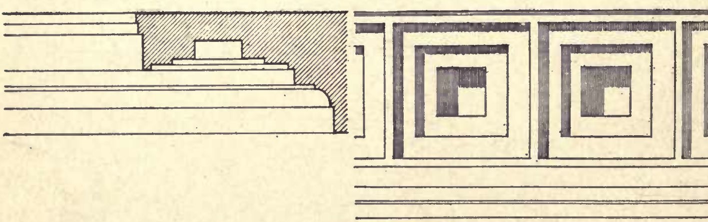


Fig. 141. — Cornice with coffering from the Temple of Demeter, Paestum.

appear as supports for the cap moulding of the cornice — a very unusual disposition.

The cornice with cofferings, found on the gable of the Temple of Demeter at Paestum (Fig. 141), constitutes a fourth type less widely spread.

There still remains the cornice which is devoid of all reminiscences of carpentry, such as that of the Erechtheion (Fig. 142) and other Attic-Ionic buildings. This cornice is characterized by simplicity and, at the same

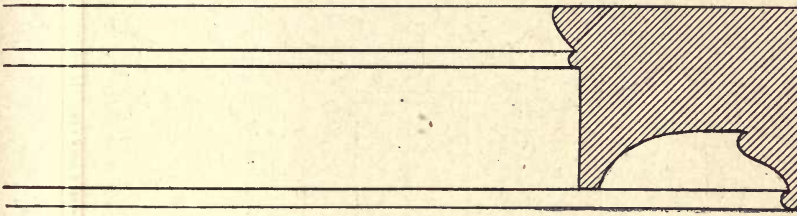


Fig. 142. — Cornice of Erechtheion, Athens.

time, great delicacy of form, especially in the hyperbolic surface of its soffit.[1] The crowning mouldings of the geison in the Erechtheion are a carved egg and dart over the bead and reel. In the Hellenistic period in Asia Minor, the cyma reversa was commonly substituted for the egg and dart.

Complex or subdivided cornices are found on the ar-

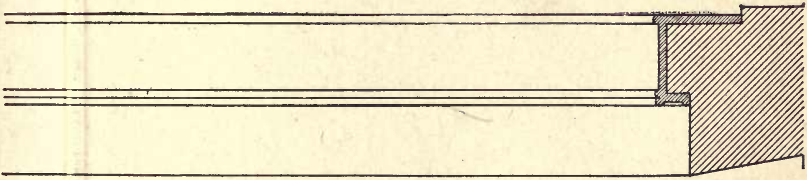


Fig. 143. — Subdivided cornice from the Treasury of Gela, Olympia.

chaic Temple of Demeter at Gaggera, near Selinous, and on the Treasury of Gela at Olympia (Fig. 143).

Curvature of lines and surfaces is observable in some Greek cornices. The front horizontal cornice of the

[1] Penrose, 51.

Temple at Segesta curves inward in plan, whereas the lateral cornices of the so-called Temple of Poseidon[1] at Paestum have a distinct outward curve in plan; those of the Parthenon[2] and other buildings curve in the vertical plane. Thus the curvature, observable in the bases of many Greek temples, in some cases was extended to the entablature also. Sometimes, as at Corinth, this curvature seems to have been applied to the façade only. A curved profile, such as was introduced into late Ionic friezes, was attempted also in cornices — probably not, however, before the Roman period. Thus the cornice of the Temple of Castor and Pollux at Rome[3] was sharply concave at the summit,

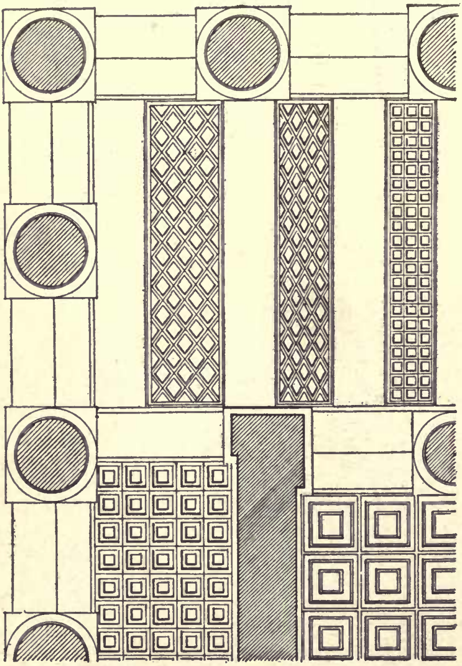


Fig. 144. — Coffered ceilings with, and without, beams, from the Temple of Apollo, Phigaleia.

[1] Burckhardt, *Cicerone* I., 4; Goodyear, *A.J.A.*, X (1895), 10.

[2] Penrose, 22.

[3] d'Espouy, Pl. 90.

while that of the Temple of Concord showed in profile a cyma recta.

7. Ceilings and Roofs. — Greek ceilings (ὀροφαί) may be formally classified as those which consist of a network of closely juxtaposed panels or coffers (πλαίσια τετράγωνα, φατνώματα) separated by narrow lath-like bands (στρωτῆρες), and those which exhibit also the large horizontal beams (σελίδες, δοκοί). Both types may be seen in the peristyle of the Temple of Apollo at Phigaleia (Fig. 144). We may readily believe that the earliest type was that which represented most clearly the actual construction, and that the types which omitted the indication of lattice-work or of ceiling beams were of later date.

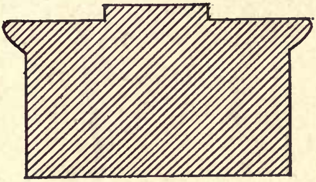


Fig. 145. — Ceiling beam from Parthenon.

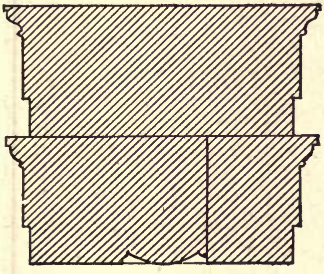


Fig. 146. — Ceiling beam from the Temple of Apollo, Miletos.

The round logs of prehistoric buildings seem to have left no impress on the ceiling forms of classic times, but squared ceiling beams survive throughout the whole history of Greek architecture. Through the classic period these beams were quadrangular in form, the only modification being the cap moulding and a socket to support the coffers (Fig. 145). In Hellenistic and Roman buildings, the large ceiling beams were treated like epistyles with overlapping fasciae (Figs. 146–147).

The stroteres, or smaller ceiling bands, occur with or without cap mouldings, and show soffits either plain or with a central astragal. The cofferings varied in depth, being simple in early and classic examples (Fig. 148), and complex in some classic (Fig. 149), and many Hellenistic, buildings. Cofferings were usually of square form, but rhomboidal cofferings are found in the Temple of Apollo at Phigaleia, in the Philippeion at Olympia (Fig. 150) and elsewhere. The coffers were usually terminated by horizontal panels (*πίνακες, καλυμμάτια*). In the case of the Theseion,[1] some of these panels were arranged so that they could be removed. In the Parthenon, the cofferings were terminated by a slightly curved surface (*οὐρανός, οὐρανίσκος*). Ionic cofferings were richly profiled with a succession of mouldings, and, in general, were larger and deeper than Doric cofferings. The Temple of Athena at Priene offers an excellent example. Roman cofferings were sometimes very elaborate in design, as, for example, in the vault of the triumphal arch at Orange,[2] France.

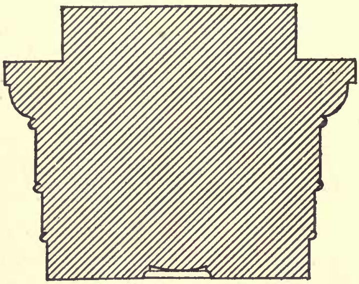


Fig. 147.—Ceiling beam from the Temple of Zeus, Aizani.

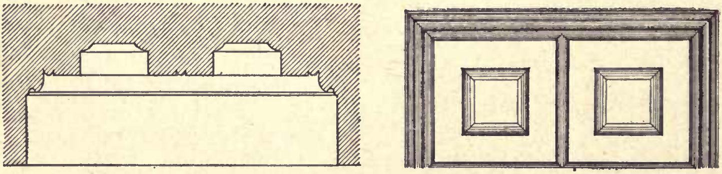


Fig. 148. — Cofferings from the Thesion, Athens.

[1] Bates, in *A.J.A.*, V (1901), 37–50.

[2] Caristie, Pl. 14.

The forms of vaults varied according to the form of the spaces covered. As with portals and window openings, the forms of long passages might be triangular or trapezoidal, pointed or round arched. The galleries at Tiryns and the tombs at Mycenae furnish early examples of tri-

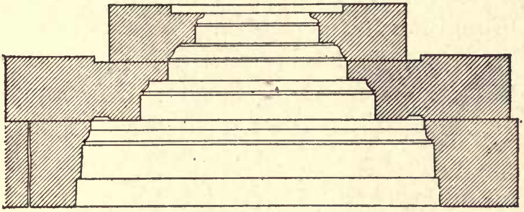


FIG. 149. — Cofferings from the Temple of Athena, Priene.

angular and pointed passages. Of round-arched vaults the most instructive examples are to be found at Pergamon.[1] Here, leading to the middle terrace of the gymnasium, is an example of a vaulted winding stairway, dating

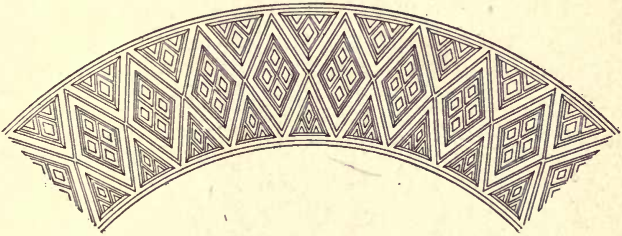


FIG. 150. — Cofferings from the Philippeion, Olympia.

apparently from the period of the Attalids. It did not occur to the architect to cover his stairway with a raking vault, as would have been done by an Assyrian or a Roman builder. He made five horizontal barrel vaults, turning

[1] Doerpfeld, in *Ath. Mitt.*, XXIX (1904), 130–137, Taf. 11–13.

twice at right angles, once at an acute, and once at an obtuse, angle, returning upon itself at a higher level. The difficulty of constructing vaults which interpenetrate, or vaults which turn an angle, was almost entirely avoided by the device of making each successive vault spring from a higher level. Even more important as a prototype of Roman and mediaeval vaulting systems are the vaults found within a mound known as the Tomb of Telephos just outside the city of Pergamon. Here two barrel-vaulted passages of the same height meet at right angles, one of which penetrates without crossing the other, resulting in half a bay of a quadripartite, cross-groined vault.[1]

When stone roofs for square spaces were undertaken, as in the Tomb at Mylasa,[2] intersecting cloister vaults were avoided by a system of construction reminding one of the pyramidal Colchian roofs described by Vitruvius.[3] When a small polygonal space was to be roofed with stone, as in the Tower of the Winds at Athens, a polygonal dome was avoided, and a series of marble slabs were set on end converging toward a common centre, like the roof of a Phrygian hut.[4] Circular buildings were sometimes covered by vaults, as was the case with the Mycenaean tholoi and the inner chambers of the great tombs at Halikarnassos and at Knidos, where the blocks of stone were laid in horizontal courses so as to form highly-pointed domes. Hemispherical domes were avoided. Whether the semi-dome which crowned Roman exedrae and the apses of early Christian churches had also its prototype in Greek apsidal buildings, like the Doric Temple at Samothrace,[5] is as yet an unsettled problem.

[1] Choisy, I, 518, Fig. 6.
[2] *Ion. Antiq.*, II, Pls. 24–25.
[3] Vitruvius, II, 1, 4.
[4] *Ibid.*, I, 1, 5.
[5] Conze-Hauser-Niemann, I, Taf. 17–20.

The roof (ἐπωροφία also ὀροφή, στέγη) was in many buildings, in form as well as construction, quite distinct from the horizontal ceilings, and must be considered separately. Pent, pyramidal, conical and other types of roofs are found as covers for porches, tombs and honorary monuments. The gable roof, almost universally employed for temples, was applied also to palaces and civic buildings. When concealed from view by horizontal ceilings, the appearance of the roof from the interior of buildings could be neglected, but when exposed to view, it was constructed so as to present a coffered form.[1]

In its outer aspect, the gable roof[2] was likened to an eagle (ἀετός, ἀέτωμα), or winged thing (πτερύγιον) with two wings (πτέρυγες).

The construction of the roof, if horizontal, was hidden by a covering of clay ; if peaked, by tiles of terra-cotta or marble. The forms of these tiles varied considerably. Nevertheless, two kinds were always employed, the rain tiles (σωλῆνες, στεγαστῆρες) and the cover tiles (καλυπτῆρες). The rain tiles were sometimes slightly curved, as in the Heraion at Olympia (Fig. 151), but were more frequently flat with raised edges. The cover tiles were sometimes curved, as in the Heraion

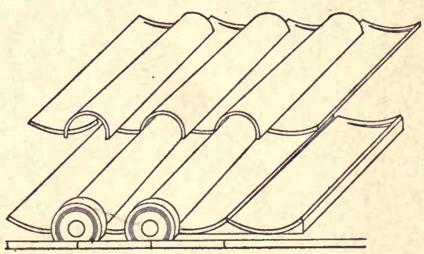


FIG. 151. — Roof tiles from the Heraion, Olympia.

[1] Choisy, *Études*, 147–152, holds that the Eastern cella of the Erechtheion had no horizontal ceiling.

[2] Boetticher, 246.

and in the Treasury of Gela at Olympia (Fig. 152); but in the classic period were more frequently triangular, as in the Temple of Zeus, Olympia, the Parthenon (Fig. 153) and the Erechtheion.

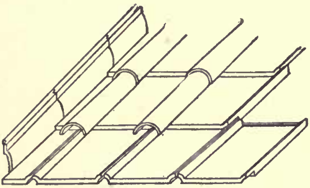


Fig. 152. — Roof tiles from the Treasury of Gela, Olympia.

In cases of pyramidal, conical and intersecting roofs, the forms of these tiles were necessarily modified in form. In the Choragic Monument of Lysicrates, the roof consists of a solid block of marble carved on its upper surface to imitate tiles of a scale or leaf pattern (Fig. 154).

The ridge of the roof was provided with half round, later with saddle back, tiles (Fig. 155), usually decorated with anthemia, which faced in two directions. At the lower extremities of the line of cover tiles a terminus was formed by similar decorative tiles, known as antefixes. These either reflected the semicircular and triangular forms of the cover tiles, or were formed to imitate a lotus flower or a palmette, or represented animal or human heads.

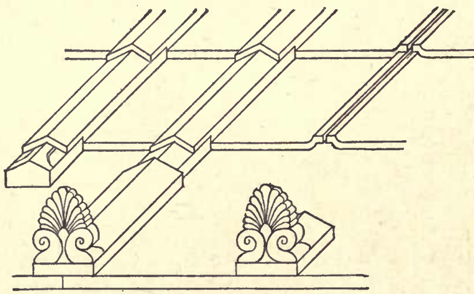


Fig. 153. — Roof tiles from the Parthenon.

The simae (σιμαί) belong, properly, to the roof. These varied in profile, and show either rectilinear or convex or concave profiles, or the doubly curved cyma reversa or cyma recta (Figs 156–159). With these principal

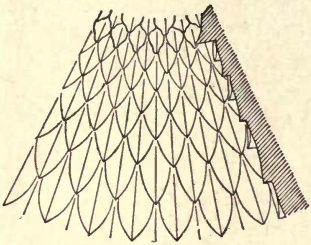


FIG. 154. — Imitation roof tiles from the Monument of Lysicrates, Athens.

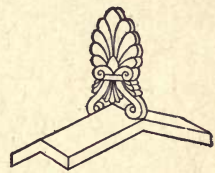


FIG. 155. — Ridge tile from the Temple of Aphaia, Aegina.

mouldings were associated subordinate base or cap mouldings of varied profiles. Water spouts (*ὑδρορρόα*) were

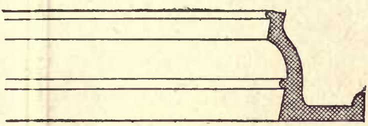


FIG. 156. — Sima of the Treasury of Gela, Olympia.

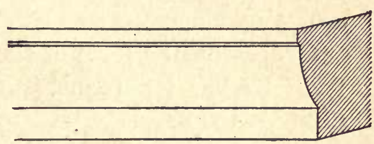


FIG. 157. — Sima of the Parthenon.

arranged at intervals, sometimes simple pipe stems (Fig. 160), more frequently in the form of lion heads

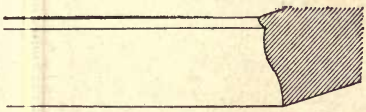


FIG. 158. — Sima of the Temple of Aphaia, Aegina.

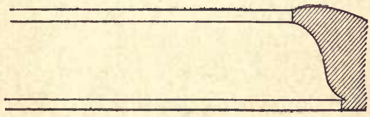


FIG. 159. — Sima of the Temple of Athena, Priene.

(*λεοντοκέφαλοι*), seldom dog heads or other symbols. Simae are found invariably on the raking cornices, and rarely more than a short distance from the cornices of the long sides. They occur very seldom on the horizontal cornices of the pediments.

The gable roof was terminated at each end by a triangular wall, called a tympanum (τύμπανον). The tympanum was set back so as to provide a suitable base or pediment for gable sculptures, and was provided with a crowning moulding of its own. Above the tympanum were the projecting raking cornices (γεῖσα αἰέτια, or καταιέτια) of the roof. In the classic period these were distinguished from the horizontal cornices by the absence of mutules and dentils, and by the presence of a crowning sima.

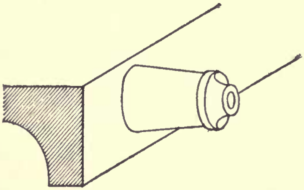


FIG. 160. — Sima with water spout, Athens Museum.

Ordinarily the form of the gable front was a rectilinear triangle, but the refinement of curved surfaces was not limited to krepidomas and entablatures and, once introduced, it necessarily modified the gable form. Thus, in the so-called Theseion,[1] the raking cornices as well as the pediment had a delicate vertical curvature. In the so-called Temple of Poseidon at Paestum,[2] the gable cornices were curved

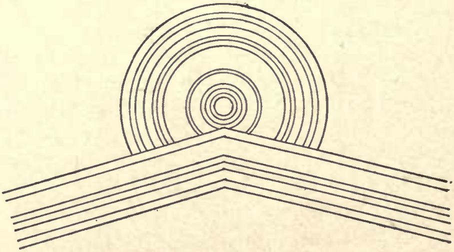


FIG. 161. — Central acroterion from the Heraion, Olympia.

[1] Penrose, 73. [2] Brooklyn Institute photograph, No. 28.

inwards towards the roof of the building. The general form of the gable front was also modified by the emphasis laid upon the extremities. Here were placed acroteria

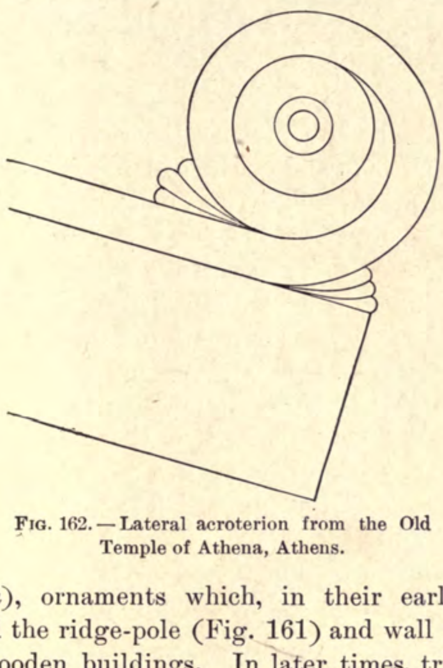


FIG. 162. — Lateral acroterion from the Old Temple of Athena, Athens.

(ἀκρωτήρια), ornaments which, in their earliest forms, symbolized the ridge-pole (Fig. 161) and wall plate (Fig. 162) of wooden buildings. In later times, tripods, griffins, victories, etc., were substituted for the early geometric forms.

CHAPTER III

PROPORTION

GREEK architects concerned themselves not only with forms, decoration and composition, but laid special emphasis on proportion. This tendency to make an exact science of architecture increased rapidly, until in the Hellenistic period there were many architects who sought in their buildings and by their writings to establish the true canons of proportion. Unfortunately, these books are not preserved to us, and we are largely dependent upon Vitruvius[1] to acquaint us with Greek conceptions of proportion. He tells us that they meant by proportion a harmony of ratios of the parts with the whole. This treatment of the proportions of various classes of buildings implies the establishment first of the major or fundamental, and then of the minor, or subsidiary, ratios.

1. MAJOR RATIOS. —In considering temple architecture the major ratios in plan are those of the temple base and of the cella; in elevation, those of the façade and sides of the peristyle. Even in these primary measurements considerable variety of practice prevailed. In laying out a temple, Koldewey and Puchstein[2] tell us that the measurements of the cella were first determined, then those of the surrounding peristyle. In many Sicilian temples cella and peristyle were not harmoniously adjusted, hence their measurements were in great measure independent of each

[1] Vitruvius, III, 1.

[2] Koldewey und Puchstein, 229.

other. In the classical period this adjustment became more imperative, and the measurements of the temple base and of the peristyle were consequently quite as important as those of the cella. From a study of the proportions of classical temples[1] it may be gathered that the fundamental ratio was sometimes taken from the rectangle made by the lowest step of the krepidoma, in other cases it was derived from the stylobate and occasionally from the axes of the corner columns. The most convenient basis for exact measurement was the stylobate, and this seems to have furnished the standards in Hellenistic and Roman times.

The stylobate rectangle shows various forms. In the archaic period it often approximated the ratio 3 : 1; classic stylobates showed usually a more contracted rectangle of about 2.50 : 1; Hellenistic stylobates measured about 2 : 1. Exceptions to this general rule were, however, so frequent that Perrot[2] hesitates to assign to the general proportions of the plan of a temple any chronological value. There is little reason to believe that the rectangle with a ratio known as the "golden section" figured either theoretically or practically in the stylobate plans of Greek temples.[3]

The plan of the temple cella varied like that of the stylobate, from a long rectangle to one whose length was double its breadth. Regulations for the subdivision of the cella are given by Vitruvius,[4] who assigns to the naos a length equivalent to one and a quarter times the breadth of the cella, and to the combined depth of

[1] Lloyd-Penrose, 111–116; Lloyd-Cockerell, 63–94.

[2] Perrot et Chipiez, VII, 551.

[3] Schultz, 10.

[4] Vitruvius, IV, 4, 1.

pronaos, or front porch, and the opisthodomos, or rear porch, three quarters of the cella breadth.

In elevations the fundamental ratios seem to have been variously constituted. For example, the krepidoma, the gable, or the sima of the cornice might be included or excluded from the computation. When the stylobate was taken as the base of the rectangle, the krepidoma was naturally excluded. The gable and the sima of the cornice, not being factors of the side elevation of a temple, were also usually excluded. In the case of elevations, therefore, the fundamental ratios were usually made up of the breadth or length of the stylobate on the one hand, and of the height of the order on the other. Measured thus the general proportions of the façade of Greek temples varied from a square to long rectangles. These variations depended chiefly upon the number of columns to be exhibited in front. The variations due to differences of style or period were less important. The square, as a major ratio, may be recognized in the façades of most tetrastyle temples of all periods. If ten units be arbitrarily established as the measure of the height of the columns and entablature, then the length of the front stylobate seems to have been about fourteen for Ionic, and eighteen for Doric, hexastyles, about twenty for octostyles, twenty-two for decastyles and thirty-six for dodecastyles.[1]

Basilicas, according to Vitruvius,[2] should exhibit a breadth of not less than one-third, nor more than one-half, their length. That is to say, they have much the same dimensions as the stylobates of temples. The

[1] These measurements are deduced from the measurements given by Hittorff et Zanth, 393-401.

[2] Vitruvius, V, 1, 4.

breadth of the basilica is further divided into fifths; one-fifth being taken for each of the side aisles and three-fifths for the central nave. The elevation follows from the ground plan, the height of the columns being made equal to the breadth of the aisles. The fundamental ratios of the stoa are similarly determined.[1]

In the case of the private house the atrium furnished the fundamental measurements. It is noteworthy that these differ from those of the temple and basilica. Vitruvius[2] describes three varieties; (1) atria having a breadth equal to two-thirds of their length, (2) those with a breadth equal to three-fifths of their length, (3) those the breadth of which is the side of a square, the diagonal of which furnishes the length. The atria of Pompeian houses are found by Mau[3] to harmonize fairly well with these recommendations of Vitruvius.

Hellenistic houses excavated at Priene[4] exhibit a prostas, or porch, with the ratio of two units in depth to three in breadth before an oikos which is almost uniformly a perfect square.

Circular buildings offered a somewhat different problem. In the case of the tholos the dimensions were taken from the diameter of the cella.[5] In the theatre the orchestra was the starting-point for other measurements. By inscribing within the inside of the orchestra triangles or squares[6] or a pentagon,[7] Vitruvius in ancient, and Oemichen in modern, times deduced the positions of the staircases of the theatron and the walls of the skene.

[1] Vitruvius, V, 9.
[2] *Ibid.*, VI, 3, 3.
[3] Mau, 24, 6, 247.
[4] Priene, 290.
[5] Vitruvius, IV, 8.
[6] *Ibid.*, V, 6; V, 7.
[7] Oemichen, 51.

2. Minor Ratios. — We may now consider some of the minor ratios.

Wall ratios, expressed in the relation of the thickness to the height, were conditioned by technique, style and other considerations. In stone and marble buildings the walls were naturally thinner than when crude brick was employed. In the composition of temples it was convenient that the antae of walls should be equal in breadth to the diameter of adjacent columns. Hence the walls themselves were usually less than a column diameter in thickness, and, being higher than the columns, their general dimensions were slenderer. Thus, in Doric temples the cella walls were given a height from nine to ten and a half times their breadth, and in Ionic temples from eleven and a half to thirteen.[1]

Doorway ratios received much attention, not so much with relation to the floor space within[2] as to mere form. The height of the doorways of the Arsenal at Peiraieus were one and a half times their breadth. The Vitruvian dimensions indicate a preference for slenderer openings. A long period of experimentation must be assumed before Vitruvius[3] could lay down his rules for Doric, Ionic and Attic doorways, and give the proper dimensions for their openings, their framework, their diminution and even for the panelling, uprights and crosspieces of the doors themselves.

Column ratios naturally demanded most attention. As columns formed a striking feature in Greek buildings we may well believe that the relation of the height of the column to the total height of a building figured more or less prominently in the architect's calculations. In

[1] Durm, 75, 239. [2] *Ibid.*, 83. [3] Vitruvius, IV, 6.

archaic buildings the column was less than half the total height. In the classic period W. W. Lloyd finds[1] "an affection for the rule that the height of the column shall exceed the joint height of pediment, entablature and stylobate and that the excess shall be equal to one aliquot part that is their common measure." Thus the relation of the column height to the remainder of the height of the façade in the case of the Theseion is that of five to four; at Phigaleia, seven to six; in the Parthenon, ten to nine. In Hellenistic buildings the column was a still larger fraction of the total height. A more general ratio to be observed was that of the column to its entablature. This varied according to locality, style and period. In countries such as Sicily and southern Italy, subject to earthquakes and provided with friable building material, columns and their entablatures remained throughout all periods heavier than in Greece proper. Buildings of the Doric style were normally more massive than those of the Ionic. The taste of the period also played its part in framing these ratios. Heavy entablatures, characteristic of the archaic period, were not tolerated in later days. In the Temple of Apollo at Corinth the entablature is more than one-half the height of the columns; in the Parthenon it is about one-third; in the Temple of Zeus at Nemea one-fourth, and in the Temple of Dionysos at Pergamon one-fifth. This general transformation of taste is evident in spite of the Greek love of variety, which makes it impossible to apply the rule mechanically so as to establish an exact chronological series.[2]

[1] Lloyd-Cockerell, 66.

[2] Some of the difficulties in accepting the proportions of buildings as an index of their date are considered in *A.J.A.*, IX (1894), 521–532.

Another characteristic ratio is that of the column to the intercolumniation. Here also various considerations determined whether the intercolumniations should be relatively wide or narrow. For example, the colonnades of the market-place were much more widely spaced than those of the temples. Colonnades of wood permitted of wider intercolumniation than those of stone. Those of friable stone were at first more closely set than was necessary. Koldewey[1] has shown that both in Sicily and southern Italy there was a constant tendency in the archaic period to widen the intercolumniation, and in the classic period a taste for more closely spaced columns. Vitruvius[2] preserves to us the names of several ratios of this sort derived from late Greek writers. The ratio was called pyknostyle (*πυκνόστυλος*) when the intercolumniations measured one and one-half times the lower diameter of the column, systyle (*σύστυλος*) when two diameters, eustyle (*εὔστυλος*) when they reached two and a quarter diameters, diastyle (*διάστυλος*) when three diameters, and araiostyle (*ἀραιόστυλος*) when more than three diameters. These proportions show a taste for wider intercolumniations than were favored in earlier days. Judged by this standard the Parthenon intercolumniations would be too narrow to be classed even as pyknostyle.

It may be further noticed that not merely the linear ratio of column diameter to intercolumniation, but the ratio of intercolumniation to column height was an important factor in Greek proportions. In other words the relation of mass to void was considered. Experience proved that, when very wide intercolumniations were used, correspondingly heavy columns should be employed.

[1] Koldewey und Puchstein, 230. [2] Vitruvius, III, 3.

The rule formulated by Vitruvius[1] for temples was that for araiostyle temples the columns should be eight lower diameters in height; for diastyle, eight and one-half lower diameters; for eustyle and systyle, nine and one-half, and for pyknostyle ten lower diameters. These proportions imply a taste for the slender columns prevalent in the Hellenistic period. The ratio of column height to column thickness was an obvious ratio, easily manipulated so as to produce a desired effect. In spite of many examples of individual variation the prevailing taste progressed from heavy to lighter forms. Thus, the height of Doric columns, measured in terms of the lower diameter, was in the Temple of Apollo at Corinth, 4.32; in Temple C, Selinous, 4.85; in the Parthenon, 5.47; in the Theseion, 5.62; in the Temple of Zeus at Nemea, 6.598 and in the Temple of Dionysos at Pergamon, 9.81. Ionic columns similarly became slenderer. The columns of the Temple of Athena Nike measure 7.575 lower diameters; those of the Temple of Athena at Priene, nine lower diameters; those of the Temple of Apollo near Miletos, ten lower diameters.

In establishing the normal ratio of the capitals and bases of columns there was the same tendency from heavy to lighter forms. The Greeks began by giving too much projection or too much height to capitals and bases, and ended by almost effacing them. This is shown most clearly in tracing the history of the Doric echinus.[2] In early examples, as in Temples C and D, Selinous and in the two temples at Metapontum,[3] the echinus was relatively low and had an excessive overhang; in the so-called Temple of Poseidon at Paestum, in the Temple of Apollo at

[1] Vitruvius, III, 3, 10.

[2] See the plates in Krell.

[3] De Luynes, Pls. 5, 9.

Corinth and in the splendid capitals of the Temple of Aphaia at Aegina the echinus gained in height and lost in overhang; in the Parthenon the echinus began again to be too low and had but little overhang. In the Temple of Zeus at Nemea and the Temple of Dionysos at Pergamon the echinus was a slight moulding having very little height, and almost no overhang. The abacus, which often exceeded the echinus in height in the early and late periods, was less significant in the classical period. In the Temple of Aphaia at Aegina the echinus was related to the abacus as 1.32 to one; in the Temple of Zeus at Olympia as 1.41 to one. But the striking fact in reference to the height of the Doric capital is its relation to the height of the shaft. At Corinth the ratio is that of one to 7.80; in Temple C, Selinous, one to 8.20; at Segesta, one to 9.49; in the Theseion, one to 11.25; in the Parthenon, one to 12.12; at the Temple of Apollo at Delos, one to 14.902; in the Temple of Zeus at Nemea, one to 27.38; and in the Temple of Dionysos at Pergamon it is about one to 30. Thus it appears that the Doric capital as the functional crown of the column gradually diminished in importance. Similarly, in the Ionic order, the older forms of capitals as exemplified at Neandreia and in the early capitals from the Acropolis at Athens were heavy. They were designed to support a heavy entablature. Lighter forms prevailed in the classic period. In the Hellenistic period the spiral band was sometimes so narrow as to lose all significance as a functional support, and became a merely decorative crown. The Ionic abacus also diminished in importance. Much care was expended on the proper ratios of the details of the Ionic capital, such as the projection of the pulvinus and of the oculus, and the width of the channels. Some of these ratios are considered by Vitruvius.[1]

Bases of columns were about equal in height to the capitals and varied accordingly. Lofty, clumsy bases are likely to belong to the early period and bases of insignificant height to the later period. The form of bases varied so much in the early, classic and even in the Hellenistic period that it is difficult to lay down general rules. The general tendency, however, was toward the so-called Attic-Ionic, or Corinthian, base with two torus mouldings separated by a scotia. Asiatic-Ionic bases exhibited many forms, the most common of which was a single torus set on a double trochilos or scotia. Vitruvius[2] assumes that the base should measure in height one-third of the lower diameter of the column, and that beneath it should be a plinth of one-half this height. The height of the two types of bases he subdivides as follows: —

Attic-Ionic		Asiatic-Ionic	
Upper torus	$\frac{2}{8}$	Torus	$\frac{3}{7}$
Scotia	$\frac{3}{8}$	Upper trochilos	$\frac{2}{7}$
Lower torus	$\frac{3}{8}$	Lower trochilos	$\frac{2}{7}$

Proportions similar to these we find in late classic and Hellenistic buildings. In the Temple of Athena at Priene[3] there are bases of the Asiatic-Ionic form with somewhat heavier torus mouldings, the ratio of torus to the rest being nearly two to three instead of three to four. In the Temple of Artemis at Magnesia[4] the bases of the Attic-Ionic form present essentially the Vitruvian proportions.

The ratios of shafts, apart from their capitals and bases, need not detain us long. The tendency toward slenderer

[1] Vitruvius, III, 5. [2] *Ibid.* [3] Priene, 92. [4] Magnesia, 50.

columns was chiefly a change in the proportions of the shaft and may be expressed in essentially the same ratios. In considering the forms of shafts we noticed that the conical shaft of the early period was abandoned for a more cylindrical shaft in the later period. Diminution is a quality in shafts which shows considerable variation within the same period; nevertheless, a strong diminution like that of the columns at Corinth, $\frac{1}{3.90}$ of the lower diameter, would be more normal for an early period than the almost cylindrical shafts such as those at Nemea, which show a diminution of only one-fifth of the lower diameter. Ionic shafts are even more cylindrical throughout their entire history. Their diminutions vary from one-sixth to one-eighth of the lower diameters. It is more difficult to generalize in the matter of the entasis of shafts. In the Doric style the entasis seems to be strong in early examples, especially in Sicily and southern Italy. Later the more nearly cylindrical shaft has correspondingly less entasis. In the Ionic style the entasis was more delicate than in the Doric. High columns demanded a stronger entasis than low ones. The following table, taken from Penrose,[1] give the ratios of some Athenian columns.

	Entasis in terms of length of shaft.	Entasis in terms of lower diameter.
Erechtheion	$\frac{1}{1080}$	$\frac{1}{134}$
Theseion	$\frac{1}{708}$	$\frac{1}{140}$
Parthenon	$\frac{1}{552}$	$\frac{1}{110}$
Propylaia, small order .	$\frac{1}{500}$	$\frac{1}{100}$
Propylaia, large order .	$\frac{1}{400}$	$\frac{1}{80}$
Olympieion	$\frac{1}{382}$	$\frac{1}{56}$

[1] Penrose, 44.

Penrose[1] proposes a mathematical formula for calculating the amount of entasis in any proposed case, but does not suppose that the Greek architects made use of such formulae.

The special ratios of the entablature concern its vertical and its horizontal divisions. When the frieze was absent, as at Priene, the entablature was divided vertically into two equal parts, the epistyle on the one hand, and dentils, corona and sima on the other. When the frieze was added, the tendency was to subdivide the entablature into three equal parts; epistyle, frieze and the cornice with its sima.

The epistyle, having a heavier burden to carry, was often more massive than frieze or cornice. In the Ionic and late Doric styles it was usually subdivided into three superposed fasciae. Considerable variety characterized the ratios of these fasciae to each other. They were rarely all equal in height, but at the Temple of Artemis at Magnesia and the Temple of Apollo near Miletos the two upper fasciae were of equal height; at the Porch of the Maidens of the Erechtheion the two lower fasciae were equal in height. In some buildings of the classic period, as the Temple of Athena Nike and the Erechtheion, and in some later buildings, as the Temple of Athena at Priene, each fascia was given slightly greater height and projection than the one below it. This practice became crystallized in the regulation of Vitruvius[2] giving to the lower, middle and upper fasciae the ratios of three, four and five, and to the crowning moulding one-seventh of the total height of the epistyle.

The Doric frieze in early Sicilian temples was slightly

[1] Penrose, 123. [2] Vitruvius, III, 5, 10.

inferior in height to the epistyle, but equal to it at Corinth, Aegina and at Athens. The dimensions of the triglyphs varied considerably from low, heavy forms to slenderer ones until the norm was set by Vitruvius[1] of breadth : height = 1 : $1\frac{1}{2}$. The metopes were normally square, though often modified by the spacing of the columns. Vitruvius further subdivides the breadth of the triglyphs into six parts, of which three are taken by the two full and two half grooves and three by the intervening shanks (*μηροί*). The ratio of triglyph breadth to metope breadth was approximate equality in early temples. In Temple C, Selinous, it was nine to ten; in Temple D, Selinous, eight to nine. Later the triglyphs became relatively slenderer. At Aegina and in the Theseion they are related to the metopes as five to eight. The normal relation was as one to one and a half.

The Ionic frieze, when without decoration, served chiefly to increase the height of the entablature. When decorated, its individual importance increased. Hence the regulation expressed by Vitruvius,[2] that an unsculptured frieze should be in height one-fourth lower than the epistyle, but if sculptured it should be one-fourth higher than the epistyle. In late Hellenistic buildings the frieze was frequently given such importance that the slender epistyle was rendered insignificant, as, for example, in the Temple of Herakles at Cori.[3]

The cornice was a member which varied greatly in its proportions. Its height, reckoned without the sima, was related to that of the frieze at Corinth and in Temple C, Selinous, as one to one and a half; at Aegina and in the Temple of Zeus at Olympia, as one to two and a half; at

[1] Vitruvius, IV, 3, 4. [2] *Ibid.*, III, 5, 10. [3] d'Espouy, Pl. 35.

Nemea as one to three. The cornice, therefore, in the Doric order gradually diminished in importance. In the Ionic order of Asia Minor the dentils were an important feature of the entablature. In Athens they were usually omitted and the geison assumed greater importance. The projection of cornices varied in appearance and effect. The Asiatic-Ionic cornice, owing to its dentils, projected gradually from the face of the building. In Doric and in Attic-Ionic buildings the projection of the cornice was more abrupt. The Greeks, in somewhat the same manner as the Florentines, made use of cornices to produce an effect. Thus, at Priene, the cornice of the Asklepieion was relatively heavier than that of the neighboring Temple of Athena. The amount of projection was also controlled by the architect. He did not feel with Vitruvius[1] that all projecting members were more agreeable when the amount of their projection was equal to their height. In the Temple of Zeus at Nemea the low cornice projected as much as twice its height. Under the Romans, cornices became elaborately decorated, and increased both in height and in projection.

Gable ratios varied within comparatively narrow limits. The relation of height to breadth was in many early examples, as Temples D and F, Selinous, and the so-called Temple of Poseidon at Paestum, that of one to seven. The architects of the classic period preferred a ratio of about one to eight, as may be seen in the gables of the Temples of Zeus at Olympia, the Theseion and the Parthenon. In some cases the slope was made still gentler, as in the Temple of Concordia at Akragas, and in

[1] Vitruvius, III, 5, 11.

the Erechtheion, where the ratio of height to breadth was one to nine. In the Temple of Demeter at Eleusis the ratio was one to ten. So varied, however, was the practice at every period that the slope of the gable has for us little or no chronological significance. As compared with the gables of Northern countries those of Greek buildings were relatively low.

The proper dimensions of the raking cornice also exercised the attention of the Greek architect. This was composed of two parts, the platband or geison proper, and the sima. To the geison was given relatively the same height as in the horizontal cornice. To this was superadded the sima, which, according to Vitruvius,[1] should be one-eighth higher than the geison. The Ionic sima was, however, frequently higher than this, as, for example, at Priene.

3. Modified Ratios. — It is evident that fixed ratios, however excellent they may be in an architectural drawing, will, in an actual building, appear to vary whenever the spectator shifts his point of view. A building, therefore, like a picture or a statue, must be designed to be seen best from a given standpoint. Granting this, it follows that the ratios of the parts of a building will depend on the proximity of the viewpoint, or the angle at which they are seen. Those parts which lie high above the spectator, if seen from near at hand, will appear to be smaller than they really are. Consequently, if it is necessary that they should conform to some agreeable ratio, they should be enlarged according to the height of the building or the steepness of the angle from which they are to be seen. This rule laid down by Plato[2] was carried

[1] Vitruvius, III, 5, 12. [2] Plato, *Sophist*, § 44.

out by Greek architects, sculptors and carvers of inscriptions. That Greek architects were obliged thus to modify theoretical ratios has been shown by Pennethorne.[1] By the time of Vitruvius, rules for the guidance of such modifications were already laid down. For example, the Greeks admired a door opening narrower at the top than at the base, and it is evident that a very high door opening from a near standpoint would appear to contract toward the top even if the door-jambs were parallel. The Vitruvian regulations[2] for door openings are as follows: the contraction for doorways less than sixteen feet in height should equal one-third of the breadth of the door-posts; for doors from sixteen to twenty-five feet high, one-fourth the breadth of the door-post; for doors from twenty-five to thirty feet high one-eighth the breadth of the door-post; and for doors more than thirty feet high there should be no contraction. Similar rules were given to regulate the diminution of the shafts of columns,[3] of the height of the abacus,[4] and of the epistyle.[5]

4. Symmetrical Ratios or Proportion.—We have thus far considered the general or major ratios and the specific or minor ratios. It now remains to consider how these were brought into relation with each other and harmonized. One method elaborately defended by Aurès[6] we may describe as the mystical method. On examining the measurements of the so-called Temple of Poseidon at Paestum Aurès was much impressed by the preponderance of odd numbers and of square numbers which resulted from assuming the common measure of the building

[1] Pennethorne, 52 ff.
[2] Vitruvius, IV, 6, 1.
[3] *Ibid.*, III, 3, 12.
[4] *Ibid.*, III, 5, 5–7.
[5] *Ibid.*, III, 5, 8.
[6] Aurès, 96–103.

to be the mean or average diameter of the columns. He quotes Virgil[1] and Vegetius[2] in upholding the importance of odd numbers and Censorinus[3] for square numbers. He does not, however, cite any Greek or Latin authority in favor of selecting the mean diameter as a modulus. We may remark further that some other modulus would have shown a preponderance of even numbers and that many of the prominent features of this temple, as, for example, the number of columns on the façade, appear in even numbers. Even if it could be proved that the Temple of Poseidon at Paestum exhibited an intentional preference for odd numbers, it is very unlikely that such a preference should have entered into the plans of Greek architects in general.

A second method of explaining the harmony of Greek proportions we may call the mathematical method. Various attempts have been made to explain the harmony of Greek architectural proportions by mathematical means. The most comprehensive of these was made by W. Schultz. Schultz[4] observes that the plans, façades and details of most Greek buildings involve a very general use of the rectangle, that the Greeks distinguished ten different kinds of proportion and that these proportions may in various ways be applied to rectangles. He then cites five Greek temples as examples of these proportions. When we consider the mathematical knowledge displayed by Greek architects of the hyperbola, the parabola and other curves, it seems easy to suppose that some at least

[1] Virgil, *Ecl.*, 8, l. 75.

[2] Vegetius, *Epitoma Rei Militaris*, III, 8.

[3] Censorinus, *De Die Natali*, XIV, 11.

[4] Schultz, 15 ff.

of these ten formulae known to Greek mathematicians might have found their way into architectural plans. However, the general history of Greek architecture indicates that continued experimentation rather than the introduction of mathematical formulae was what led finally to normal or satisfactory proportions.

A third method we may call the architectural method. It is best illustrated by Vitruvius. He thus defines proportion,[1] *Proportio est ratae partis membrorum in omni opere totiusque commodulatio.* Proportion (*ἀναλογία*), therefore, consists in the common measurements subsisting between the whole and its separate parts. This signifies not merely such a relationship between what we have styled the major and minor ratios, but also between every member of a building and its constituent parts.[2] When the plan of a temple had been roughly sketched Vitruvius proceeds to derive the modulus (*ἐμβάτης*) or common measure from the breadth of the stylobate. If, for example, the temple were to be an Ionic tetrastylos eustylos, this major dimension was to be divided into eleven and one-half equal parts; if an Ionic hexastylos eustylos, into eighteen parts; if an Ionic octostylos eustylos, into twenty-four and a half parts.[3] One of these parts was taken for the lower diameter of the columns; two and a quarter for the intercolumniations; nine and a half for the column heights, and so on. If, however, the building were to be a Doric tetrastylos

[1] Vitruvius, III, 1, 1.

[2] Aristotle, *περὶ ἀτόμων γραμμῶν περίφρασις*, II, defined symmetrical quantities as those having a common measure, and cited as an example, "16 is symmetrical with 24 in having 4 as a common measure."

[3] Vitruvius, III, 3, 7.

diastylos, the frontal stylobate should be divided into twenty-seven parts ; if a Doric hexastylos diastylos, into forty-two parts. Two of these parts should constitute the lower diameter of the columns ; fourteen, the column heights ; one, the height, and two and a sixth, the breadth of the capital, and so on.[1] It may be observed, however, that Vitruvius was not accustomed consciously to consider every detail of a building as a fraction or multiple of this common measure or modulus. He would not have said that the beak moulding of the cornice was such and such a fraction of the lower diameter of the column. He compared adjacent parts of a building and stated their ratios to each other in such a way as to give the impression that not one but many moduli were used in determining the proportions of a building. Thus, for example, the heights of mouldings are stated as fractions of the members to which they belong ; the middle fascia of an Ionic epistyle is taken as a modulus for the geison ;[2] the diameter of the oculus of an Ionic capital gives the amount of projection for the echinus,[3] and so on. This method of passing from one modulus to another is nowhere more clearly expressed by Vitruvius[4] than in his description of the Ionic doorway. From the temple height is derived the height of the doorway ; from the doorway height is derived the doorway breadth and also the breadth of door-jambs. From the doorway breadth is derived the breadth of the stiles (*scapi cardinales*), and breadth of the panels (*tympana*) ; from the breadth of the panels is determined the height of the rails (*impages*), and from the height of the rails is derived the breadth of the

[1] Vitruvius, IV, 3, 3–4.
[2] *Ibid.*, III, 5, 11.
[3] *Ibid.*, III, 5, 6–7.
[4] *Ibid.*, IV, 6, 3–4.

inner stiles (*scapi*). From the breadth of the door-jamb (*antipagmentum*) is derived not only the height of its terminal moulding (*cymatium*), but also the height of the lintel (*supercilium*), the overdoor (*hyperthyrum*) and the dimensions of the cornice brackets (*ancones*). From this example we see that though each member of the doorway is regarded as a modulus or measure of its immediate neighbor, nevertheless all are connected with each other and with the large dimension of the whole by a common measure. This illustrates the Vitruvian conception of proportion and there is every reason to believe that the standpoint of the Greek authors from whom he derived his inspiration was not essentially different.

CHAPTER IV

DECORATION

THE preceding chapters have already dealt with many features of Greek architecture, which, in a broad sense, might be classed as decoration. But after the refinements of construction and of architectural forms and proportions, there remains so much else that added charm to Greek buildings that we find it convenient to consider this surplus in a chapter by itself.

1. GREEK METHODS OF DECORATION. — If we should insist that all architectural decoration should spring from construction, Greek architectural decoration would be condemned from the start. The greater part of it, like Oriental ornamentation, was not structural but applied. We may, indeed, point to triglyphs, mutules and dentils as revealing the building methods of the carpenter; but, on the other hand, devices to conceal poor construction were equally abundant. Of such a nature were the stucco coverings of roughly constructed walls and columns, terracotta revetments of cornices, which were not substantial enough to resist the snow and rain, and revetments of wood which concealed the rougher members of the entablature and roof. In the perfected marble buildings of the classic period, however, this superficial dressing was, in great measure, abandoned.

The Greeks, like the Egyptians, Assyrians and Persians, not satisfied with monochromatic effects in architecture, relied upon polychromy to give added charm. In some cases, as in the ceiling at Orchomenos, the design was carefully carved so as to separate the colors, as in cloisonné enamels; in other cases, as in a cornice from Temple F, at Selinous,[1] the background was cut away, as in champlevé enamels; but more frequently easier methods were adopted. In buildings covered with stucco the design was either scratched with a stylus and the coloring applied, as in fresco painting, before the stucco hardened, or the slower encaustic method[2] was employed in which the coloring matter was mixed with wax and applied hot with a brush[3] or spatula. Upon marble, where the colors were likely to overrun, the encaustic method was preferred. Some colors served to preserve the surface of the stucco or marble, others had the opposite effect. Hence, the contrast between smooth and weathered surfaces has sometimes preserved schemes of decoration long after the colors themselves have vanished.[4] It has also been observed that different pigments vary in the amount of protection they give when applied to marble or stucco; thus the amount of weathering affords a clew as to which pigments were originally employed in a given design.[5]

The range of colors employed was not great. In the archaic period, sombre colors prevailed; in the classic, striking contrasts were sought for; in the Hellenistic period, the color scale was enlarged by a more frequent employment of the half tones and of gilding. Reds were used freely in the classic period, replacing the

[1] See Fig. 297; also Hittorff et Zanth, Pl. 55. [2] Cros et Henry, 46.
[3] Petrie, *Hawara*, 18, quoted by Murray, *Hdbk.*, 397.
[4] Fenger, 23. [5] *Olympia*, II, 183.

brownish reds which prevailed earlier. Blues, ranging from ultramarine through a medium shade to a light one, were also abundant. Yellow and green were selected for the ornamentation of mouldings, where also gold was sometimes employed. Blacks and whites were used sparingly. All of these colors were chiefly derived from earths and minerals. In their application strong contrasts rather than delicate gradations were preferred. Such contrasts were shown not only in the large members, such as the blue triglyphs which project clearly from the red or white metopes, but in almost every ornamental detail. A few colors only, usually two or three, were employed with rhythmical sequence. The color was applied in flat masses, and only in exceptional cases and at a late period was an attempt made to produce the effect of relief by means of shadows.[1] Color harmonies and the subordination of tones were not carried very far, but the colors employed in the archaic period harmonized well with the dark red tiles of the roofs ; while the brighter colors of the classic period made brilliant contrasts on the white marble buildings.

Decoration by painting was preferred for Doric, decoration by sculpture for Ionic, architecture. This was especially true in the case of mouldings, where the Doric were shaped into the desired form and received in addition a painted ornament, while the Ionic were seldom left without some kind of carved decoration. Not only mouldings, but also columns, with their bases, shafts, capitals, as well as entablatures with their epistyles, friezes, cornices and roofs with their simae, antefixes and acroteria, were decorated with sculptured ornament. In the early

[1] *Olympia*, II, 185, Taf. 113, 4.

period this decoration was flat and closely related to painted ornament. Even pedimental sculpture was sometimes, as in the poros reliefs from the Acropolis at Athens, executed in low relief. Usually, however, deep recesses like the triangular gable were decorated with sculptures nearly, if not altogether, in the round; shallower recesses, like metopes, with sculptures in half relief; platbands, with low relief. In the classic period ornamental details show a beauty of form and charm in composition, which was usually lacking in the workmanship of the later period.

2. Types of Greek Ornament.—The types of ornament applied to the decoration of architectural forms by the Greeks are surprisingly few. They may be classed, in general, as geometric, floral, zoömorphic and anthropomorphic.

Geometrical types reached their highest development in the archaic period. These include closed patterns, such as rectangles, squares, lozenges, polygons, circles and disks, ovals and ovoids; running patterns, such as zigzags, rectilinear and curvilinear maeanders, scrolls and braids; diapered patterns composed of squares, polygons, circles or scrolls. Squares of blue glass occur in the alabaster frieze from Tiryns. Red and cream-colored squares in diapered pattern decorate a sima and acroterion from the Acropolis at Athens.[1] Rectangles are used in an interesting way in the decoration of the gable acroterion of the Heraion at Olympia.[2] They are colored in regular order, violet, black, white, black, and, in their arrangement, form a steplike pattern. Lozenges were painted on the terracotta plaques from the cornice of the Treasury of Gela at Olympia,[3] and carved in the ceiling of the Philippeion

[1] Wiegand, Taf. 9. [2] See Fig. 293. [3] *Olympia*, I, Taf. 41.

(Fig. 163). Polygons were a frequent motive in Greek mosaic pavements, if we may judge from the splendid pavement in Nero's palace at Olympia.[1] Disks showing

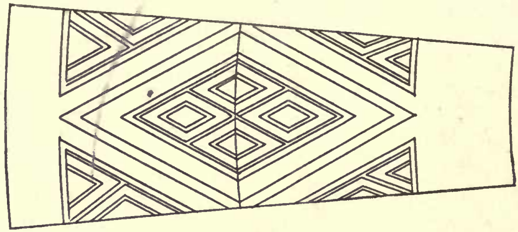


FIG. 163. — Lozenge decoration of ceiling of the Philippeion, Olympia.

the flat side decorated the lintel of the Tholos of Atreus, and the epistyle of the Porch of the Maidens in the Erechtheion; disks in profile occur with but slight variation in form in the bead and reel moulding (ἀστράγαλος).

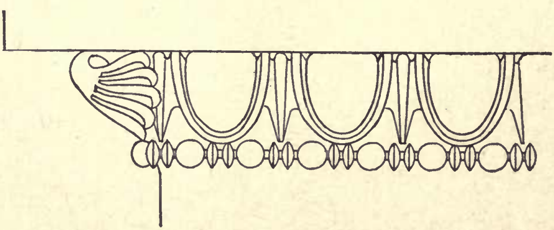


FIG. 164. — Bead and reel, also egg and dart, ornament.

Oval or ovoid forms are seen in the beads of these mouldings and in the egg and dart ornament (Fig. 164).

Running patterns were applied on short and vertical, as well as on long, horizontal surfaces. Elaborately carved and ornamented zigzags, separated by a running pattern of spirals, decorated the shaft and capital from the Tholos of Atreus (Fig. 165). Painted zigzags ornament an ar-

[1] *Olympia*, II, Taf. 108–110.

chaic sima from the Acropolis at Athens.[1] The rectilinear maeander (*μαίανδρος*) occurs in many forms and applications. It is not merely a ceiling decoration (*κόσμος τις ὀροφικός*) as defined by Hesychios, but decorates also platbands in the bases of columns, abaci of capitals, and cornices. The rectilinear maeander sometimes appears as a disconnected pattern, as in cornice of the Treasury of Gela (Fig. 166), but more frequently as a continuous, or running, pattern. The continuous pattern may be simple (Figs. 167, 168), or enlivened with ornamental squares or stars set at rhythmical intervals, as in cornices from Ephesos and from Olympia.[2] Maeanders with squares, or rosettes, or stars, are usually composed of two running bands (Fig. 169). More complicated is the maeander of the wall cornice of the Treasury

FIG. 165. — Zigzag ornament from the Tholos of Atreus, Mycenae.

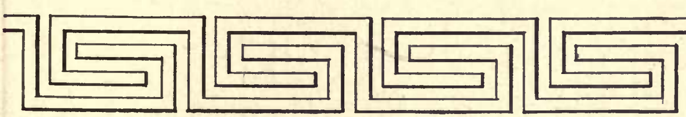


FIG. 166. — Maeander from the Treasury of Gela, Olympia.

of Sikyon (Fig. 170) and that over the Panathenaic frieze of the Parthenon, composed of three running bands, and enclosing two rows of checkered squares.

The scroll pattern may be discontinuous, as on the great acroterion of the Heraion at Olympia (Fig. 171),

[1] See Fig. 296.

[2] *Olympia*, II, Taf. 113.

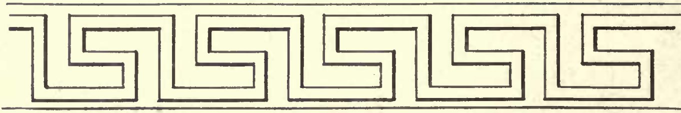


Fig. 167. — Maeander from Olympia.

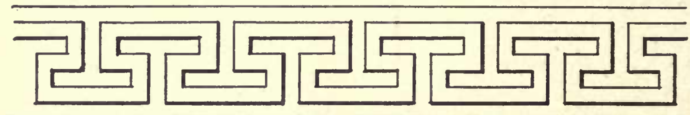


Fig. 168. — Maeander from archaic cornice from Athens.

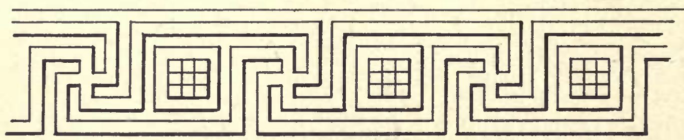


Fig. 169. — Maeander from the S.E. building, Olympia.

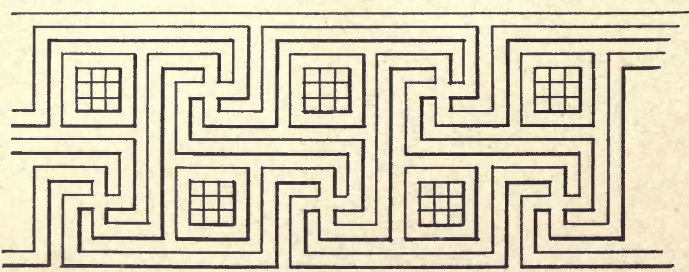


Fig. 170. — Maeander from the Treasury of Sikyon, Olympia.

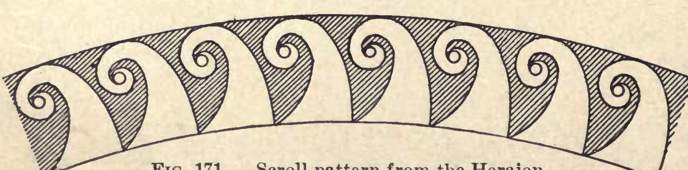


Fig. 171. — Scroll pattern from the Heraion.

or continuous, such as that painted on the hearth of the Megaron at Mycenae (Fig. 172), and on a sima from

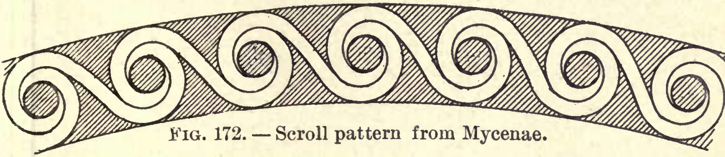


FIG. 172. — Scroll pattern from Mycenae.

Olympia (Fig. 173). This pattern might well be designated a curvilinear maeander. The scroll was exceedingly popular in Egyptian art of the Middle and New Empires; even the little palmettes which sometimes fill the

FIG. 173. — Scroll pattern from Olympia.

angles in Greek scrolls are common in Egyptian designs.[1] Branching scrolls occur in the necking of capitals from the Erechtheion (Fig. 174). Such complicated scroll patterns, however, were seldom used in architectural decoration before the late Hellenistic, and Roman, periods.

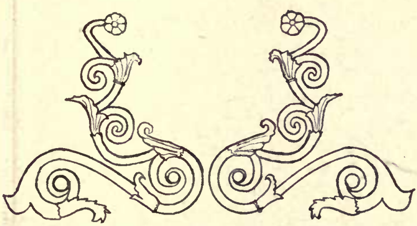


FIG. 174. — Scroll pattern from the Erechtheion, Athens.

Another running pattern, which is found in all periods of Greek art, is the guilloche or braid pattern. A discontinuous, single-band variety occurs on the raking cornices from the Old Temple of Athena at Athens (Fig. 175).

[1] Prisse d'Avennes, Pls. 27–30; Petrie, Figs. 50, 56.

The two-band type, however, was more common, even in the archaic period. The Acropolis of Athens again furnishes excellent examples (Figs. 176, 177). Even a three-

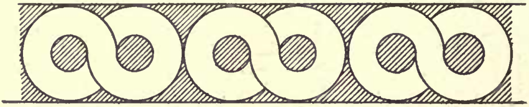


Fig. 175. — Braid pattern from Athens.

band braid arranged in two courses was found among the archaic fragments from the Acropolis (Fig. 178). Triple-coursed braids occur on the upper torus mouldings of the

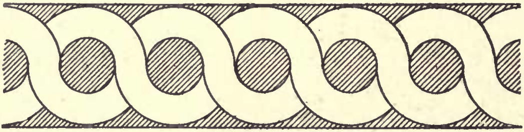


Fig. 176. — Braid pattern from Athens.

column bases of the North Porch of the Erechtheion.[1]

Diapered patterns, composed of the preceding elements, were used to decorate broad surfaces like pavements and

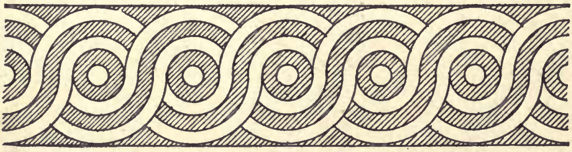


Fig. 177. — Braid pattern from Athens.

ceilings. Intersecting squares, hexagons, octagons, circles and other designs are found in the mosaic pavements from the Roman baths near the Kronion[2] and from the Palace of Nero at Olympia,[3] and were probably repre-

[1] See Fig. 208. [2] *Olympia*, II, 182. [3] *Ibid.*, Taf. 108–110.

sented earlier in Greek pavements. Diapered spirals are found in the well-known carved ceiling of the Tholos at

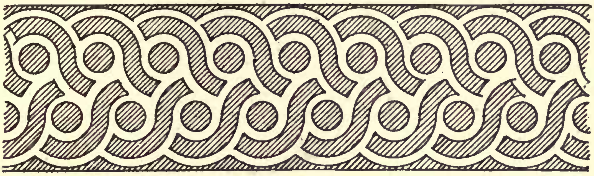


Fig. 178. — Braid pattern from Athens.

Orchomenos (Fig. 179), for which Egyptian ceilings[1] undoubtedly furnished the inspiration.

Conventionalized floral types were even more character-

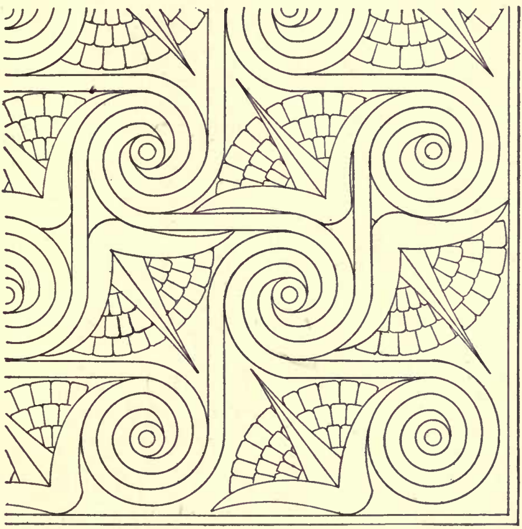


Fig. 179. — Ceiling from Tholos at Orchomenos.

istic of Greek ornamentation, and included various forms of leaves, stems, flowers and fruit. The archaic and classic

[1] Prisse d'Avennes, Pls. 27–30.

types of leaf decoration were so conventionalized as to suggest little of nature. Identification in such cases is, therefore, idle speculation. The most common and characteristic Doric leaf ornament was that which decorated

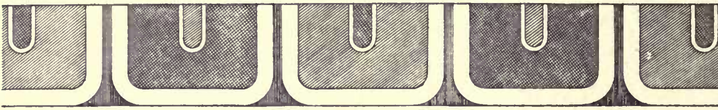


FIG. 180. —Doric leaf pattern from the Temple of Themis, at Rhamnous.

the beak mouldings of anta capitals and cornices. It consisted of broad, flat leaves, the ends of which were slightly rounded. This type of ornament was imported from Egypt to Crete in the pre-Mycenaean period.[1] In the classic period, the leaves were usually colored alternately red and blue. Only the central spine suggests the leaf origin (Fig. 180). Occasionally, as in a terra-cotta cornice from Olympia (Fig. 181), the leaves were terminated

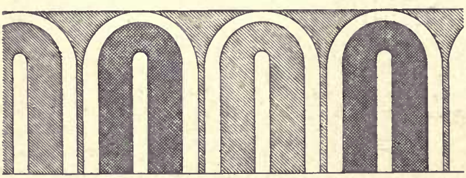


FIG. 181. — Doric leaf pattern from Olympia.

with a strongly rounded arch. More pointed leaves, like those of the laurel, were also used, as in some bases from the Temple of Apollo near Miletos and the Artemision at Magnesia; and long, lançeolate leaves were used in the capitals from the Theatre of Dionysos and in the Tower of the Winds at Athens. The so-called "egg and dart" was also treated as a leaf motive. Thus, in the South East building at Olympia (Fig. 182) and elsewhere the "eggs"

[1] *G.B.A.*, XXXVII (1907), 105.

are painted with a central spine, and the "darts" represent lanceolate leaves.

A characteristic decoration in Ionic architecture is the heart-shaped "leaf and dart" upon mouldings having the form of the cyma reversa.[1] Aischylos alludes to this when he speaks of the Lesbian cyma with its triangular rhythms.[2] Whether sculptured or painted, this ornament seldom lost its central spine (Fig. 183). Other forms of leaves — the olive, the oak with its acorns, ivy and grape

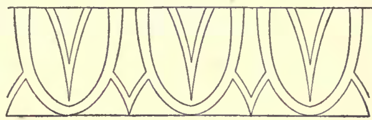


FIG. 182. — Egg and dart pattern from Olympia.

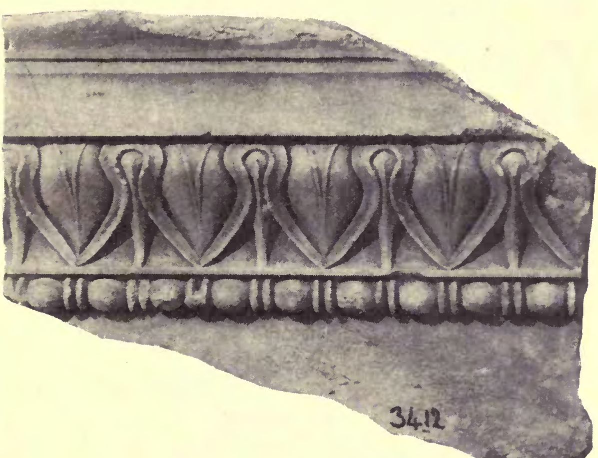


FIG. 183. — Ionic leaf pattern from the Acropolis Museum, Athens.

leaves — occur occasionally. With the development of plastic forms a leaf, popularly identified as the acanthus,

[1] *A.J.A.*, X (1906), 282–288. [2] Fragment 72 : . . . *ἐν τριγώνοις ῥυθμοῖς.*

gradually assumed a permanent place in Greek decoration. It appeared, timidly employed, in the necks of the columns and in the raking sima of the Erechtheion, and in the decoration of the mouldings of the door of the North Porch. Iktinos used it in the capital of a column at Phigaleia. Polykleitos, the younger, employed it in a bolder way in the Tholos at Epidauros, not only in the capitals of columns, but also in a wall frieze and in a sima. In the Hellenistic art of Asia Minor and in the Imperial temples of Rome the acanthus reached the climax of its development. It became the favorite type of decoration for capitals of columns, and was frequently used to decorate the friezes of temples. An acanthus frieze of striking character is supposed to have once adorned the Temple of the Sun at Rome.[1] More elaborate, and yet exceedingly beautiful, is the acanthus scroll work on the Ara Pacis Augustae at Rome.[2] Greek artists under Trajan continued to employ this type of decoration with great skill. Stems (*cauliculi*) entered into the acanthus decoration with increasing complexity, whether employed to support the volutes of the capitals or to serve as the basis for scroll ornament, and reached a climax in the elaborate acroteria of the Ionic Temple and Trajan's Temple at Pergamon.[3]

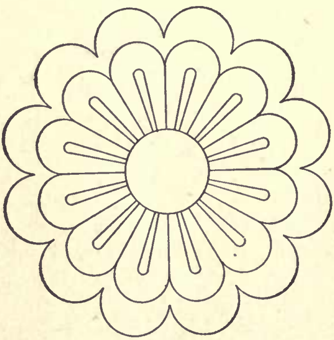


FIG. 184. — Rosette pattern from Tiryns.

[1] d'Espouy, Pl. 63; Middleton, II, 184, note 1. [2] Strong, Pl. 18.
[3] *Pergamon*, IV, Taf. 40; V, Taf. 15.

The rosette was a common type in Greek architectural ornament. It seems to have been suggested by some form in the floral world, either by the lotus,[1] or the daisy, or some composite flower with radiating petals. It was strongly conventionalized even in the Mycenaean period, as may be seen in the carved ornamentation from Tiryns (Fig. 184), Mycenae, Orchomenos, and Phaistos. In the archaic period it was treated with great severity, as in the terra-cotta fragments from the Acropolis at Athens (Fig. 185).

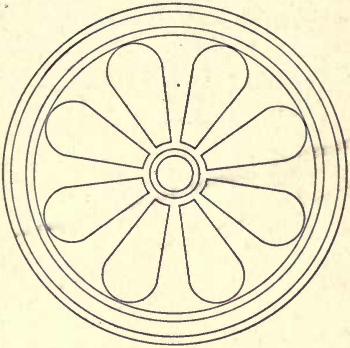


Fig. 185. — Rosette pattern from Athens.

The better artists of the classic period produced richer forms of rosettes, such as those which decorate the North Portal of the Erechtheion and the metopes of the Tholos at Epidauros (Fig. 186). From a later period are the terra-cotta rosettes found in front of the Bouleuterion at Olympia (Fig. 187).

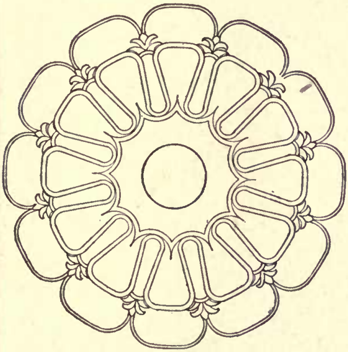


Fig. 186. — Rosette pattern from Epidauros.

Closely associated with the rosette are the palmette and the lotus. These two

[1] Goodyear, Figs. 5, 6.

patterns were so conventionalized as to make their identification with specific flowers doubtful; but as both were used at a very early date in Egypt it is possible that they were suggested by the Egyptian lotus.[1] Sometimes the two forms are so much alike that it is difficult to distinguish them, but, in general, in palmettes the petals, and in lotuses the sepals, are most strongly marked. Archaic examples strongly resembled Egyptian prototypes. Classic artists made these patterns stately and graceful, — witness the antefixes of the Parthenon, and the column necking, the epikranitis, and the sima decoration of the Erechtheion. In the Hellenistic period, the favorite type of palmette shows S-shaped petals, as, for example, the slender, graceful antefixes of the Leonidaion at Olympia (Fig. 188). Here the petals show not only a double curve in a flat plane, but are curved outward into a third dimension of space.

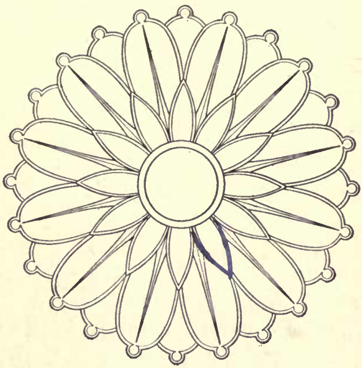


FIG. 187. — Rosette pattern from Olympia.

As a running design the palmette and lotus exhibited many forms. The patterns were sometimes juxtaposed, but not connected, as on some simae from the Acropolis at Athens;[2] but usually they were united to each other by curved stems or bands, as on a sima from one of the Treasuries at Olympia (Fig. 189). The normal juncture,

[1] Goodyear, 115–119.

[2] Wiegand, Taf. 9.

however, was a current spiral, as we see it in examples of this ornament from the Erechtheion. The uniting bands, as well as the floral patterns, varied considerably in plastic character as well as in linear treatment. This design was naturally adapted for the ornamentation of crowning members, where we should expect to find the patterns set upright. The Greeks did not, however, hesitate to use it as a pendent motive, as, for example, on the central moulding of an archaic, or early classic, anta found near the Temple of Apollo near Miletos.[1] A popular variety was the form in which the patterns were set base to base, lotuses opposed to lotuses, palmettes to palmettes, or lotuses to palmettes. The sima from Temple C, Selinous, furnishes an early example of the alternating variety (Fig. 190). The cornice

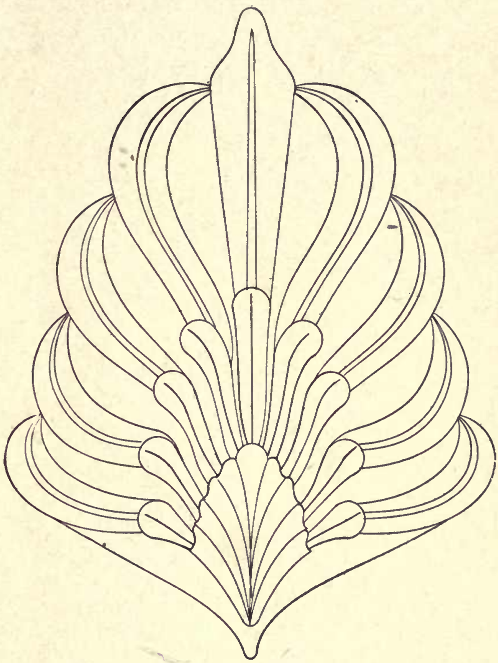


FIG. 188. — Palmette pattern from the Leonidaion.

[1] Haussoullier, Pl. 18.

from Temple F, Selinous,[1] presents a more developed example of nearly classic design. A late example may be seen at the Temple of Apollo near Miletos,[2] where the

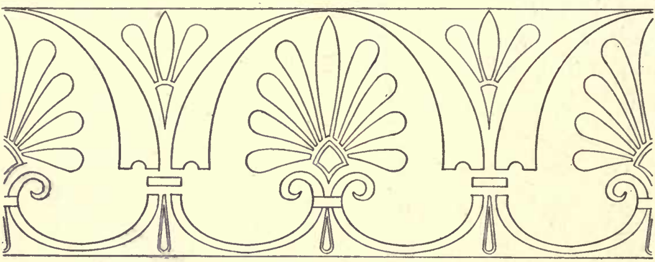


FIG. 189. — Palmette and lotus pattern from Olympia.

torus of one of the column bases is thus decorated. Ordinarily it is the same type of lotus and palmette that recurs in the design, but at the Temple of Apollo near Miletos, several different types were introduced and repeated at wide intervals. In Roman decoration the acanthus was sometimes used as a running pattern resembling the palmette and lotus.[3]

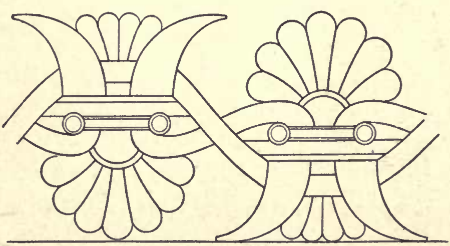


FIG. 190. — Palmette and lotus pattern from Temple C, Selinous.

The introduction of flowers, as those on the smaller tendrils of the Erechtheion neck ornament, of acorns, as in the over-door of the Temple of Rome and Augustus

[1] See Fig. 297. [2] Haussoullier, Pl. 14.
[3] d'Espouy, Pl. 62.

at Ancyra, of olives, as in the base of the Column of Trajan at Rome, or of pine cones, grapes, or garlands of fruit and flowers, seldom occurred before the Hellenistic or Roman period.

Zoömorphic designs did not figure largely in Greek decoration. On the archaic sculptures from the Acropolis at Athens we find eagle feathers and serpent scales[1] represented by the same pattern. This was also employed upon the echinus of an archaic Athenian capital.[2] Entire animals were sometimes employed as ornament, as the eagles beneath the raking cornice of the old Athena Temple[3] on the Acropolis, the eagles and the owls on the frieze of the Propylaia at Pergamon,[4] or the griffins which capped the gable ends of the Temple of Aphaia at Aegina. But animal heads were more commonly employed in this way. Such were the bucrania, or ox heads, which passed from Egyptian into Mycenaean art and became a common motive in Hellenistic and Roman decoration, also the lion heads, used as water spouts and as mere decoration on the simae of Greek temples of every period.

Anthropomorphic decoration is exemplified by the Maidens (*κόραι*), which stood as columns in the Treasury of the Knidians at Delphi,[5] and the Porch of the Maidens at Athens; and the Telamones, or Giants, which served as decorative supports in the Temple of Zeus at Akragas. Human masks also were employed decoratively, as in the archaic temple antefixes for the Greek cities of southern Italy (Fig. 191). In the Hellenistic period human bodies or masks were associated with acanthus foliage, as in the

[1] Wiegand, Taf. 3–5. [2] Durm, 91. [3] Wiegand, Taf. 1–3.
[4] *Pergamon*, II, Taf. 29. [5] See Fig. 221.

decoration of the Artemision at Magnesia and of the Temple of Apollo near Miletos.[1] This type of decoration reached its climax in the beautful reliefs from Trajan's Forum.[2] Vari-

FIG. 191. — Archaic antefix in A. M. private collection.

ous products of art and industry, such as vases, candelabra, trophies, and imaginary architecture entered into Hellenistic decoration, but became much more common under the Romans.

Mythological motives abound in Greek decoration. To treat of these adequately would be to write the history of Greek sculpture and painting, for pediments, metopes, friezes, wall paintings, and pictorial reliefs exhibited mythological compositions almost exclusively. Sometimes, as in the Parthenon and the Temple of Zeus at Olympia, the subjects selected were more or less closely associated with the divinity to whom the temple was dedicated, but frequently they seem to be quite irrelevant.[3]

[1] Haussoullier, Pl. 16. [2] Alinari photographs, Nos. 6342–6345.
[3] Tarbell and Bates, *A.J.A.*, VIII (1893), 18–27.

As with geometrical and floral ornament, so here certain fixed types became popular and were repeated as pure decoration. Such subjects as the Labors of Herakles, of Theseus, contests of Gods and Giants, Lapiths and Centaurs, or Greeks and Amazons, were frequently used with as little regard to significance as was the palmette or the lotus.

3. Decoration of Foundations, Pavements, and Walls. — It is sometimes assumed that Greek decoration never failed in being properly adapted to architectural forms, but a study in detail of the application of Greek ornament will disprove this assumption. It is important, therefore, that we should be acquainted not merely with the motives which make up the repertoire of the Greek decorator, but also with the principles by which he was guided in the decoration of each architectural detail. We may follow the same order as in our consideration of architectural forms, treating first of foundations and walls with their openings, then of piers and columns and their entablatures, then of roofs and ceilings.

The foundations of a Greek building, when more than a mere projecting socle, consisted of a stepped krepidoma or of a raised podium. In archaic and classic buildings a severe type of krepidoma prevailed, which was left undecorated. In the wings of the Propylaia at Athens, beneath the three-stepped krepidomas and to mark their separation from the supporting walls below, we find a dark course of Eleusinian stone; but in later buildings, each step was separated from the other by deep lines of shadow, produced by undercutting the lower edge of each step, as in the Leonidaion at Olympia (Fig. 192). In the Philippeion (Fig. 193) the process of individualization was carried still farther, for not only were the edges of each step undercut, but each block had a complete anathyrosis. This produced the effect of breaking each step into a series of independent blocks, and thus weakened its appearance as a foundation.

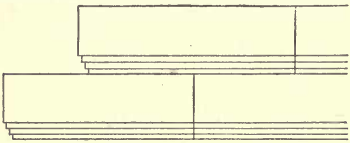


Fig. 192. — Steps from the Leonidaion, Olympia.

In the case of podia, the base and crowning mouldings sometimes received the principal decoration. In the podium of the Monument of Lysicrates each course of blocks composing the die had a marginal drafting at its base which served to decorate it by a series of horizontal lines of shadow. The podium of the Mausoleion at Halikarnassos and that of the Great Altar at Pergamon were decorated with sculptured friezes and with elaborate base and cornice mouldings.

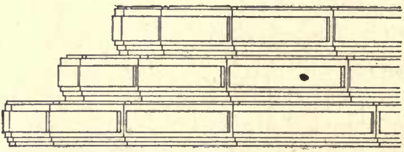


Fig. 193. — Steps from the Philippeion, Olympia.

Pavements were decorated in various ways. At Tiryns and Mycenae pavements of concrete were ornamented with scratched lines forming geometrical patterns; at Phaistos (Fig. 194) and Hagia Triada large slabs of gypsum were so arranged and separated by lines of red stucco as to form a regular design; at Priene[1] pebbles laid alternately flat and on edge were arranged in regular patterns. In Greek temples marble pavements were laid so as to emphasize the front, or the long sides, or to

[1] *Priene*, 177.

give all sides of the peristasis equal importance. Highly decorative and figured mosaic pavements did not appear before the Hellenistic or the Roman period. The earliest of these, that in the pronaos of the Zeus temple at Olympia,[1] with its geometric and floral borders, suggests the pattern of a rug. Pompeian mosaics sometimes exhibited elaborate pictorial compositions.

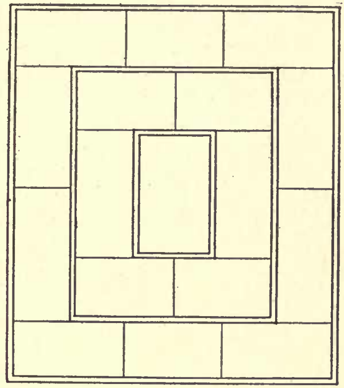


Fig. 194. — Pavement from the palace at Phaistos.

An unusual kind of decoration is found in the Temple of Athena at Priene. Here the doors to the naos swing inward and were guided by curved channels sunk in the pavement (Figs. 195, 196). These channels are carved on either side into fasciae, which add charm to the otherwise awkward clefts in the pavement.

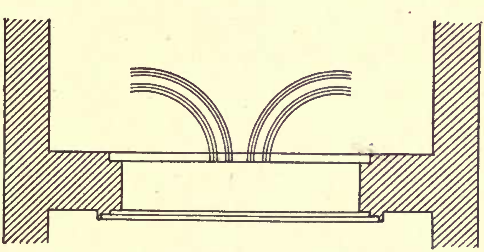


Fig 195. — Door-tracks from the Temple of Athena, Priene.

Walls were decorated in various ways: by breaks in the continuity of their surface, by the concealment of structure, by the emphasis of structure, by base, central and crowning mouldings, and by wall pictures. Wall

[1] *Olympia*, II, 180, Taf. 105; Blouet, I, Pls. 63–64.

surfaces, if continuously unbroken, are wearisome from their monotony. In fortifications bastions and towers served to break this monotony. In the wall of the Leleges near Iassos in Caria,[1] the continuity of the wall was broken by vertical set-backs, deep enough to have been useful in flanking an enemy. But at Troy, Mycenae, and elsewhere, the vertical set-backs are so slight as to serve no useful purpose beyond that of breaking the monotony of the continuous walls. Similar to these, but more decorative, are the pilasters set at rhythmical intervals around the hypaethral courts of the Temple of Apollo near Miletos. Horizontal set-backs similarly broke the monotony of continuously vertical walls.

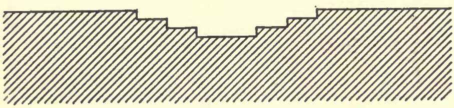


FIG. 196. — Profile of door-tracks from the Temple of Athena, Priene.

A second method of decorating walls was to conceal their structure. In Greece, as well as elsewhere, stucco revetments concealed poorly constructed walls and served as a ground for superficial ornamentation. Marble revetments, varied in color or pattern, decorated the façade of the Tholos of Atreus at Mycenae, the palace of Mausolos at Halikarnassos, and the public buildings of Alexandria. In the pre-Mycenaean palace at Knossos, as well as in Hellenistic and Roman private houses at Delos and Pompeii, marble revetments were imitated in painted stucco. In buildings of the classic period, the walls were jointed as finely as possible so as to produce the effect of a monolithic mass, in which the actual con-

[1] Texier, III, Pl. 147.

struction from relatively small blocks was concealed from view.

A third type of wall decoration consisted in the emphasis of structure. In the Museum at Candia there are a number of small glazed plaques, from Knossos,[1] which picture several types of houses. In some of these emphasis is given to the regular courses of masonry set in horizontal courses with alternating joints; others represent half-timbered construction. A similar emphasis of structure is exhibited in the archaic fragments from the Acropolis, which portray the oldest Erechtheion.[2] Here walls are represented in which every block is marked by a complete anathyrosis. In the classic period, heavy walls, such as those of fortresses, were composed of blocks which were carefully dressed at the borders. But for finely constructed walls smoothly dressed blocks without marginal draftings were preferred. In some cases where these still persist, as in the Propylaia at Athens, the walls may be considered as unfinished. In later buildings, however, marginal draftings were left for aesthetic effect. In the pedestal of the Choragic Monument of Lysicrates only the horizontal joints have marginal draftings. At Magnesia on the Maeander, at Priene (Fig. 197), and elsewhere the vertical joints were very strongly emphasized and the faces of the blocks slightly rounded. An extreme limit was reached by the Byzantines, who did not hesitate in some cases to point their walls with gold.

A fourth method of wall decoration consisted in the adornment of the base, body, and crowning mouldings. Wall bases usually presented a socle and orthostatai,

[1] *B.S.A.*, VIII (1901–1902), 14–22. [2] Wiegand, Taf. 14.

which we have considered as formal characters. But the broad, almost unbroken surface of the orthostatai contrasted with the detailed play of lines in the masonry above and thus became a part of the wall decoration. To the present day, a dado is an aesthetic rather than a practical necessity. Beneath the orthostatai, in buildings of the Ionic order, were usually a series of mouldings. These mouldings in the Treasury of the Phocaeans at Delphi[1] and in the Temple of Athena Nike at Athens, repeated the decoration as well as form of the base mouldings of the columns. In other cases, as in the Erechtheion, anta and column bases were emphasized by more richly decorated mouldings. The body of walls in archaic and classic buildings was seldom broken by string courses. The white marble town walls of Thasos[2] were, however, decorated with a horizontal band of black stone,

Fig. 197. — Wall from Priene.

[1] Homolle, *Le Temple d'Athêna Pronaia*, 10.

[2] Perrot et Chipiez, VIII, 17.

and in the Pinakotheke of the Propylaia at Athens, the blue Eleusinian stone of the window-sills was continued along the side walls. At a later period architects more frequently broke the monotony of vertical walls by string courses, as in the façade of the Temple of Zeus at Aizanoi.[1]

The crowning mouldings of walls were usually more

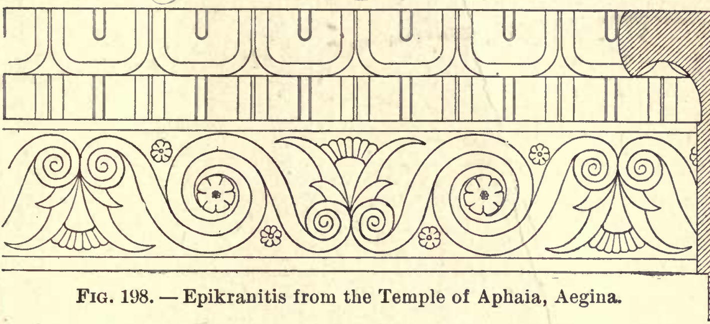


Fig. 198. — Epikranitis from the Temple of Aphaia, Aegina.

highly decorated than those of the base. In the Treasury of Sikyon at Olympia, which is a *ναὸς ἐν παραστάσιν*, the triglyphal frieze and cornice with mutules was continued around the outer walls of the cella, while the interior walls were capped by a platband surmounted with a beak moulding. In the Temple of Aphaia at Aegina (Fig. 198) the platband was adorned with a scroll and lotus pattern of severe but interesting design. The epikranitis of the exterior of the cella walls of the Parthenon (Fig. 199) was more complicated. Above the well-known sculptured frieze was a cyma reversa decorated with the Lesbian leaf and dart; above this a broad platband ornamented with a double-coursed maeander, and a beak moulding with the usual Doric leaf pattern. In some Ionic buildings,

[1] Texier, I, Pl. 30.

like the Temple of Athena Nike and the Erechtheion, an entire entablature with epistyle, frieze, and cornice was continued around the building above the regular epikranitis. In all these examples the real epikranitis con-

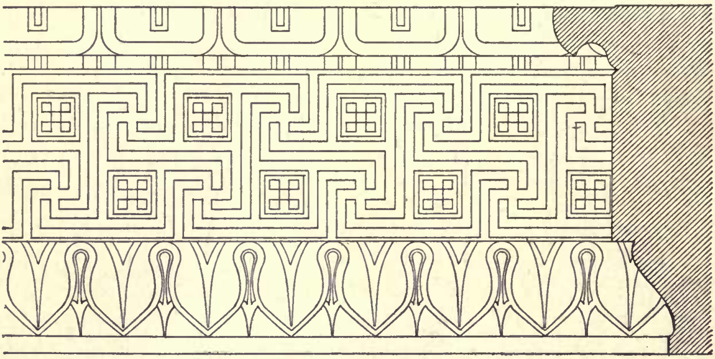


FIG. 199. — Epikranitis from the Parthenon.

sisted of a decorated platband, surmounted by painted or carved mouldings. The platband would seem to represent the wall plates which bound together the studs and corner posts of a frame building. In stone and marble buildings, this band with its decoration served an aesthetic purpose of a similar character. In the Hellenistic and Roman periods, the platband of the epikranitis was often decorated with some form of acanthus scroll, as in the Augusteum at Ancyra. An unusual, but not altogether successful, type of decoration was adopted in the temple of Mars Ultor at Rome,[1] where the epikranitis imitates a coffered ceiling.

A fifth method of wall decoration was by means of color. In the Thalamegos of Ptolemy Philopator[2] the

[1] d'Espouy, Pl. 52. [2] Athenaios, *Deipnos.*, V, 206.

walls of the dining hall were decorated with alternate bands of dark- and light-colored alabaster. The palace of Mausolos at Halikarnassos was ornamented with polychromatic marble revetments. The stuccoed walls of private houses, palaces, market-places, and temples afforded an excellent field for the display of the painter's art. The palaces at Knossos, Tiryns, and Mycenae have preserved interesting examples from the earliest period. The figured wall paintings of Polygnotos, Mikon, and other artists of the classic period are lost, but the paintings of a later period which have survived from Pompeii and Herculaneum were designed to imitate marble walls, pilasters, and cornices, or to produce fantastic architectural effects, or to portray historical, mythological, or other such scenes. These paintings, as a rule, harmonized well with the character of the building they were intended to decorate.

4. Decoration of Doors, Windows, Antae, and Pilasters. — Doors and windows were sometimes left as mere openings without decoration. This is especially true of the gateways and windows of well-constructed fortifications. But sills, lintels, and jambs set flush with the walls or slightly projecting were, from time immemorial, a means not only of protecting but also of decorating wall openings. Where severity of treatment was required, as in the agora at Aegae,[1] jambs and lintels were left without special decoration. But decorative forms were also given to door and window-frames. Sometimes jambs and lintels were recessed by a series of successive fasciae (*κόρσαι*), as in the tomb of Atreus at Mycenae or in the entrance to the theatre at Aizanoi. Lintels projecting beyond the jambs were used by the Greeks of Asia Minor,

[1] Bohn-Schuchhardt, Figs. 16, 17, 24.

as well as by the Etruscans. They occur in the western windows of the Erechtheion (Fig. 200), where they are emphasized by terminal mouldings. They are prescribed by Vitruvius.[1] In a rock-cut tomb at Antiphellos, the sill, as well as the lintel, was thus decorated. The doorways of the Parthenon and those of the Propylaia at Athens seem to have been decorated with bronze revetments. Richly carved decoration characterized the North Door of the Erechtheion (Fig. 201). Here the outermost fascia was framed by bead and reel mouldings and decorated by a series of rosettes. The second fascia had a more noteworthy decoration in the acanthus leaf and dart carved upon its cyma reversa moulding. This is, perhaps, the earliest example of this type of decoration. Doorways recessed with a series of fasciae occur so frequently on the façades of Lycian tombs as to lead us to believe that wooden doorways of houses and public buildings were similarly constructed from the light timber which alone was available in that country. Porches were often built in front of doorways opening on thoroughfares, and windows were provided with hoods

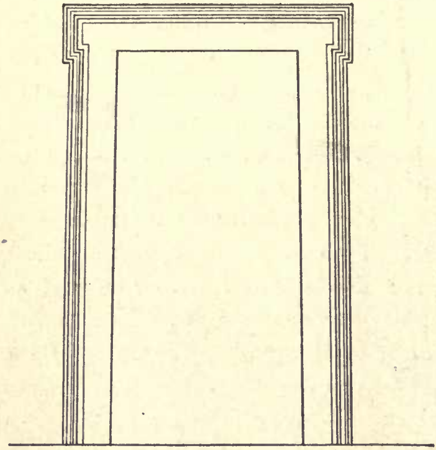


FIG. 200. — Western window, Erechtheion.

[1] Vitruvius, IV, 6, 2.

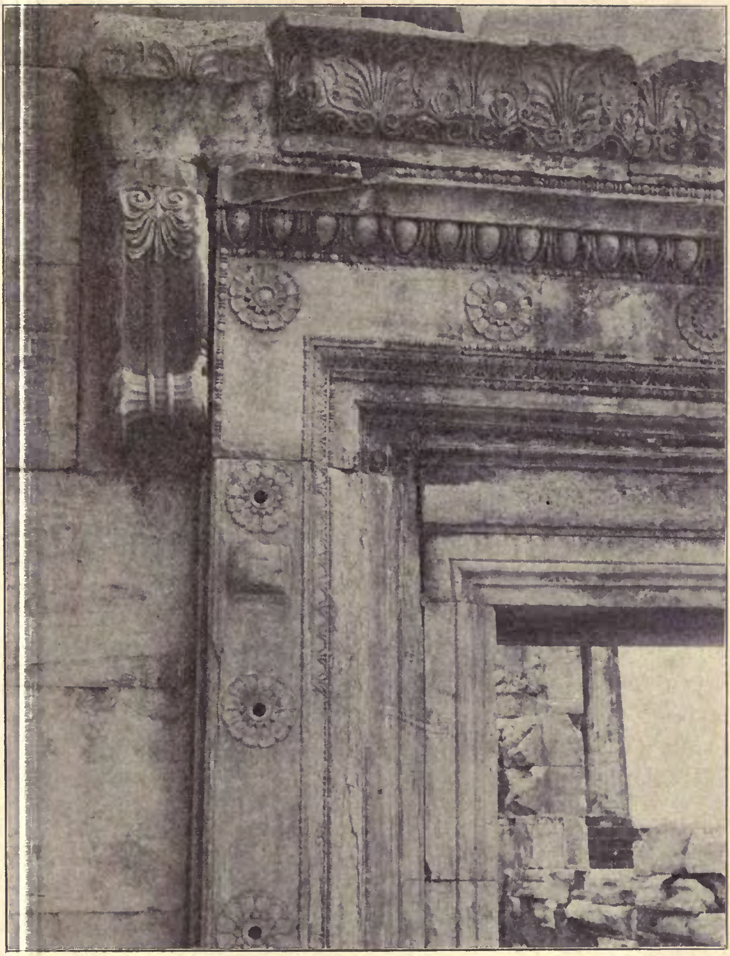


FIG. 201. — North door of the Erechtheion.

as a protection from sun or rain; hence followed naturally the columnar decoration of doorways, as in the Tholos of Atreus, and of windows, as in the Pinakotheke on the Acropolis at Athens;[1] hence also door cornices resting on consoles or brackets (*παρωτίς, ἀγκών, οὖς*), as in the North Porch of the Erechtheion. When a cornice with consoles was applied to a door-frame the lintel of which projected beyond the jambs, as in the Temple of Herakles at Cori,[2] the effect was less pleasing.

A word may be said about the decoration of the doors themselves. As already noticed, these were constructed so as to exhibit a series of panels, which were surrounded by mouldings, and decorated by such symbols as bolts,[3] lion heads[4] (*λεοντοκέφαλαι*), or Gorgon heads (*Γοργόνεια*).[5] We may well believe that, even in the archaic period, temple doorways were sheathed with figured bronze reliefs of similar character to those known as Argive reliefs, and that, in the classic and Hellenistic periods, decorated bronze doors continued to be used. Doors of carved wood, and of marquetry were also probably employed by the Greeks, and chryselephantine doors are recorded for the Temple of Athena at Syracuse.[6]

Antae, pilasters, and engaged columns received a decoration related to that of the walls or columns. Their bases, in the Doric order, were plain socles and orthostatai. In the Ionic order they received decorative mouldings similar to those of the walls in the Temple of Athena Nike at Athens, and in the Treasury of the Phocaeans

[1] Bohn, Taf. 9.
[2] Mauch, Taf. 56.
[3] Texier, III, Pl. 169.
[4] Texier, III, Pl. 174.
[5] Cicero, *Verr.* IV, 56.
[6] *Ibid.*

at Delphi. Sometimes, on the other hand, their decoration contrasted with that of the walls. Thus, in the North Porch of the Erechtheion, they are ornamented to correspond not with the walls but with the columns, and show a similar triple braid, with this interesting distinction — the pilaster bases have flowers in the centre and at the corners.

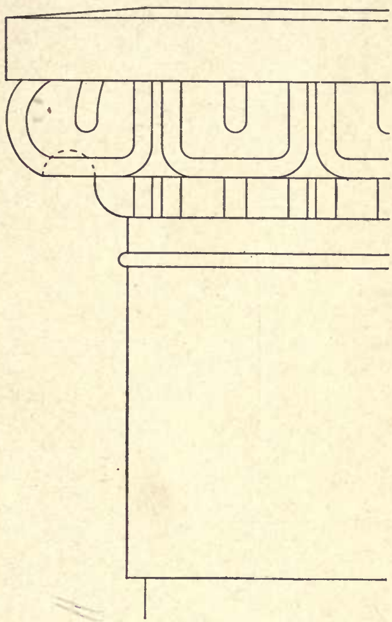


FIG. 202. — Anta capital from Aegina.

The shafts of antae and pilasters, in the early period, were decorated as walls or wall coverings. In later times they often had an independent decoration. Thus, for example, in the monument of Philopappos at Athens,[1] they were panelled, but as a rule they were channelled. Engaged columns in the Tomb of Atreus at Mycenae were decorated with elaborate zigzags, obviously in imitation of metal sheathing, but ordinarily they were decorated with channellings.

The capitals of antae and pilasters in the earlier periods were decorated to correspond with the epikranitis of the wall. In general, this decoration consisted of a platband

[1] Stuart and Revett, III, Ch. V, Pl. 3.

surmounted by a cornice moulding. In the Doric order the platband was usually left undecorated, as in the representative series of buildings at Olympia.[1] The crowning moulding was painted with the Doric leaf pattern. A typical instance is that of the Temple of Aphaia at Aegina (Fig. 202). In Attic buildings, as, for example, in the Parthenon (Fig. 203) or in the temple at Sounion, mouldings with carved decoration were placed beneath the painted beak mouldings. The abacus in the Doric order was usually undecorated, but in the Ionic it received crowning mouldings.

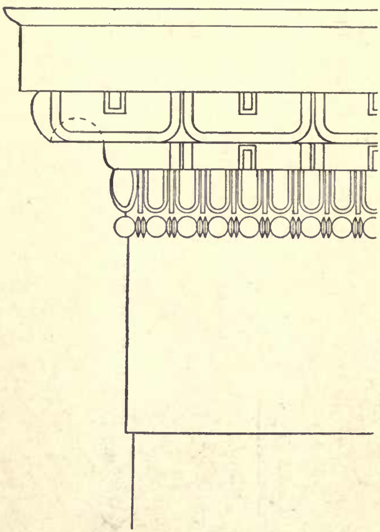


FIG. 203. — Anta capital from the Parthenon.

In the Ionic order the neck of the capital was given some form of sculptured ornament: rosettes in the Propylon of the Stoa at Pergamon;[2] palmettes and lotus flowers in the Temple of Athena Nike and the Erechtheion;[3] scroll work in the theatre at Miletos. Above the neck a series of mouldings was also carved. Even the crowning moulding of the abacus was provided with sculptured ornament.

[1] *Olympia*, II, 184.
[2] See Fig. 205.
[3] Stuart and Revett, II, Ch. II, Pl. 18.

In the Hellenistic period, capitals of antae and pilasters were frequently assimilated in decoration to the capitals of columns. In the Temple of Apollo near Miletos (Fig. 204) the pilaster capitals had undeveloped volutes. The channelled volutes and connecting bands were decorated with olive leaf, or scale ornament, and rosettes. The central space between the volutes was filled with an acanthus scroll between two griffins, and

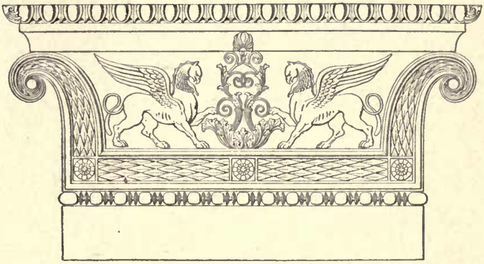


Fig. 204. — Pilaster capital from the Temple of Apollo, Miletos.

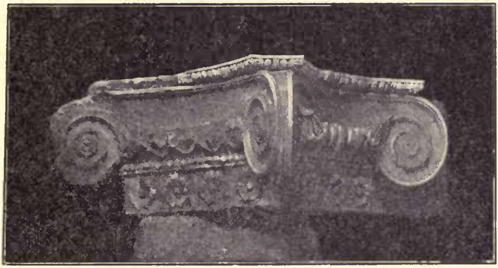
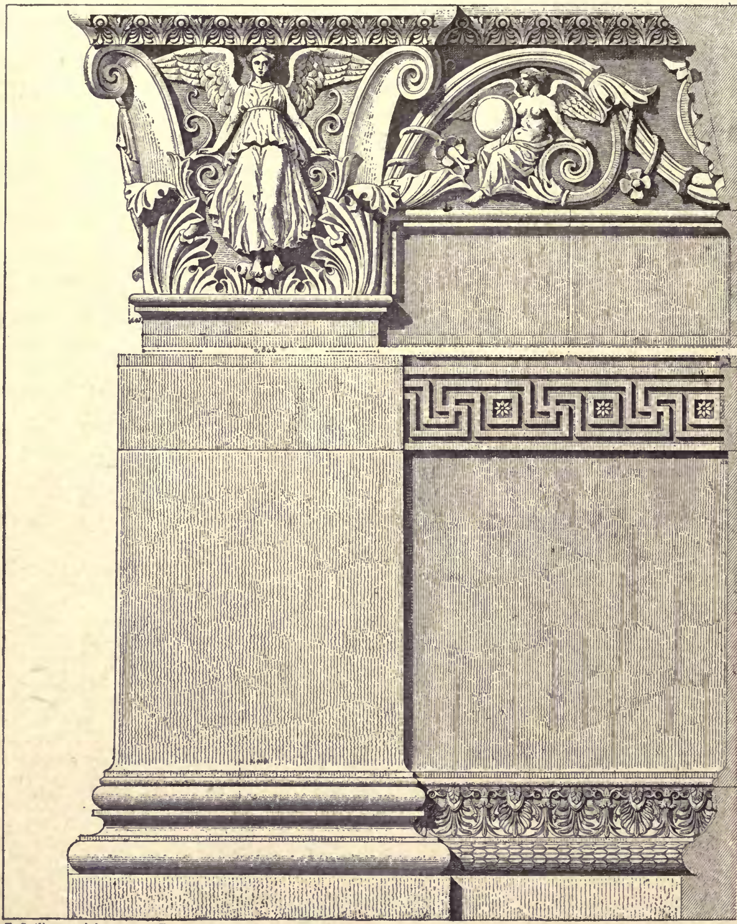


Fig. 205. — Anta capital from the Propylon at Pergamon.

the abacus capped with an egg and dart moulding. On the anta capitals of the Propylon of the Stoa at Pergamon (Fig. 205) are fully developed volutes and echinus. In the Augusteum at Ancyra (Fig. 206), the acanthus and winged genii dominate the decoration of



E. Guillaume del.

Fig. 206.— Anta capital from Ancyra.

the anta capitals, connecting them not only with the capitals of the columns but also with the epikranitis of the wall.

5. Decoration of Columns. — Columns varied not merely in form, but also in decoration, and their bases, shafts, and capitals all shared in furnishing decorative charm. The torus mouldings of column bases were usually left plain, but in Asiatic Greece were often deco-

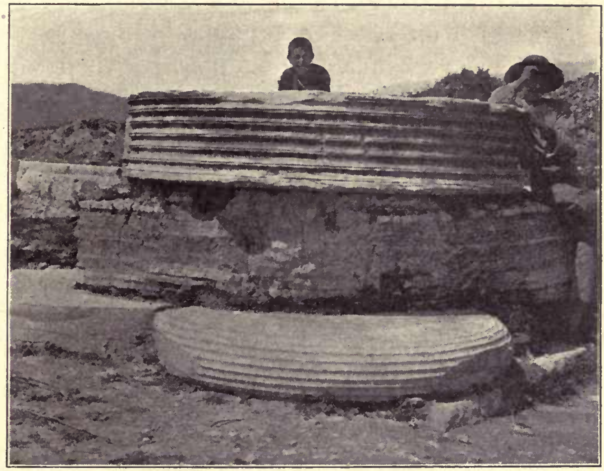


Fig. 207. — Column base from early and late Temple of Hera at Samos.

rated. In the Temple of Athena at Priene[1] those bases which are protected from the weather have their mouldings decorated with horizontal channellings, while the bases of the peristyle are channelled only on the lower half of their torus mouldings. The earliest architects of the Temple of Hera at Samos (Fig. 207), and those of the

[1] See Fig. 80.

Temple of Nike and the Erechtheion at Athens, were less practical in their methods, and, even for the exterior order, channelled the upper as well as the lower half of the torus mouldings. The horizontal channelling emphasized the base as distinct from the vertical support. This type of decoration must have appealed strongly to the Greeks of Asia Minor, for it was employed there for several centuries. In the column bases of the North Porch of the Erechtheion the upper toruses were decorated with a braid ornament, which on the two columns at the angles was formed by concave bands, and on the remaining bases of the porch by convex bands (Fig. 208). These may have been rendered still more effective by the insertion of enamel.[1] Hermogenes used the scale, or laurel leaf, pat-

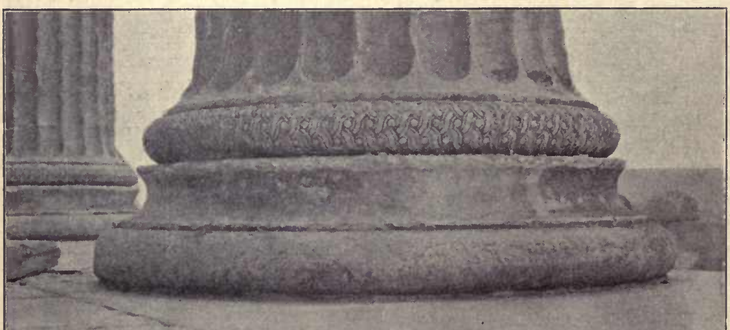


Fig. 208. — Column base from North Porch of Erechtheion.

tern to decorate bases of the Temple of Artemis at Magnesia, and the architects of the façade of the Temple of Apollo near Miletos[2] employed a series of different

[1] E. A. Gardner, *Ancient Athens*, 369.
[2] *Records of the Past*, IV (1905), 3–15.

motives to decorate the column bases of that temple (Fig. 209).

The shafts of columns were sometimes left undecorated. In some cases, as at Segesta, this is evidently to be accounted for by the unfinished state of the buildings. In

FIG. 209. — Column base from the Temple of Apollo near Miletos.

other cases, as in the Arsenal at the Peiraieus,[1] considerations of economy dispensed with decoration as unnecessary. Channelling (ῥάβδωσις) was almost the exclusive type of decoration employed by Greek architects for column shafts from the earliest to the latest period. In most cases, the channelling was carried completely around the

[1] Frazer, *Paus.*, II, 16.

shaft. It was, however, sometimes confined to the front or visible sides of shafts, as, for example, in the Treasury of the Megarians at Olympia, and sometimes to the upper portion of shafts, as in the Stoa of Attalos at Athens. Private houses of the Hellenistic and Roman period at Delos, Priene, and Pompeii bear witness to the growing tendency to leave the lower portion of shafts unchannelled. The Greeks of the classic period preferred channellings which followed the vertical line of the shaft, but more freedom was displayed both in the earlier and later periods. A Hellenistic relief in the Naples Museum[1] and a sarcophagus from Asia Minor[2] may be cited as examples of spiral channellings, which became a favorite type for the columns of Christian churches of all periods. The technical execution of channellings required considerable skill. Vitruvius[3] lays down rules for the designing of Doric and Ionic channellings, in both cases assuming them to be of circular section. But Greek channellings were not always circular. In the columns of the so-called Temple of Demeter at Paestum[4] they were elliptical, and in the columns of the Temple of Apollo at Phigaleia[5] they take the form of a three-centred arch. Greek columns were not perfect cylinders, but exhibited the qualities of diminution and entasis, hence the form and width of the channelling varied from the base to the summit of the shaft. The number of channellings soon became fixed at twenty for Doric, and twenty-four for Ionic columns; but there were many exceptions to this

[1] Schreiber, *Hell. Reliefb.*, Taf. 54.
[2] Strzygowski, *Byz. Denkm.*, III, Figs. 1, 2.
[3] Vitruvius, IV, 3, 9; III, 5, 14.
[4] Koldewey and Puchstein, 19.
[5] Cockerell, Pl. 13.

rule. Archaic Ionic columns, such as those of the Temple of Artemis at Ephesos,[1] had as many as forty-four channellings. Some late Ionic buildings, as the Leonidaion at Olympia, have columns with only twenty channellings. Similarly, in Doric buildings, examples might be cited of twenty-eight and twenty-four channellings at Paestum, eighteen at Orchomenos in Arcadia,[2] sixteen at Syracuse and at Sounion, and twelve at Tegea.[3] The shallow channellings of Doric columns were separated from each other by sharp arrises, and the deeper channellings of the Ionic order by flat arrises, or fillet mouldings. The ratio of the width of the channelling to the separating arris[4] varied from 3:1 to 5:1. The termination of the channelling at the upper and lower ends of the shaft exercised the ingenuity of Greek architects. In the angle columns of the so-called Temple of Demeter at Paestum (Fig. 210) the channellings terminate on the shaft against a fillet, becoming shallower as they ascend and having a flat elliptical contour, and a small leaf ornament between the channellings. Other columns of the same temple have channellings which die away against a roundel moulding. In the Parthenon (Fig. 211), as in Doric columns of the classic period in general, the channellings are carried through the neck of the capital and die away with an almost horizontal contour against the annuli. In later columns, as those of the Stoa at Pergamon (Fig.

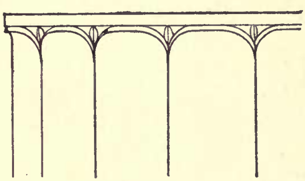


FIG. 210. — Column channellings from the Temple of Demeter, Paestum.

[1] Hogarth, 267.
[2] Frazer, *Paus.*, IV, 226.
[3] *Ath. Mitt.*, VIII (1883), 284.
[4] Marini, III, 3, note 31.

212), the channellings do not become shallower, but are carried abruptly against the annuli of the capital. In Ionic and Corinthian columns the channellings terminate usually in a semicircular contour and die away before or after the apophyge of the shaft begins. Late columns, such as those of the Forum Triangulare at Pompeii, frequently exhibit channellings with abrupt terminations like those of the Stoa at Pergamon. The channellings themselves, in late buildings, sometimes received special decoration, as, for example, small vases at the Temple of Zeus at Aizanoi (Fig. 213), or disks at the gymnasium at Solunto.[1]

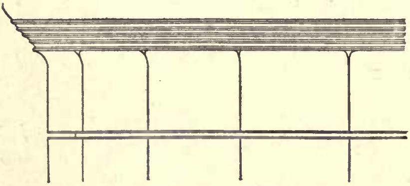


Fig. 211. — Column channellings from the Parthenon.

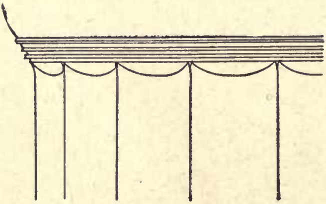


Fig. 212. — Column channellings from Pergamon.

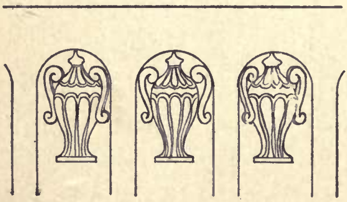


Fig. 213. — Column channellings from the Temple of Zeus, Aizanoi.

Even the arrises were decorated in the Erechtheion (Fig. 214) by an added moulding at the crown. What the origin of the Greek channelling may have been is not perfectly evident. The Egyptians had channelled columns a thousand years before we find them at Mycenae.

[1] Photograph No. 238, by G. Incorpora, Palermo.

At the tombs of Benihassan, the channelled columns with their play of light and shade have a greater charm than the polygonal shafts with flat faces. The Greeks also were not blind to the aesthetic effects of channelling. To describe it Aristotle[1] used the word ῥάβδωσις, which emphasizes their continuous vertical character. These vertical lines counteract the effect of the horizontal joints of the drums, when they become visible. Vitruvius[2] reasoned that, by means of channellings, columns might be made to appear broader, and that the slenderer columns of an inner order might in this way be made apparently equal to those of the exterior. According to modern writers, the object of channelling is to make columns appear slenderer, and to avoid the appearance of flatness and of variable proportions, to which an unchannelled shaft is subject when variously lighted.[3]

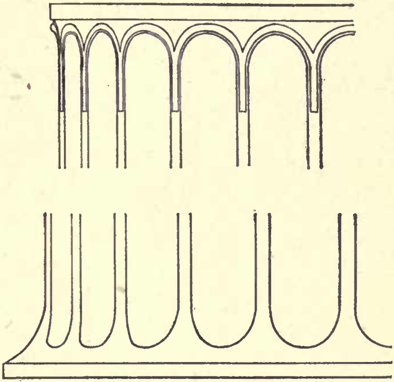


Fig. 214. — Column channellings from the Erechtheion.

Other modes of decorating the shafts of columns occur exceptionally, but deserve mention. Mycenaean gems, an archaic poros shaft[4] in the Acropolis Museum, and the support of a tripod from Plataia[5] exhibit spiral windings,

[1] *Nic. Eth.* 10, 4, 2.

[2] Vitruvius, IV, 4, 1–4.

[3] Uhde, I, 135–136.

[4] Belger in *Arch. Anz.*, 1895, 15.

[5] Daremberg et Saglio, *s.v.* Donarium, Fig. 2529.

the broad portions of which are convex and not concave, as in ordinary channellings. Convex flutings also occur on the lower portion of the engaged columns in the interior of the Tower of the Winds (Fig. 215), and were not uncommon in Pompeii. In the columns of the Choragic Monument of Lysicrates (Fig. 216) the channellings at the top of the shaft die away, and the arrises become the central spines of a lanceolate leaf ornament. When we consider the frequency with which reed bundle columns occur in Egypt and that they were in actual use over a large part of the Orient, it seems strange that reeded columns do not occur more frequently in Greek architecture. Channelling was usually carried from the base to the top of the shaft, but, even in the archaic period, a partial channelling was attempted, as in the *columnae caelatae* of the Temple of Artemis at Ephesos,[1] where the lowest drums were sculptured with figured decorations. The same method of decoration was employed in the fourth-century restoration of that temple (Fig. 217). Athenaios[2] tells us that the shafts in

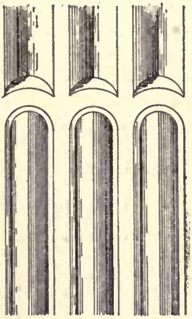


FIG. 215. — Channellings from the Tower of the Winds, Athens.

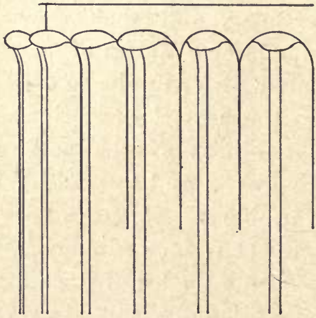


FIG. 216. — Channellings from the Monument of Lysicrates, Athens.

[1] Murray in *J.H.S.*, X (1889), 8.

[2] *Deipnos.*, V, 206.

the dining hall of the Thalamegos of Ptolemy Philopator were built up with drums of white marble alternating

FIG. 217. — Sculptured Drums from the Temple of Artemis, Ephesos.

with black, which, with the similarly decorated walls in the same hall, constitute the beginnings of a system of decoration which later Byzantine and Italian artists developed into a national style. Athenaios[1] also makes mention of shafts decorated with inlaid marble or precious stones. The decoration of columns and piers with mosaic, as exemplified in Pompeii and in Byzantine churches, was in all probability found in Greek buildings of the Hellenistic period. Carved or painted tablets (*στυλοπινάκια*) decorated the columns of the Temple of Apollo at Kyzikos.[2]

These later instances of polychromatic shafts raise the question how far shafts of columns were colored in earlier times. The present rusty coloring of Pentelic marble shafts is insufficient evidence to lead us to believe with Semper[3] that they were originally painted a warm, rich red. That the stuccoed shafts of the archaic period and the marble shafts of the classic period were left white, as Kugler believed, is probable in some instances. On the other hand, there appears to be substantial evidence that the earliest marble columns, and even those of the Theseion and the Parthenon, were covered with a thin coating of color.[4] This coloring matter fused with wax served to protect the surface of the marble and perhaps also give to it the appearance of ivory. The shafts of the proskenion of the theatre at Priene were painted red, while those of the Palaistra at Olympia were probably yellow.[5]

A common decoration of the Doric shaft consisted in the incised annuli at the upper end of the shaft. An elementary example occurs in the columns of Temple D at Selinous (Fig. 218). Here the lower end of the capital block was chamfered so as to protect the arrises of

[1] *Deipnos.*, XII, 514.
[2] Daremberg et Saglio, *s.v.* Columna, 1346.
[3] Semper, *Vorläuf. Bemerk.*, 48.
[4] Hittorff, 44–45.
[5] *Olympia*, II, 184.

the channelling from injury when being set in place. The ornamental character of this incision was recognized at once and the number of annuli increased. In the

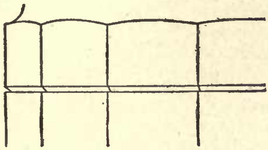


FIG. 218. — Incised annulus from Temple D, Selinous.

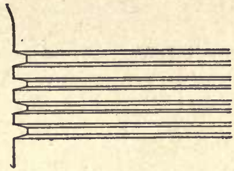


FIG. 219. — Annuli from the Treasury of Gela, Olympia.

Treasury of Gela at Olympia (Fig. 219) the shafts have four of these incised annuli; the temples of Poseidon at Paestum, of Apollo at Corinth, and several of the treasuries of Olympia show three incised annuli. These annuli were usually composed of two plane surfaces meeting at an angle, or separated by a fillet moulding. In the Temple of Apollo at Phigaleia (Fig. 220), and of Aphaia at Aegina, curved surfaces are employed in the construction of the annuli. The architects of the Parthenon and of the Propylaia reduced the number of annuli to one and were content with plane surfaces. In the Hellenistic period, this feature of the Doric shaft disappears altogether.

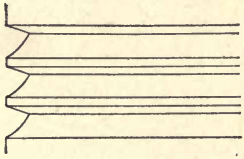


FIG. 220. — Annuli from Phigaleia.

The shafts of square pillars in the earlier periods, as in the Choragic Monument of Thrasyllos at Athens, were left undecorated. In the Hellenistic and Roman periods, their decoration was usually borrowed from that

FIG. 221. — Kanephoros from Knidian Treasury, Delphi.

of the columns. Channelling, partial or complete, was the normal type, as in the Tomb at Mylasa.[1] Figures in high relief decorated the piers of the upper story of the so-called Incantada at Thessalonica.[2]

Anthropomorphic supports were usually in the form of maidens (*κόραι*) bearing baskets or other burdens on their heads (*κανηφόροι*), and were described by Vitruvius[3] as Caryatides. The Treasuries of Knidos (Fig. 221) and of Siphnos at Delphi present this type in its earliest and most characteristic form. The heavy neck, reinforced by the hanging locks of hair, the broad draperies and the

[1] *Ion. Antiq.*, II, Pl. 24.

[2] Stuart and Revett, III, Ch. IX, Pls. 6–13.

[3] Vitruvius, I, 1, 5.

rigid pose gave the female form apparent strength to support its heavy burden. In the Porch of the Maidens of the Erechtheion, similar devices were employed. Male figures appear also as supports (*ἄτλαντες, τελαμῶνες*), in rigid pose, at the Olympieion at Akragas, and, crouching,

FIG. 222. — Neck of capital from Mycenae.

beneath the Neronian stage platform in the Theatre of Dionysos at Athens.[1]

Capitals of columns were decorated upon the neck, principal moulding, and abacus. Neck mouldings, as we have seen, did not constitute an invariable part of the Greek capital. They varied in form, and their decoration was determined by no fixed canon. In the Mycenaean capital from the Tomb of Atreus (Fig. 222) the slightly concave neck was decorated by a series of round-headed leaves, and in an ivory colonnette from Mycenae[2] the

[1] Photograph by Bonfils, No. 527. [2] Perrot et Chipiez, VI, Fig. 204.

channellings were carried through the neck to the principal moulding. The archaic columns of the Enneastylos and the so-called Temple of Demeter at Paestum (Figs. 223, 224) show deeply concave necks decorated with flat arched or rectilinearly terminated leaves which sometimes show spikes between their rounded ends and sometimes curve over to form a bead moulding. In the Monument

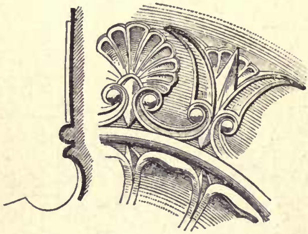


FIG. 223.—Neck of capital from Paestum.

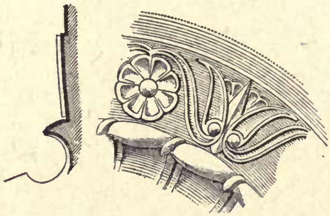


FIG. 224.—Neck of capital from Paestum.

of Lysicrates at Athens the leaves of the neck are lanceolate. Rosettes decorate the neck of a capital in the Museum of Naples[1]; garlands of lotus buds and flowers, at Naukratis (Fig. 225); the lotus and palmette alternate at Lokroi[2] and in the Erechtheion. At Magnesia on the Maeander (Fig. 226) and in the Theatre of Laodikeia the high neck forms the principal moulding of the capital and is decorated with palmettes having alternately inward- and outward-curving petals. In the theatre at Aizanoi[3] the necks of the capitals were decorated with acanthus scrolls. Painted zigzags decorated the neck of an archaic capital at Delos. In Roman

[1] Mauch, *Detailbuch*, Taf. 6.
[2] Petersen in *Röm. Mitt.*, V (1890), 193.
[3] Texier and Pullan, Pl. 20.

buildings undecorated necks were not uncommon and became typical of the so-called Tuscan order.

The chief moulding of the capital was, as we have noted, either of rectangular or circular section. Rectangular capitals were formed chiefly under Ionic influence. Originally, as in a capital represented on a vase from Hagia Triada (Fig. 227), now in the Museum at Candia, the rectangular form was emphasized by the decoration. But almost universally the sharp angles of the rectangular block were rounded, the faces were decorated with spirals, and the sides with the pulvinus, all of which concealed the essential rectangularity of the capital block. Capitals decorated with spirals were used by the Egyptians, Assyrians, Hittites, Phoenicians, and Persians, and probably also by the Mycenaeans. This type of decoration seems to have been derived from a floral prototype, possibly that

Fig. 225. — Neck of capital from Naukratis.

of the Egyptian lotus.[1] Many fanciful derivations have been suggested.[2] A great variety of spiral forms are found on Greek capitals. Capitals from Neandreia, Lesbos,

Fig. 226. — Neck of capital from Magnesia.

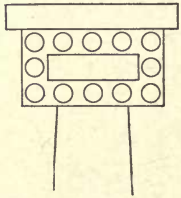


Fig. 227. — Capital on a vase from Hagia Triada, Crete.

Delos, and Athens[3] exhibit the spirals, in Oriental fashion, springing vertically from the shaft and united by horizontal bands. A survival of this type occurs in the South entrance of the Palaistra at Olympia (Fig. 228). In the capitals with an echinus the spirals spring horizontally from above the echinus. An interesting early experiment in this direction is exhibited in a capital from Delos (Fig. 229). In these examples a lotus flower, palmette, or acanthus leaf appears between the

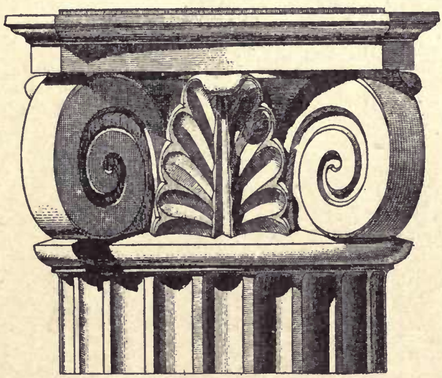


Fig. 228. — Capital from the Palaistra, Olympia.

[1] Goodyear, 115–137.

[2] Marini, I, 179, note 57; Hittorff et Zanth, 335, note 1; Clarke in *A.J.A.*, II (1886), 8–9.

[3] Perrot et Chipiez, VII, Pls. 52–53.

spirals. This flower, or leaf, pattern, which occurs in Egyptian examples, seemed to have been an obstacle in the development of the Ionic capital and was consequently given up. The spirals henceforth became united in the centre. Their springing point in a few cases, as on the capitals from the Temple of Apollo at Phigaleia (Fig. 230), was raised so high as to give their channels at the start a downward slope. But in the normal classic type, as exemplified in the capitals of the Temple of Athena Nike and the Propylaia at Athens (Fig. 231), the united spirals are bounded above by horizontal, and below by sagging mouldings resembling festoons (ἔγκαρπα). In the Mausoleion at Halikarnassos, the sagging moulding has almost disappeared.[1] In these examples it will be noticed that palmettes cover the angles where the sagging moulding meets the spirals. These

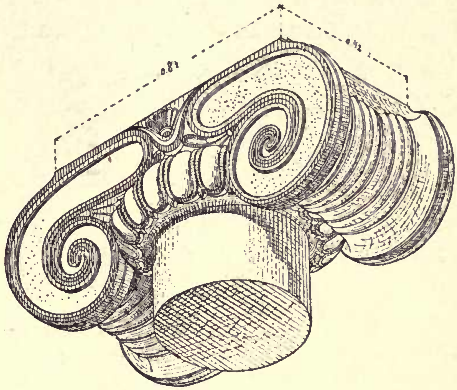


Fig. 229. — Capital from Delos.

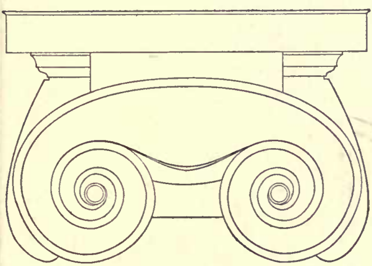


Fig. 230. — Capital from Phigaleia.

[1] Bates in *Harvard Studies*, X (1899), 31.

palmettes decorate an awkward corner without violating the very ancient tradition, which associated angle flowers with spirals, as, for example, in the ceiling at Orchomenos. A horizontal instead of a sagging moulding is seen in some capitals, as in those of the Philippeion at Olympia (Fig. 232). In most Hellenistic capitals, as at Magnesia on the Maeander (Fig. 233) and at Teos, this moulding was omitted; even the effect of horizontality is not so strong in reality as it appears in line drawings, since the eggs and darts of the echinus were separated by sharp cuttings, and had no visible bond of union. A more elaborate type of spiral decoration was devised by subdivision of the volutes. Thus, in the

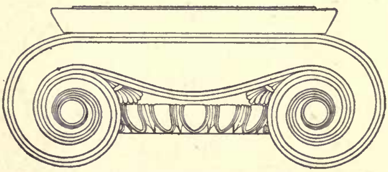


Fig. 231. — Capital from the Propylaia, Athens.

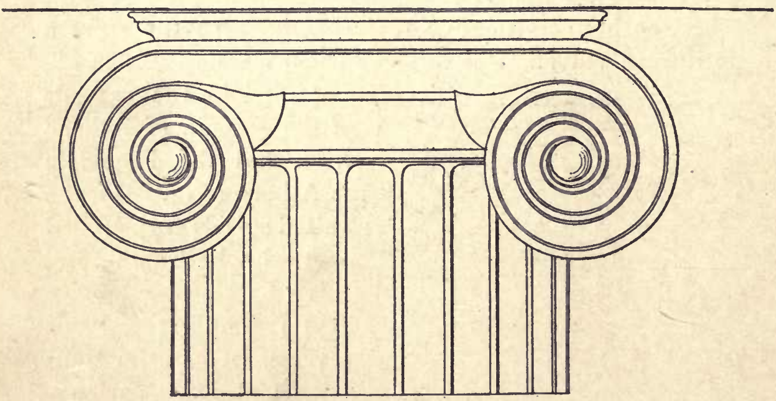


Fig. 232. — Capital from the Philippeion, Olympia.

Nereid Monument at Xanthos,[1] the channel (*canalis*) of the capital is subdivided into double-ranged channels which wind spirally until they meet at the central oculus. In the capitals of the North Porch of the Erechtheion (Fig. 234) there is a subdivision into four channels which die away into three and then into two — the channellings and dividing mouldings showing a subordination which can only be appreciated by close observation of the original or of a cast. Another type of capital resulted from the application of the double scroll, as in a

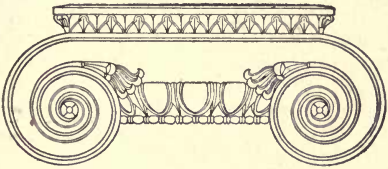


Fig. 233. — Capital from Magnesia.

Fig. 234. — Capital from the Erechtheion.

capital from Megara Hyblaea (Fig. 235). But superposed spiral forms, such as those which occur upon Assyrian and Persian monuments,[2] do not seem to have been favored by the Greeks.

Considerable variety in the effect of spiral capitals re-

[1] Puchstein, *Ion. Cap.*, Fig. 19.

[2] Reber, Figs. 35, 50, 80.

sulted from the manner of treating the channel and the edges of the spiral band. In some archaic examples, as at Ephesos and Neandreia, the channel was convex; in others, from Athens and Delos, a plane surface; ordinarily it was concave, as its name implies. Sometimes it was shallow, as in the Temple of Nike at Athens, or relatively deep, as in the Mausoleion at Halikarnassos. The effect also varied according to the form given the terminal mouldings. In the old temple at Ephesos a plain roundel was used, but in the later temple, and frequently elsewhere, we find a roundel set upon a fillet. In the Erechtheion these mouldings were subdivided by a triangular incision. Flat fillets were employed in the Temple of Artemis at Magnesia and in many later buildings, and double or duplex fillets in the Palaistra at Olympia.[1]

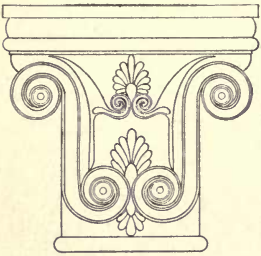


FIG. 235. — Pilaster capital from Megara Hyblaea.

FIG. 236. — Capital from Samothrace.

In the enriched type of Ionic capitals the channel itself was ornamented. Thus in the Erechtheion it was decorated by subordinate mouldings. In Hellenistic capitals, such as those of the Ptolemaion at Samothrace (Fig. 236), or the Temple of the Apollo Smintheus in the Troad, it was decorated with an acanthus scroll. In Roman capitals, as in S. Maria in Trastevere[2] at Rome, the acanthus

[1] *Olympia*, II, Taf. 74.

[2] Haussoullier, 172.

leaf sometimes ornamented the channel in its entire course, including the volutes. The treatment of the oculus also modified the charm of the capital. This was usually an unornamented circular disk. But in some capitals from the archaic temple at Ephesos[1] a large rosette took the place of spirals and disk, and in a capital found in the Erechtheion a rosette was carved upon an oculus of normal size. In the capitals of the North Porch of the Erechtheion oculi of bronze were probably employed. It is possible also that half palmettes of bronze were used in the angles of the spirals, and that their stems were carried in spiral windings to the oculus. In some capitals of the façade of the Temple of Apollo at Miletos heads of divinities were substituted for volutes.

It would be interesting to know how the Greeks designed their spirals. The method of describing a spiral, given by Archimedes,[2] is an ideal rather than practical method, while that of Vitruvius[3] produces a spiral of but two revolutions. A survey of a collection of Ionic capitals, such as those illustrated in Puchstein's *Das Ionische Capitell*, will show very great variety in respect to the point where the terminal moulding reaches the oculus. In the archaic and classic periods these spirals were probably drawn free hand. Banister Fletcher[4] has suggested that spirals similar to those of the Ionic capital may be drawn by unwinding a cord from the convolutions of a spiral sea shell. Penrose[5] has shown that they may be formed with mathematical accuracy by unwinding a string from a cylinder. In the Hellenistic

[1] Hogarth, Pl. 7. [2] Περὶ ἑλίκων.

[3] Vitruvius, III, 5. For a résumé of various methods of designing spirals, see Marini, I, 179, note 57. Cf. Pennethorne, 139.

[4] *Building News*, Aug. 22, 1902; Cook, *Spirals*, 187.

[5] *J.R.I. Br. Architects*, X (1903), 21–30; *A.J.A.*, VII (1903), 462.

period, the use of some mechanical method of producing spirals seems probable, as the endeavor to bring the terminal moulding to a vanishing point above the oculus is quite evident. The number of windings was usually more than two. An exceptional example, from the North Portico of the Agora at Priene,[1] shows three windings on one and four on the other volute.

Our consideration of the Ionic capital is not complete without a word concerning the decoration of its base. When the spirals sprang vertically from the shaft, as in the capitals from Neandreia, no decoration at the base was required. But when they sprang from a higher level, the base of the capital was ornamented with a horizontal band, which Athenian designers elaborated into a series of superposed mouldings of varying profile and decoration. One archaic capital from the Acropolis[2] shows a platband decorated with a maeander set between two egg and dart mouldings; another,[3] a quarter round decorated with the scale pattern above a cyma reversa with the Ionic leaf and dart. The capitals of the Erechtheion show a braid set above an egg and dart and a bead and reel. A simpler and broader effect was preferred by the architects of the Propylaia and of the Temple of Athena Nike, who placed at the base of the capital an echinus moulding carved with the egg and dart. With singular persistence the egg and dart has continued to be the characteristic decoration of this moulding throughout its entire history. Considerable difference, however, may be observed between the refined forms of the egg and dart ornament in Athenian capitals of the classic period and the mechanical treatment which was only too common in later days.

[1] *Priene*, Figs. 194, 195. [2] Puchstein, Fig. 4. [3] *Ibid.*, Fig. 7.

The side of the Ionic capital, formed more or less like a bolster (*pulvinus*), was variously treated. At Lokroi it was decorated with pendent lanceolate leaf or scale ornament. Other archaic Ionic capitals, such as that of the column of the Naxians at Delphi (Fig. 237), or those of the old temple at Ephesos, were decorated with vertical channellings separated by roundel mouldings. This kind of decoration brought the capitals into harmony with the decoration of the shaft and bases of the columns. The Erechtheion capitals (Fig. 238) were similarly, but more richly decorated, in having bead and reel in place of plain roundels. When the pulvinus was formed like a compressed bolster by means of a central belt (ζώνη, δεσμός), this was decorated with vertical channellings, or with some form of leaf decoration, and, on either side of the centre, lanceolate leaves were often arranged horizontally to emphasize the independence of the capital. At Magnesia (Fig. 239) the form and decoration of the pulvinus suggests two calyx capitals set base to base.

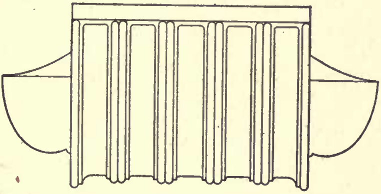


FIG. 237. — Pulvinus decoration from Delphi.

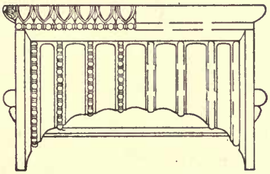


FIG. 238. — Pulvinus decoration from the Erechtheion.

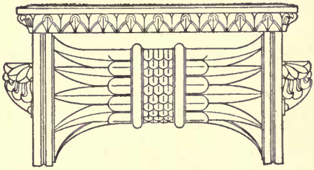


FIG. 239. — Pulvinus decoration from Magnesia.

Acanthus leaves were sometimes substituted for the lanceolate leaves. The great altar at Pergamon furnishes examples of studied variety in pulvinus decoration, a thunderbolt[1] being sometimes substituted for geometrical or floral ornament. A special type of decoration found at Pergamon (Fig. 240), and also at Olympia, consisted in carrying the belt above the pulvinus until it reached the abacus. This appears to represent a feeling on the part of the architect that the decoration of the side of the capital by means of exclusively horizontal lines emphasized too strongly the independence of the capital. In the capitals of the propylon at Priene (Fig. 241) a branching scroll ornamented the sides of the pulvinus. The extreme limit of floral ornament applied to the pulvinus may be seen in the capitals from the Ionic Temple on the theatre terrace at Pergamon (Fig. 242).

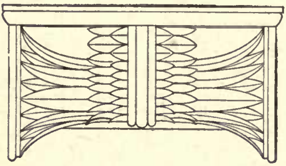


Fig. 240. — Pulvinus decoration from Pergamon.

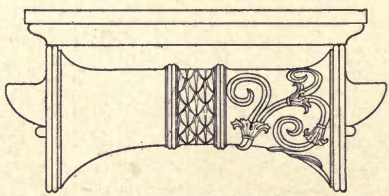


Fig. 241. — Pulvinus decoration from Priene.

The next stage in decoration was the substituting of animal for floral types. This occurred in the corner capitals of the Agora at Magnesia on the Maeander.[2] At Salamis in Cyprus (Fig. 243) the heads of winged bulls formed the sides of the capitals, their curved wings taking the place of volutes.

When the principal moulding of the capital was not

[1] *Pergamon*, III, Taf. 12. [2] *Magnesia*, Figs. 128, 130.

rectangular but of circular section and showed convex,

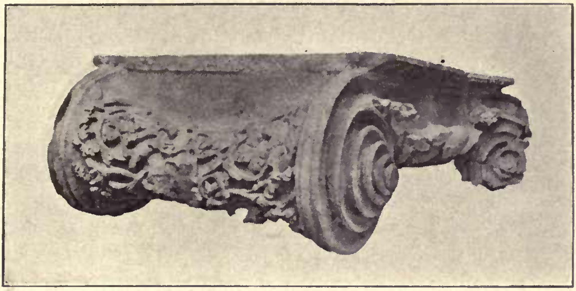


FIG. 242. — Pulvinus decoration from Ionic Temple, Pergamon.

concave, or other profiles, the decoration was modified to some extent by the form of the moulding. Thus the

FIG. 243. — Pulvinus decoration from Salamis, Cyprus.

torus mouldings of the capitals of the Tholos of Atreus were decorated with rhomboids enclosing spirals — a type of decoration which brought the capitals into close harmony with the decoration of the shafts. When this moulding had a curved profile varying from an hyperbola

Fig. 244. — Capital from the Heraion, Samos.

to a straight line, it was usually painted or carved with the egg and dart, as in the columns of the Heraion at Samos (Fig. 244). The egg and dart was so common a decoration of the echinus moulding in general that we might expect to find it also on the echinus of the Doric capital. It does occur, in fact, on an early stele capital from Athens.[1] Other types of ornament, having less regard to the form of the moulding, are also found on these

[1] Borrmann in *Jhb.*, III (1888), 274.

stele capitals, as, for example, the scale ornament and palmettes enclosed in scrolls. Whether such ornaments were ever applied to larger capitals such as those of a temple, or stoa, is uncertain. Boetticher[1] claims to have seen an egg and dart painted on the capitals of the Theseion, and Semper verified his observations. Other observers, however, have been unable to find any traces of painting even on the protected sides of these capitals, and the German excavators at Olympia[2] found no such decoration there. Although the Egyptian analogies are not very close, it would be interesting to believe that the Doric capital was of Egyptian origin. On any other hypothesis, in fact, it is difficult to explain the raised annuli that decorate the base of the capital. Choisy[3] considers them reminiscences of the original blocking out the capital. Were this the case, we should expect to find simple, broad bands in archaic capitals, and a series of annuli as a later development. The earliest archaic capitals, however, show three or four raised annuli, reminding us of those which occur at the summit of the shaft or the base of the capital of Egyptian columns;[4] and later capitals frequently show a smaller number of annuli, or none at all. By means of color, alternately red and blue, applied to the separating incisions, the annuli were made to stand out in clearer relief. They were also emphasized by the varied formation of the separating incisions. Thus, in the earlier Temple of Aphaia at Aegina (Fig. 245), the incisions were semicircular in section; in Temple C, Selinous (Fig. 246), triangular; in Temple D, Selinous (Fig. 247) and in the Parthenon (Fig. 248),

[1] Boetticher, 71.
[2] *Olympia*, II, 184.
[3] Choisy, I, 291.
[4] *A.J.A.*, VI (1890), 52.

curved in the upper half, and straight in the lower. Cruder methods of indicating the annuli are found in many capitals from Olympia (Fig. 249). In later examples, as in the interior order of the Tower of the Winds, and in the Gate of the Agora at Athens (Fig. 250), the annuli were sometimes applied below the echinus. The number was by no means constant. They varied from one to five,[1] but four may be considered the normal number. In the examples thus far considered the annuli were formed like fillet mouldings. Occasionally,

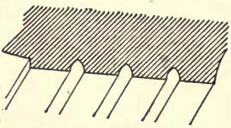


Fig. 245. — Annuli from Old Temple, Aegina.

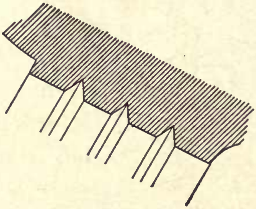


Fig. 246. — Annuli from Temple C, Selinous.

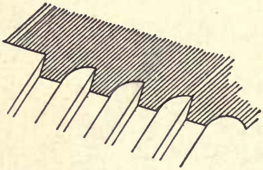


Fig. 247. — Annuli from Temple D, Selinous.

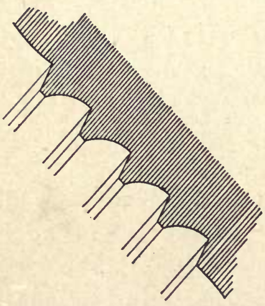


Fig. 248. — Annuli from the Parthenon.

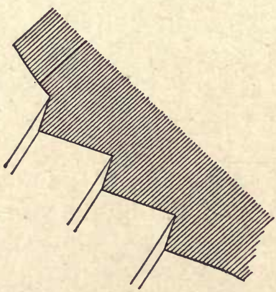


Fig. 249. — Annuli from Olympia.

[1] *Olympia*, II, Taf. 88, 5, 9.

however, we find other forms. In one of the capitals from Paestum[1] the annuli consisted of roundel mouldings; at Cadacchio (Fig. 251), of a fillet, a cyma recta, and a quarter round. At Paestum, in one of the capitals from the Temple of Demeter, a cyma recta decorated with upright leaves took the place of simpler annuli; in a second, a triple braid; in a third, a frieze of lotus flowers and rosettes;[2] and in a fourth, lotus flowers alternating with palmettes.[3] Such highly decorative substitutes for the annuli were, however, exceedingly rare. When the channellings of the shaft were carried through the neck of the capital it was a great practical convenience that they should end against a horizontal annulus rather than die away on the conical surface of the echinus. This, perhaps, accounts for the extraordinary persistence of the annuli in the Doric capital. The decoration of capitals of concave profile — campaniform or calyx capitals — in some cases closely follows Egyptian prototypes (Fig. 252). Thus the well-known capital from the Theatre of Dionysos in

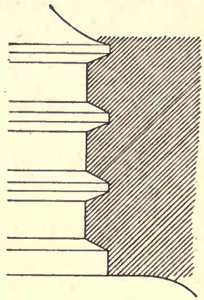


Fig. 250. — Annuli from Agora Gate, Athens.

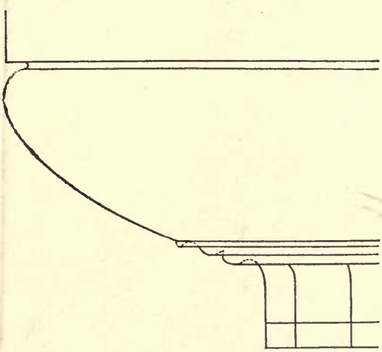


Fig. 251. — Annuli from Cadacchio.

[1] Puchstein, 49, Fig. 41, 3.
[2] See Fig. 224.
[3] See Fig. 223.

Fig. 252. — Capital from Thebes, XVIII dyn., Egypt.

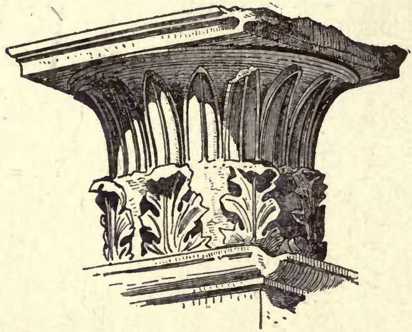


Fig. 253. — Capital from the Theatre of Dionysos, Athens.

Athens (Fig. 253), seems to be a translation of Egyptian into Greek floral forms. Similarly, some of the capitals

Fig. 254. — Capital from the Stoa of Eumenes, Pergamon.

from the Stoa of Eumenes at Pergamon (Fig. 254) recall the Egyptian palm-leaf capital (Fig. 255). Even for the more usual type with acanthus decoration Egyptian prototypes may be cited. A Theban wall painting of the XIX dynasty (Fig. 256) exhibits a calyx capital with angular volutes, and a row of pointed leaves at the base — a type of capital which, in the Ptolemaic period, was elaborated into very complicated forms. The earliest Greek capital with analogous decoration was found in the interior of the Temple of Apollo at Phigaleïa (Fig. 257). It had

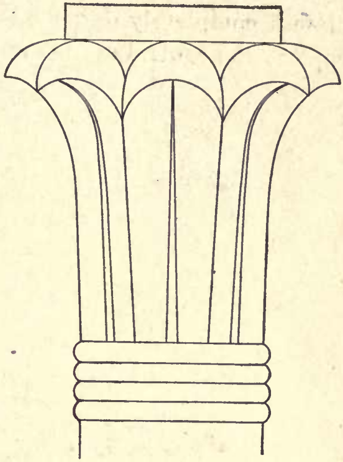


Fig. 255. — Capital from El Bersheh, Egypt.

Fig. 256. — Capital from Thebes, XIX dyn., Egypt.

Fig. 257. — Capital from Phigaleia.

small angular volutes, large central spirals and palmette, and a double row of acanthus leaves at the base. In the Tholos at Epidauros (Fig. 258) the angular volutes were almost completely detached from the central bell of the capital, the central spirals made smaller, the central flower raised until it touched the abacus, and more space allotted to the acanthus decoration, which in this case consisted of a row of alternately high and low leaves. The capitals of the Monument of Lysicrates in Athens (Fig. 259) were still more highly developed. In this case the central bell was hidden by elaborate spiral, acanthus, and floral decoration, resembling applied metal work. In the half capitals in the Philippeion at Olympia (Fig. 260) the central spirals and flower were given up, the acanthus leaves were multiplied, and for the first time appear cornucopia-like, channelled *cauliculi* from which the volutes spring. In the normal Corinthian capital, exemplified in the Olympieion at Athens (Fig. 261), the central spirals and flower reappear — the flower being raised to the summit of abacus — and both rows of the acanthus leaves are strongly curled at the top.

Fig. 258. — Capital from the Tholos at Epidauros.

Capitals whose principal moulding shows the form of a cyma recta were decorated in various ways. That of the Votive Column of Aischines at Athens (Fig. 262) was decorated with the Doric leaf ornament, and with a similar series of pendent leaves on the moulding above it. The

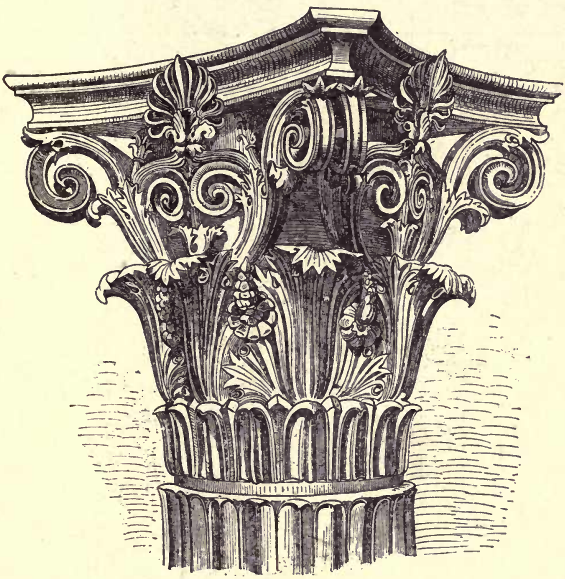


Fig. 259. — Capital from the Monument of Lysicrates, Athens.

leaves were colored alternately red and a dark gray. In the capital of another votive column at Athens (Fig. 263) the double curvature of the cyma recta would appear to have influenced the painted decoration, of which the upper half is upright and the lower pendent. But this influence was not felt in every case. Near the Temple of Artemis at Magnesia a capital of this form was found decorated with a single series of upright palmettes. The larger capitals of this form, like those of the Leonidaion at Olympia, and those of the gymnasium at Pergamon, appear to have been undecorated.

The abacus of the Greek capital was often left undecorated. This severe simplicity was all but universal in Doric architecture of the archaic and classic periods. Occasionally, however, some simple ornament was given to the face of the abacus, as, for example, in an archaic capital at Olympia (Fig. 264), where the abacus shows four incised annuli, a decoration which brought it into harmony with the decoration of the echinus and the shaft; or in the anta capitals of the Enneastylos at Paestum, where the abacus blocks were surrounded by a small fillet moulding; or in the capitals of votive stelae at Athens (Fig. 265), where painted maeanders were not unusual in Doric as well as Ionic capitals. In capitals of the Ionic style the abacus was ornamented by the modification of its profile through the addition of mouldings, or by carved or painted ornament. The variations in profile we have already con-

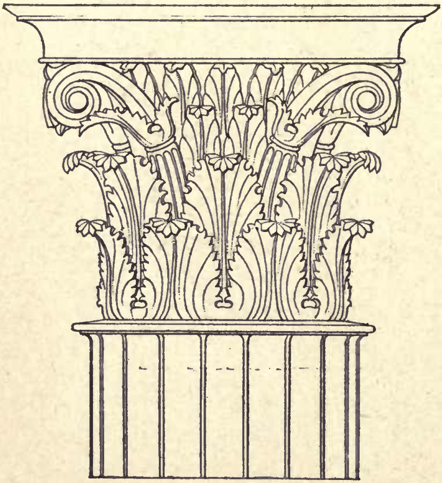


FIG. 260. — Capital from the Philippeion, Olympia.

Fig. 261. — Capital from the Olympieion, Athens.

sidered in a previous chapter. In Attic-Ionic capitals the abacus was given the form of an echinus carved with the egg and dart ornament. This echiniform abacus with

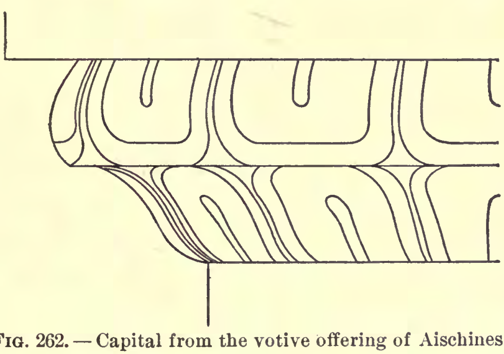


Fig. 262. — Capital from the votive offering of Aischines.

the carved egg and dart appears to have capped some of the columns of the Old Temple of Artemis at Ephesos.[1] Other capitals from this temple had an abacus

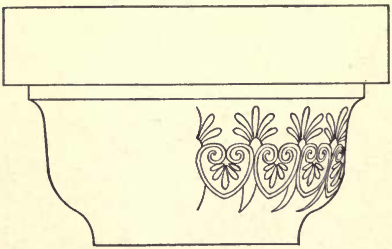


FIG. 263. — Capital from the votive offering of Evenor.

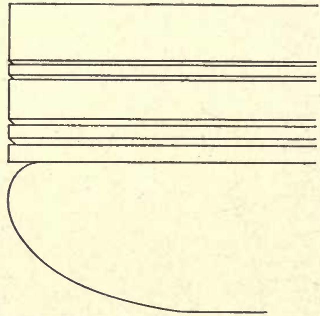


FIG. 264. — Abacus from Olympia.

with a cyma reversa profile decorated with the Lesbian leaf and dart. The latter type of abacus with its decoration was used also at Priene, Halikarnassos, Magnesia on

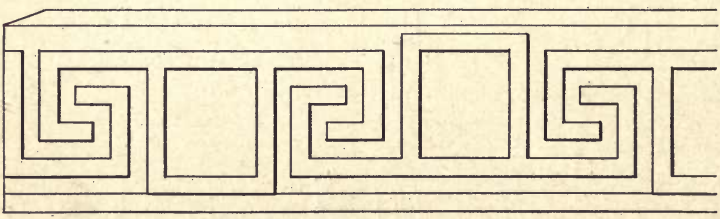


FIG. 265. — Abacus from Athens.

the Maeander, and elsewhere, so frequently as to entitle it to rank as the normal Ionic abacus. More complicated types of abaci, consisting of a series of mouldings, were sometimes, as in the Leonidaion at Olympia, left without further decoration; sometimes, however, as in the Temple

[1] Br. Mus. No. 2727. Photograph by A. M.

of Zeus at Labranda and in the peribolos of the Temple of Aphrodite at Aphrodisias (Fig. 266), all of the mouldings were decorated. The acanthus scroll, as we might expect, was finally applied to the decoration of the abacus, as in the Temple of Minerva in the Roman Forum, and in other Roman buildings.

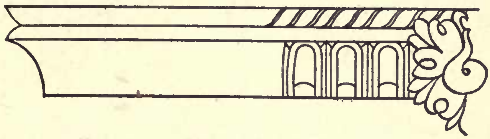


FIG. 266. — Abacus from Aphrodisias.

6. DECORATION OF THE ENTABLATURE. — The entablature had its specific decoration on epistyle, frieze, and cornice.

The face of the epistyle received, as a rule, little or no decoration. This, however, was not invariably the case. The fragments from the façade of the tomb of Atreus make it probable that the wooden epistyles of Mycenaean palaces[1] were covered with geometric ornamentation. Shields were hung up on the epistyles of the temples at Delphi, Olympia, and at Athens. Disks, which possibly were to have been carved as rosettes, decorated the uppermost band of the epistyle of the Porch of the Maidens at Athens. In the pre-Roman temple at Suwêda in Syria,[2] the lowest band of the epistyle was decorated with oblique squares enclosing rosettes and surrounded by small disks. Floral motives, such as running palmette and vine patterns, may have been used at a late period in Sicily,[3] if we accept as evidence the fragments of vases with architectural decoration. The central band of the epistyle of the Temple of Jupiter Stator in Rome[4] was decorated with

[1] Perrot et Chipiez, VI, Pl. 5.
[2] Butler, 330; De Vogüé, Pl. 4.
[3] Kekulé, II, Taf. 61.
[4] Taylor and Cresy, II, Pl. 86.

a beautiful running lotus and palmette pattern. Mythological subjects carved in low relief were employed to decorate the epistyle of the archaic temple at Assos. In the Hellenistic and Roman periods the fasciae, or bands, in Ionic and Corinthian epistyles were frequently capped with ornamental mouldings. In the temples of Zeus at Magnesia and at Aizanoi, and in the Temple of Aphrodite at Aphrodisias, each fascia was capped with the bead and reel. In the theatre at Myra (Fig. 267) the central fascia was capped with a cyma reversa decorated with a modified form of the Lesbian leaf and dart. On the arch of Septimius Severus in Rome the acanthus decorated a similar moulding.

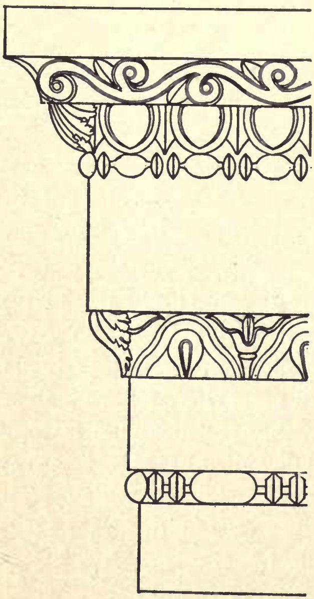


FIG. 267. — Epistyle from Myra.

The crowning moulding of the epistyle was decorated with color, or carved ornament, or both. Thus, in tombs of the Doric style in the Cyrenaica,[1] the epistyle was crowned by a red taenia with blue regulae and guttae. A similar decoration appears to have prevailed generally in Doric architecture of the archaic and classic periods.[2] On the taenia of the Parthenon epistyle (Fig. 268) was painted a double maeander, and on the regulae, hanging

[1] Smith and Porcher, Pl. 37; Beechey, 443.

[2] Cf. Fenger, 13; Borrmann, 1338–1339; Wiegand, 57; Hittorff, Pl. 6.

palmettes and lotus flowers. Ionic epistyles were crowned with curved mouldings usually decorated with carved ornament. Thus the echinus moulding which crowned the epistyle of the Temple of Athena at Priene was carved with the egg and dart, and the cyma reversa of the Erechtheion, and of the Tholos at Epidauros, with

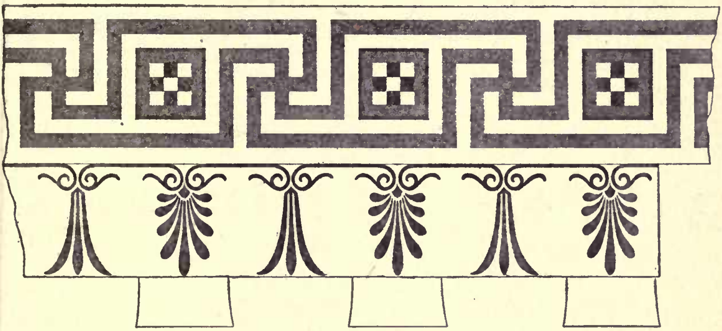


FIG. 268. — Epistyle from the Parthenon.

the Lesbian leaf and dart. Double-coursed ornament was used in the crowning mouldings of epistyles in Hellenistic buildings, such as the Temple of Artemis at Magnesia, or of Apollo near Miletos. In these cases there was an echinus moulding carved with an egg and dart and a cavetto decorated with the lotus and palmette. In the theatre at Myra the cavetto was ornamented with a vine pattern. In richly decorated Roman temples, such as the Temple of the Sun at Rome,[1] the acanthus scroll ornamented the cavetto. A series of superposed mouldings, richly decorated, were used in the Great Altar at Pergamon (Fig. 269).

The soffit of the epistyle was left undecorated during

[1] d'Espouy, Pl. 63.

the archaic, and most of the classic period. In later Ionic, and in Roman buildings, it was usually ornamented with panellings, which were surrounded by decorative mouldings. Thus, in the Temple of Artemis at Magnesia (Fig. 270), a bead and reel moulding was used; at Priene (Fig. 271), a Lesbian leaf and dart over a bead and reel; at Pergamon, in the Ionic temple on the Theatre terrace, the panel was pulvinated and decorated with a scale or laurel leaf pattern surrounded by a bead and reel (Fig. 272). Still more complicated was the soffit decoration of the epistyle in the Temple of Serapis at Pozzuoli.[1]

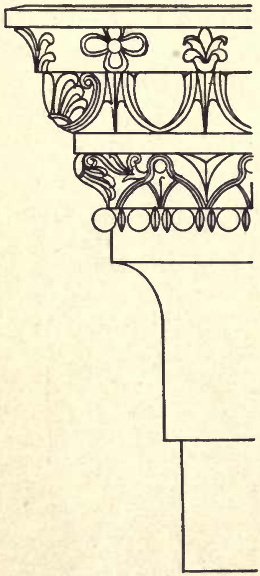


Fig. 269. — Epistyle crown from the altar at Pergamon.

The antithema of the epistyle calls for little comment. Its decoration was influenced by the exterior face of the epistyle. When the exterior face was highly decorated with bead and

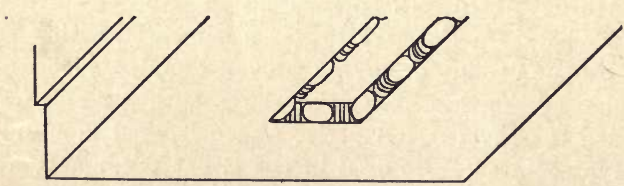


Fig. 270. — Epistyle soffit, Magnesia.

reel or other carved mouldings to mark its successive

[1] d'Espouy, Pl. 94.

fasciae, similar mouldings are likely to be found on the antithema. The crowning mouldings, when differing in profile from those on the exterior, received a

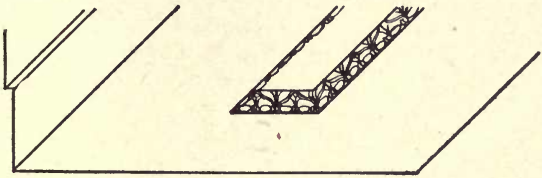


FIG. 271. — Epistyle soffit, Priene.

different decoration. In such cases harmony with the ceiling mouldings seems to have been the determining factor.

The decoration of the frieze was conditioned by its form. The Doric frieze called for interrupted, the Ionic for continuous, or uninterrupted, decoration. In the Doric frieze, the metopes were frequently left undecorated, exhibiting a plain white surface of stucco or marble. Their square surfaces, however, afforded an inviting field for the decorator. At Thermon in Aetolia[1] have been found fragments of a terracotta frieze of the archaic period in which the metopes were painted with such subjects as Perseus, the Gorgoneion, three divinities enthroned (Fig. 273), and two women facing each other. Framed as they usually

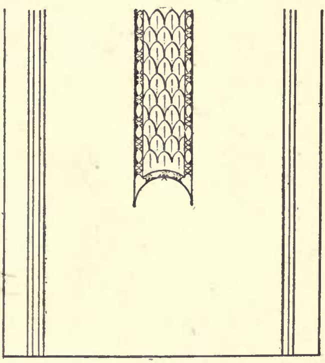


FIG. 272. — Epistyle soffit from Pergamon.

[1] *Eph. Arch.*, 1903, 71–95; *A.J.A.*, VIII (1904), 108.

were by strongly projecting triglyphs, metopes were better adapted for sculptural decoration. They themselves were sometimes provided with individual frames, consist-

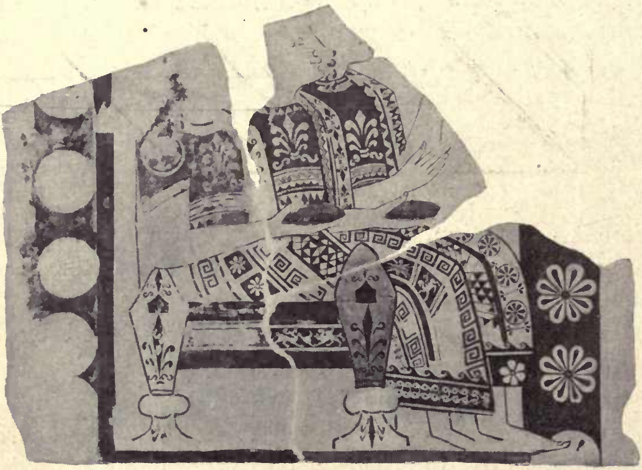


FIG. 273. — Metope decoration from Thermon.

ing of broad bands at the summit and base, and narrow ones at the sides. As examples of such box-like metopes may be cited the well-known Perseus, Herakles, and Apollo metopes from Selinous, now in the Museum at Palermo. The metopes from the temple at Assos exhibited a broad band at both top and bottom. In the Treasury of the Athenians at Delphi there is a broad band at the top, and a narrow one at the bottom of the metopes (Fig. 274). In later periods metopes had no individual framework beyond an abacus or crowning moulding. This abacus was sometimes enriched by mouldings in the form of an echinus, half round, a bead and reel,[1] or cyma

[1] Penrose, Pl. 17.

reversa and cavetto,[1] and occasionally adorned with undercuttings and minor mouldings at its base. The face of

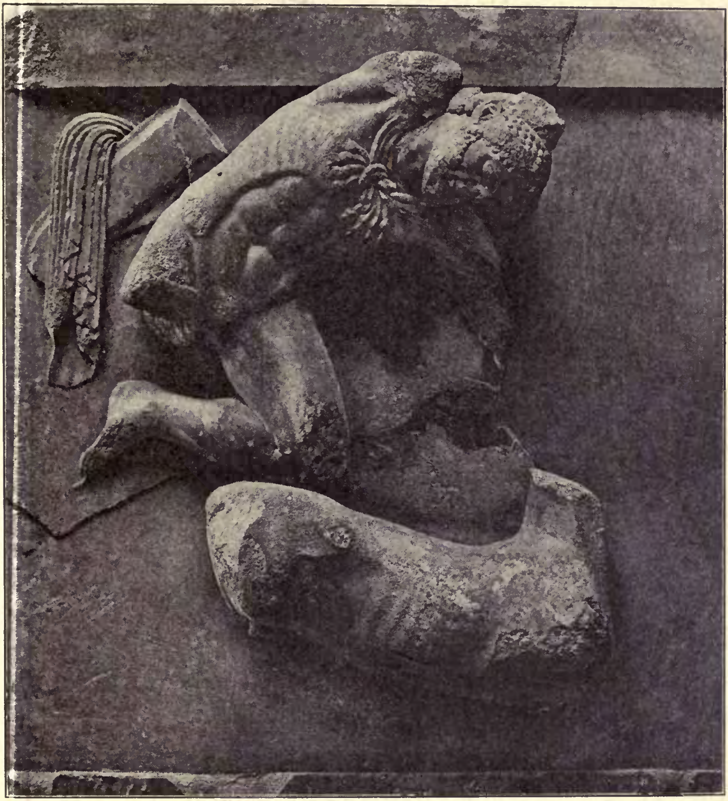


FIG. 274. — Metope from the Treasury of the Athenians, Delphi.

the metope was often carved with decoration more or less elaborate. A very simple pattern consisted of a narrow band of Doric leaves immediately below the abacus, as in

[1] Cockerell, Pl. 8, Fig. 2.

the Old Temple of Athena on the Acropolis at Athens (Fig. 275). Possibly this was a reminiscence of a decoration common in Egyptian cornices. Other conventional floral patterns were used, such as the horizontal palmettes on the alabaster frieze from Tiryns, or the beautiful rosettes on the metopes of the Tholos at Epidauros. Symbols such as bucrania and tripods decorated the metopes at the theatre of Delos, and shields were placed by Mummius upon twenty-one of the metopes of the Temple of Zeus at Olympia.[1]

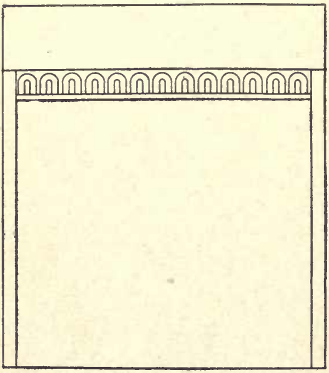


Fig. 275.—Metope from the old Temple of Athena, Athens.

But figured sculpture with mythological subjects treated in high relief became at an early period the standard method of metopal decoration. Disconnected subjects seem to have occurred in some archaic buildings, but an effort was usually made to present some unity of design. The twelve labors of Herakles were admirably adapted to fill the twelve metopes of the prodomos and opisthodomos of a hexastyle temple, and are best exemplified in the Temple of Zeus at Olympia. To these the labors of Theseus formed a natural supplement in the metopes of the peristyle of the so-called Theseion at Athens. Other contests were added in the decoration of the thirty metopes of the Treasury of the Athenians at Delphi. Contests of Gods and Giants, Greeks and Amazons, Lapiths and Centaurs, and other

[1] Paus. V, 10, 5.

subjects decorated the ninety-two metopes of the Parthenon.

Triglyphs were decorated from the earliest period. Thus the portions of the alabaster frieze at Tiryns which corresponded to triglyphs were decorated with rosettes. Similarly, at Thermon, the narrow bands which separated the metopes were adorned with rosettes. When this member received the form of a triglyph, it was usually left undecorated except by the formal characters of abacus, and grooves, and by a coating of blue paint. The various parts of triglyphs, however, were often emphasized by additional decoration. Thus the grooves of the corner triglyph of Temple C, Selinous (Fig. 276) were framed by narrow fillets which terminated at the summit in an ogee arch. In the Temple of Apollo at Metapontum [1] the grooves were emphasized by an incised cutting which was possibly filled with coloring matter in contrast with that of the grooves. The terminal half-grooves were sometimes decorated at the summit not only with deep undercutting but also by an acanthus leaf or other ornament, as in the Temple of Dionysos at Pergamon.[2] The shanks (μηροί) of the triglyphs were carved, in Temple C, Selinous, to a convex surface in contrast with the flat fillets which surrounded the grooves, whereas, at Metapontum, a similar emphasis was obtained by means of a projecting fillet moulding. The abacus was also sometimes decorated by scroll-work, or other motives, and in late buildings by

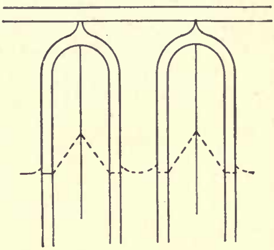


FIG. 276. — Triglyph from Temple C, Selinous.

[1] See Fig. 127. [2] Bohn, *Temp. Dion. Perg.*, 7.

crowning mouldings. During the Hellenistic and Roman periods superficial decoration was occasionally applied to triglyphs in such a way as to obscure rather than to emphasize their form. Thus, in a portico at Delos,[1] protomoi of oxen over-decorated the triglyphs, and in the Propylaia of Appius Claudius Pulcher at Eleusis[2] the character of the triglyphs was hidden from view by various emblems of Demeter's worship.

The Ionic, or continuous frieze, presented not only a variety of forms but also of decoration. Often the form alone sufficed with its rigid planes or curved surfaces and crowning mouldings. But the Ionic love of decoration found in the continuous frieze a suitable field for running

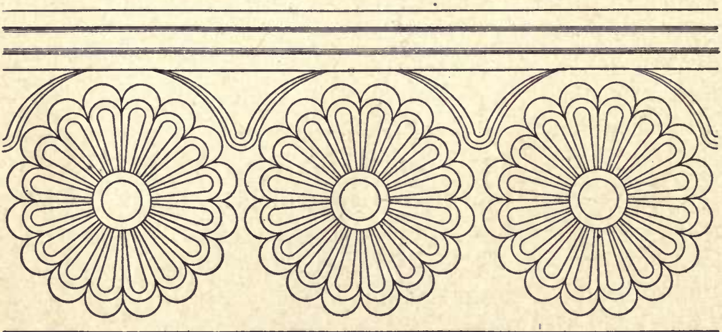


Fig. 277. — Frieze from Knossos.

ornament, whether geometrical, floral, or mythological. Essentially geometric in type was the round-headed leaf and dart ornament found in late friezes, such as that of the Incantada at Thessalonica,[3] or the Temple of Zeus at Aizanoi. Conventionalized floral ornament figured more

[1] Blouet, III, Pl. 7. [2] Durm, 118.
[3] Stuart and Revett, III, Ch. IX, Pl. 3.

frequently. Rosettes and lotus flowers decorated a border or frieze of the southern Propylaia at Knossos (Fig. 277), as did palmettes the alabaster frieze at Tiryns. Anthemia

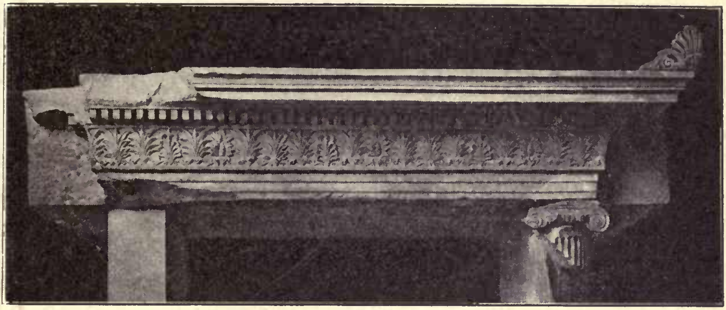


Fig. 278. — Frieze from the Stoa at Pergamon.

of four different kinds were rhythmically arranged on the frieze of an Ionic niche in the Stoa of Athena Polias at Pergamon (Fig. 278). The continuous character of the

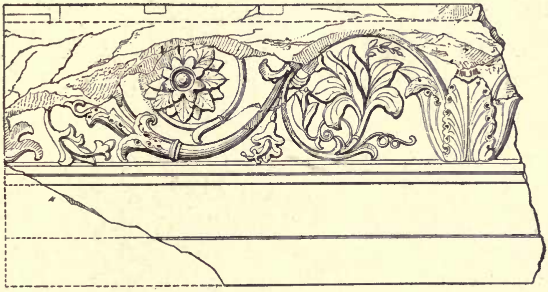


Fig. 279. — Frieze from the Propylon, Pergamon.

Ionic frieze was emphasized still better by the vine pattern, or branching scroll, as in the Propylaia of the Temple of Athena at Pergamon (Fig. 279). This type of decoration was further developed in many Roman friezes, notably that of the Temple of the Sun at Rome. Zoömorphic types, such as griffins, eagles, owls, bucrania, occur not infrequently in combination with garlands. The Propylaia at Pergamon (Fig. 280) again furnishes an appropriate illustration. But in the archaic and classic periods

FIG. 280. — Frieze from the Propylon, Pergamon.

mythological subjects were preferred. Vigorous scenes of conflict were represented in Ionic as well as in Doric friezes. Thus, in the Treasury of the Knidians at Delphi the subjects are: (E) the conflict of Greeks and Trojans over the body of Euphorbos, (W) the apotheosis of Herakles, (N) contests of Gods and Giants, and (S) the rape of the daughters of Leukippos by the Dioskouroi (Fig. 281). Such subjects as the contests of Gods and Giants (Delphi, Pergamon), Lapiths and Centaurs (The Theseion, and Phigaleia), Greeks and Amazons (Phigaleia, Magnesia) or Greeks and Persians (Athena Nike), were well adapted for the decoration of a continuous frieze, and lingered through the classic into the Hellenistic period. Local legends, such as the Destruction of the Tyrrhenian Robbers (Choragic Monument of Lysicrates) and the Story of Telephos (Pergamon) occur sporadically. The finest example of an Ionic frieze is the frieze surrounding the exterior of the cella of the Parthenon. Here a single subject — the Panathenaic Procession — was developed upon four sides of the building in a frieze but three feet

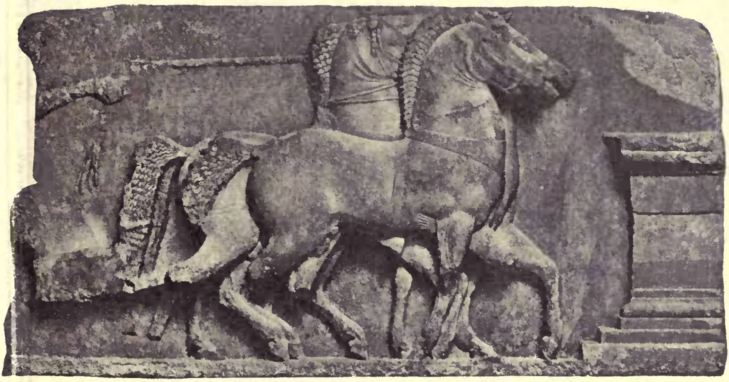


Fig. 281. — Frieze from the Treasury of the Knidians, Delphi.

four inches in height and five hundred and twenty-two feet eight inches long. The figured procession was constructed so as to ornament appropriately each wall of the cella.

Both Doric and Ionic friezes were provided with crowning mouldings. In Doric buildings the triglyphs and metopes were usually crowned with platbands, which differed in height and thus emphasized the regular divisions of the frieze. The unity of the frieze was also sometimes marked by the introduction of an astragal or other moulding common to both triglyphs and metopes. The

Panathenaic frieze of the Parthenon was crowned by a broad platband set between an Ionic cyma reversa and a Doric beak moulding (Fig. 282). In buildings of the Ionic order the crowning moulding of the frieze showed carved decoration. This was either an echinus carved with the egg and dart, as in the Mausoleion at Halikarnassos (Fig. 283), or a cyma reversa with Lesbian leaf decoration, as in the Erechtheion (Fig. 284). The antithema of the frieze, in porches and peristyles, was usually capped by simpler mouldings.

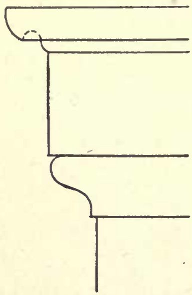


Fig. 282. — Cap mouldings of frieze, Parthenon.

In treating of the decoration of the cornice we may consider first the bed moulding, then the overhanging geison. The bed moulding in the Old Temple of Athena[1] was a platband

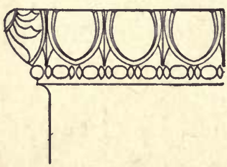


Fig. 283. — Cap moulding of frieze, Halikarnassos.

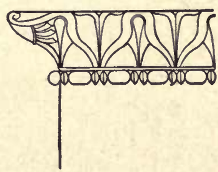


Fig. 284. — Cap moulding of frieze, Erechtheion.

painted red; in the Parthenon,[2] it was decorated with a simple maeander. In Attic Ionic buildings, the cap moulding of the frieze was often identical with the bed moulding of the cornice. This in the Erechtheion consisted of a cyma reversa carved with the Lesbian leaf.

[1] Wiegand, Taf. 1. [2] Penrose, Pl. 1; Fenger, Taf. 2.

In Asia Minor a row of dentils usually intervened between the frieze and cornice, and its crowning moulding became the bed moulding of the cornice. This was notably the case in the Temple of Athena at Priene (Fig. 285). The soffits of the dentils were left plain, but the inter-dentils were sometimes broken at the top by a cross band, as at Priene (Fig. 286). This led to very elaborate decoration of the inter-dentils in Roman buildings.[1]

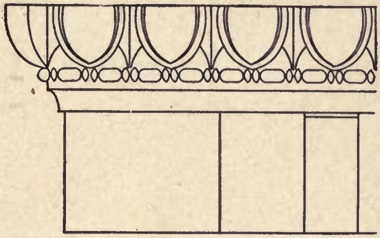


FIG. 285. — Dentils from Priene.

The faces of the dentils were usually undecorated, but in the Temple of Apollo near Miletos (Fig. 287) lotuses and palmettes of varied design decorated the dentil fronts. The cap mouldings of the dentils varied considerably. Sometimes, as in the Smintheion,[2] the most prominent moulding was a plat-band; at Priene and elsewhere, an echinus moulding carved with the egg and dart; in the Porch of the Maidens of the Erechtheion, a cyma reversa carved with Lesbian leaves.

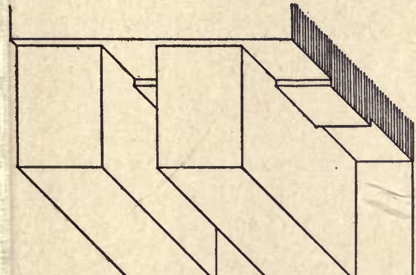


FIG. 286. — Dentils and inter-dentils, Priene.

The decoration of the cornice varied, naturally, with its

[1] Taylor and Cresy, II, Pls. 81, 113. [2] Ion. Antiq., IV, Pl. 29.

form. The soffit, being visible from below, afforded an important field for decoration. A succession of alternating eagles and palmettes decorated it on the raking cornice of the Old Temple of Athena at Athens.[1] An unbroken soffit, bounded by roundel mouldings, appears in the terra-cotta sheathing of the upper part of the corona of the Treasury of Gela at Olympia.[2] The roundels were painted with alternate bands of red, or black, and yellow, while the enclosed surface was decorated with a black maeander on a yellow ground. The soffit of the cornice of the Treasury of the Knidians at Delphi was beautifully decorated with a carved palmette and lotus pattern; that of the Temple of Dionysos at Pergamon[3] with sculptured lozenges, each with a central rosette. On the other hand the soffits of Ionic cornices were often left undecorated. Cornices with interrupted soffits received marked decoration. When showing a series of mutules, the latter were almost universally painted blue, their trunnels red, or white, and the intervening spaces, or *viae*, red.[4] In addition to simple color, a double anthemion decorated the *viae* of the Temple of Asklepios at Epidauros (Fig. 288). When coffered, as in the so-called Temple of Demeter at Paestum, the panels were doubtless painted so

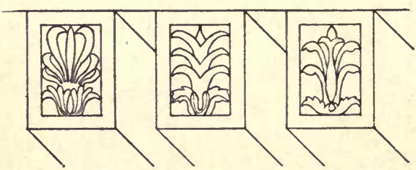


Fig. 287. — Dentils from the Temple of Apollo near Miletos.

[1] Wiegand, Taf. 1.
[2] See Fig. 289.
[3] Bohn, *Temp. Dion. Perg.*, 6; Collignon et Pontremoli, 55.
[4] Borrmann, 1338–1339.

as to harmonize with the ceiling cofferings. When consoles also were added, they, as well as the panels, were decorated. Almost no decoration was applied to the consoles and panels of the interior cornice of the Tower of the Winds at Athens, but in the Temple of Zeus

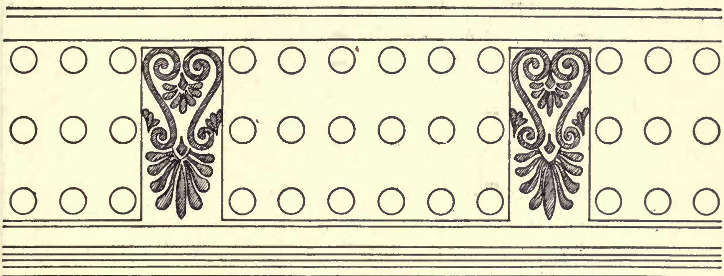


FIG. 288. — Cornice soffit from Epidauros.

at Aizanoi[1] the scroll-shaped consoles were decorated with carved acanthus and the deep panels with rosettes in high relief — a species of cornice decoration which became common in Roman architecture.

The face of the cornice in the archaic period was sometimes highly decorated. This was notably the case when terra-cotta sheathing was used. Thus, in the Treasury of Gela at Olympia (Fig. 289), the decoration consisted of a painted braid ornament of complex type bounded by roundel mouldings wound with painted bands. Classic cornices usually discarded this luxuriance of decoration. The typical Doric cornice was a broad white band having no central ornament ; its beak moulding, however, was painted with Doric leaves (Fig. 290), and the blue mutules

[1] Reinach-Lebas, *Arch. As. Min.*, I, Pl. 32.

on its soffit had their sides painted red. The Ionic cornice was equally simple, being adorned only with carved cap mouldings (Fig. 291). Only in Roman times was

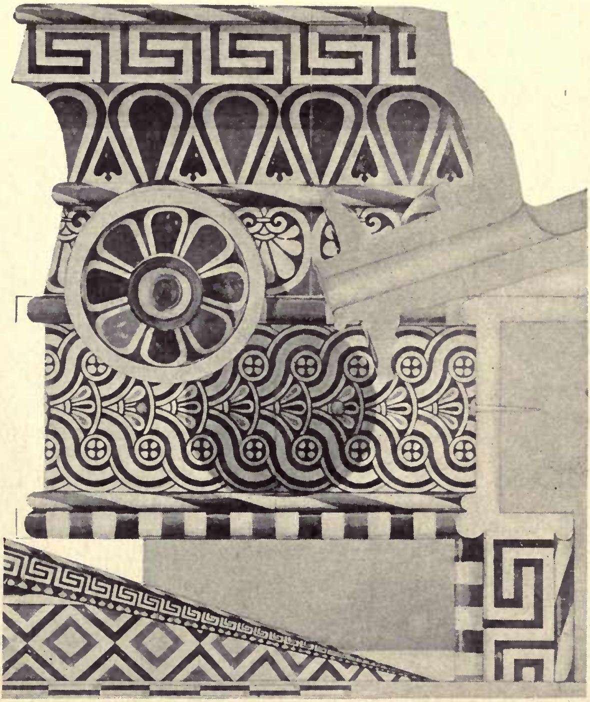


FIG. 289. — Cornice from the Treasury of Gela, Olympia.

the face of the cornice decorated with carved maeanders, flutings, reeds, or other ornament.

7. DECORATION OF CEILINGS AND ROOFS. — The decoration of Greek ceilings was concerned with the beams and the cofferings. Wooden ceiling beams were

doubtless decorated with painted ornament. This we may infer from the ceilings of a later period in Byzantine

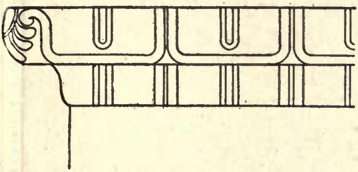


Fig. 290. — Cornice crown from the Parthenon.

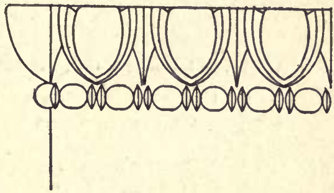


Fig. 291. — Cornice crown from the Erechtheion.

and mediaeval churches, and from the general demands

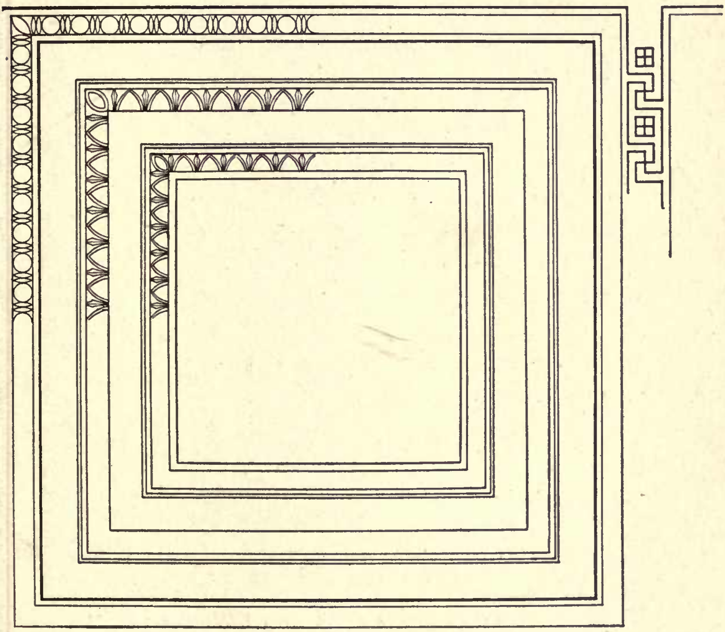


Fig. 292. — Ceiling cofferings from the Parthenon.

of polychromatic architecture. The usual method of decorating ceiling beams was to sink, in their soffits, panels framed with ornamental mouldings, to break up the sides into fasciae sometimes enriched with astragals, and to crown them with decorative mouldings.

The divisions between the cofferings were ornamented in the Theseion by a bead and reel moulding, in the Parthenon (Fig. 292) and Erechtheion by a painted maeander. This association of the maeander with ceiling decoration is thought by Boetticher [1] to explain the definition of *μαίανδρος* by Hesychios as *κόσμος τις ὀροφικός*.

The recessed cofferings were ornamented in various ways. The Theseion affords a simple example. The soffits of the coffers each present a single star, painted probably in gold against a blue ground, and hence called *οὐρανός*, or *οὐρανίσκος*. The surrounding moulding was painted with the egg and dart. The Parthenon and the Propylaia show doubly recessed coffers with decorated mouldings surrounding the central plate. Some of the plates of cofferings from the Propylaia still show stars; others, anthemia of beautiful design. These are charmingly published by Penrose.[2] The central plates of the Erechtheion cofferings were decorated by some attached ornament — probably rosettes of bronze.[3] Coffered ceilings in Asia Minor were sometimes triply or quadruply recessed, and framed by mouldings of varied form and carved ornament. A noteworthy example is that of the Temple of Athena at Priene,[4] where the coffers were framed by an echinus moulding, carved with an egg and dart, a cyma recta with the palmette and lotus, and a

[1] Boetticher, 90.
[2] Penrose, Pl. 25.
[3] Choisy, *Études*, 131, 152.
[4] *Priene*, Taf. 10.

cyma reversa with the leaf and dart. The Romans went a step further and ornamented by permanent carving the central plate as well as its surrounding mouldings. Possibly the most elaborately decorated ceilings of antiquity were those of the *ναῦς θαλαμηγός* of Ptolemy Philopator, where cedar and cypress, gold, ivory, and precious stones were employed in the decoration.[1]

The triangular gable invited special treatment. Beneath the raking cornice the tympanum had its own crowning moulding: concave in form, and decorated with Doric leaf pattern, in one of the poros buildings on the Acropolis;[2] a beak moulding, decorated with Doric leaves, at Aegina;[3] a cyma reversa, probably decorated with Lesbian leaf pattern, in the Temple of Athena Nike;[4] an echinus moulding carved with the egg and dart at Magnesia on the Maeander;[5] a group of mouldings in the Sacred Stoa at Priene.[6] The face of the tympanum was ornamented sometimes by a simple motive, such as a round shield, which occurs at the gable front of the Stoa at Priene, or by mythological sculpture in low or high relief, as in the poros buildings on the Acropolis at Athens.[7] In these archaic examples from Athens the difficulty of filling the narrow corners of the gable was solved by the introduction of composite creatures like the Hydra, Tritons, or Typhon, whose bodies terminated in the tail of a serpent, or fish. The shallow gables of Ionic temples were usually devoid of sculpture, but the deeper gables of Doric buildings allowed free standing figures. The

[1] Athenaios, *Deipnos.*, V, 204 d.
[2] Wiegand, 148, Taf. 12.
[3] Cockerell, Pl. 6; Furtwängler, Taf. 33.
[4] Ross-Schaubert-Hansen, Taf. 6.
[5] *Magnesia*, Fig. 59.
[6] *Priene*, Fig. 191.
[7] Lechat, *Sc. Attique*, Chs. II–III.

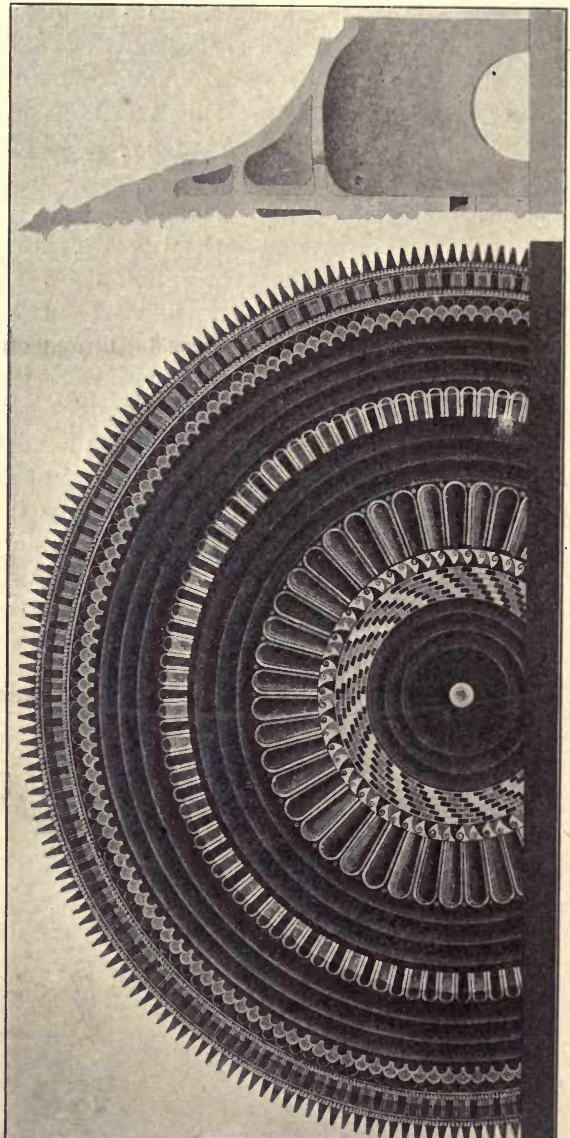


FIG. 293. — Acroterion from the Heraion, Olympia.

subjects selected were usually mythological in character, but not necessarily related to the divinity to whom the temple was dedicated. The triangular space to be decorated led to pyramidal compositions in which the interest culminates in the centre of the pediment. Reclining figures occupy the corners of the pediments at Aegina and Olympia. The climax of pedimental composition was reached in the pediments of the Parthenon, where balance and symmetry were preserved without being crudely obvious.

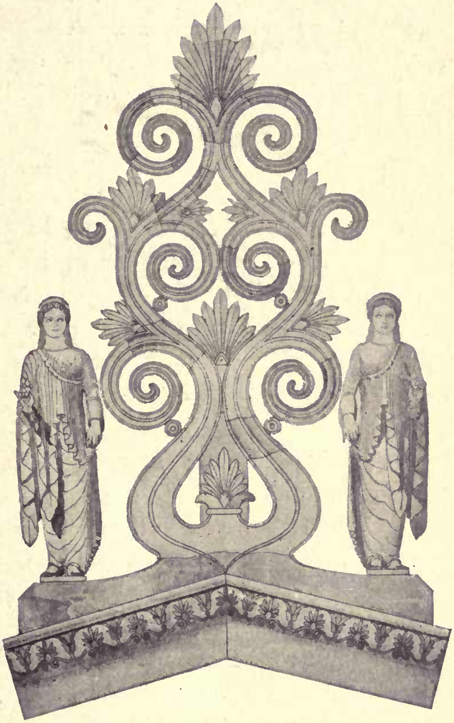


FIG. 294. — Acroterion from the Temple of Aphaia, Aegina.

The acroteria (ἀκρωτήρια) at the extremities of the gable received special decoration. The earliest types were perhaps circular disks representing the ends of ridge-pole and wall-plates.[1] The most notable early example is that found in the Heraion

[1] Benndorf in *Jhb. Oesterr. Arch. Inst.*, II, 1–51.

at Olympia (Fig. 293), which is decorated by concentric bands of geometric ornament. For this type other ornamental forms were substituted. The Temple of Aphaia at Aegina (Fig. 294) had, at its apex, an elaborate palmette scroll flanked by figures of maidens, and, at the lower extremities of the gable, figures of griffins. More complex acroteria of this type crowned the summits of the Ionic temple and the Traianeum at Pergamon.[1] The Temple of Zeus at Olympia had a figure of Nike at the apex, and vases at the lower angles.[2] Mounted Nereids crowned the lower ends of the gable of the Temple of Asklepios at Epidauros. A bronze of the time of Caligula[3] indicates that the Romans did not hesitate to place a quadriga over the apex of a temple gable. In later days Renaissance architects sometimes went further still and filled the space between the central and lateral acroteria with ornament.

Similarly the long lines of cover tiles (καλυπτῆρες) were decorated at their extremities, on the ridge and at the eaves, by ornamental tiles usually in the form of anthemia (καλυπτῆρες ἀνθεμωτοί). The excavations at Olympia[4] brought to light many such terra-cotta antefixes of various periods. The marble antefixes of the Parthenon (Fig. 295) furnish fine examples of this type. The Etruscans and Romans often substituted heads of divinities and masks for the simpler anthemion.

The sima, as the crown of the horizontal cornice or of the raking gable, afforded an attractive field for decoration. It was usually subdivided into a broad central band, with a cap, and frequently also, a base mould-

[1] *Pergamon*, IV, Taf. 40; V, 2, Taf. 16.
[2] Paus. V, 10, 4.
[3] Daremberg et Saglio, *s.v.* Acroterium.
[4] *Olympia*, II, Taf. 91.

ing. In the archaic period more complicated methods prevailed, the decoration being partitioned into a series of superposed bands. The waterspouts of horizontal cor-

FIG. 295. — Antefix from the Parthenon.

nices were seldom left unornamented. In the Treasury of Gela at Olympia the ends of the waterspouts were decorated as rosettes. The more common type, however, for all periods was the lion head. Doric simae of the archaic and classic periods were decorated with painted, Ionic simae with carved ornament. But the form of the sima had comparatively little influence in determining the character of the decoration. The same running patterns were applied almost indifferently to flat, concave, convex, or doubly curved surfaces. The flat-faced sima of the Old Temple of Athena on the Acropolis (Fig. 296) was deco-

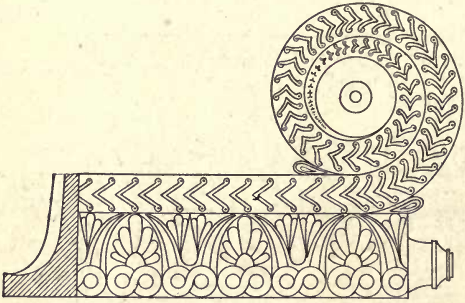


FIG. 296. — Sima of old Temple of Athena, Athens.

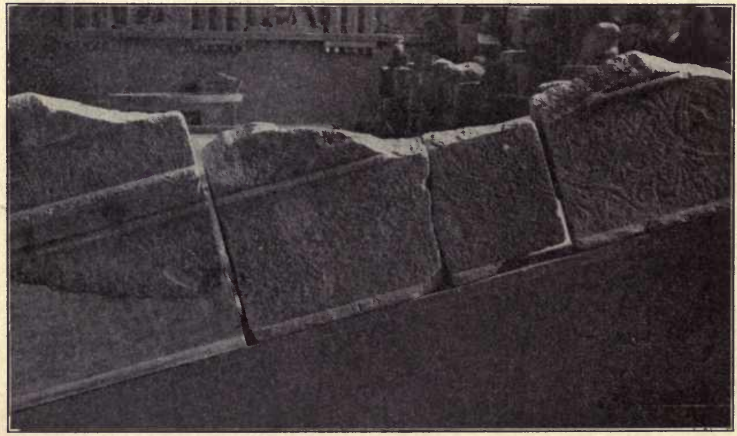


FIG. 297. — Sima and cornice from Temple F, Selinous.

rated with conventionalized lotuses and palmettes, a type of ornament which, in the cornice from Temple F, Selinous

(Fig. 297), developed into more stately and graceful forms. Flat-faced simae occur also in the Tholos at

FIG. 298. — Sima from Epidauros.

Epidauros (Fig. 298), and in several of the later buildings at Olympia, where they are decorated with carved acanthus scrolls. The concave section of the sima from the Treasury of Gela[1] was decorated with an unusual form of a conventionalized leaf pattern, while in that of the Bouleuterion the old Doric leaf pattern still survived. The convex sima of the Pro-

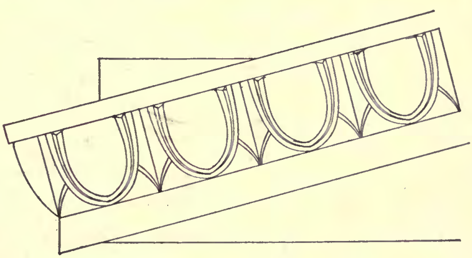


FIG. 299. — Sima from the Propylaia, Athens.

[1] See Fig. 289.

pylaia at Athens (Fig. 299) was decorated with an incised and painted egg and dart ornament, whereas in the Temple of Zeus at Olympia (Fig. 300), in the Parthenon,

Fig. 300. — Sima from Olympia.

and elsewhere the lotus and palmette pattern prevailed. The transition from the echinus curve to the cyma reversa

Fig. 301. — Sima from Olympia.

was an easy one. At Olympia several simae retain at the base a platband ornamented with the maeander, while the principal moulding was decorated with lotuses and palmettes. In the Temple of Aphaia at Aegina[1] the lotus and palmette pattern was confined to the upper part of the curved surface of a fully developed cyma reversa. The type of curve, however, which was destined to become normal for simae was the cyma recta. We find it deco-

FIG. 302. — Sima from Priene.

rated with the Doric leaf pattern in an early sima from one of the treasuries at Olympia (Fig. 301); with the palmette and lotus above the door of the North Porch of the Erechtheion;[2] and with the acanthus scroll and lion heads in the Temple of Athena at Priene (Fig. 302) and elsewhere.

The waterspouts of the classic and Hellenistic periods were usually lion-headed (*λεοντοκέφαλοι*), although dog-headed spouts (*κυνοκέφαλοι*) occur at the Temple of Artemis at Epidauros. Roman architects preferred the cyma recta form for simae, and retained the lion heads and acanthus ornament.

[1] Cockerell, Pl. 13; Furtwängler, Taf. 33, 53. [2] See Fig. 201.

CHAPTER V

COMPOSITION AND STYLE

THUS far we have considered the various architectural elements in respect to their technique, forms, proportions, and decoration. In this chapter we confine our attention to the manner in which these elements are combined, and to the formation of various styles.

1. FOUNDATIONS AND PAVEMENTS. — It is not always remembered that more than elementary composition was involved in the construction of foundations and pavements. This is especially the case in adjusting the construction of the stylobate to its substructure. In the earlier buildings, as in the Heraion at Olympia and Temples C and D at Selinous, the vertical joints of the lower steps of the krepidoma stand in no regular relation to those of the stylobate. When, later, dilithic stylobates were introduced, greater regularity was required in the jointing of the krepidoma. Hence we find in such buildings as the Parthenon, or the Temple of Concordia at Akragas, a perfect harmony between the joints of the stylobate and those of the lower steps. Below the krepidoma the stereobate, though sometimes partially exposed to view, was usually invisible. Here, especially in the early period, irregularity of construction was condoned. In the classic period, however, the love of regularity and harmony exhibited in the jointing system of the krepidoma

was extended also to the stereobate. Thus in the Temple of Concordia at Akragas[1] we find no less than seven courses of masonry of the stylobate, sub-stylobate, and stereobate showing a perfectly regular system of alternating joints. When we take into consideration that the

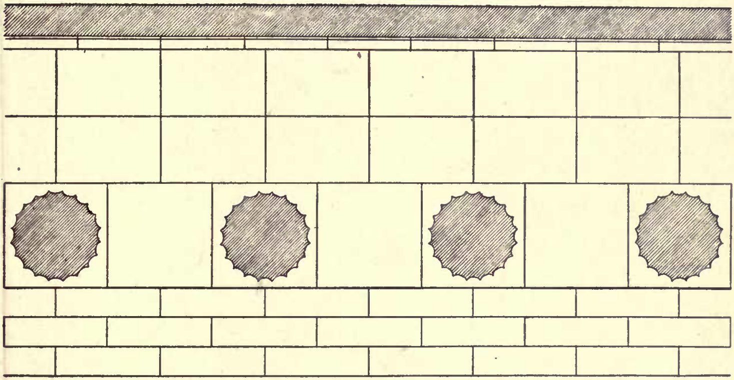


FIG. 303. — Composition of stylobate and pavement blocks in the Temple of Concordia, Akragas.

stylobate blocks were not all equal in length, but were cut to suit the spacing of the columns, and that they were not set in a horizontal plane, but on a convex foundation, we begin to realize that the jointing system of the base of a classic temple required mathematical calculations of no mean order.

Pavements also required proper adjustment to their surroundings. In peristyles the jointing system of the pavement was gradually brought into regular relation with that of the stylobate (Fig. 303) on the one side and

[1] Koldewey und Puchstein, 172.

that of the wall on the other. The paving blocks were usually laid according to some system. Thus in Temple C, Selinous, most of the blocks were laid in the same direction as the temple axis; in Temple D they were laid regularly at right angles to the axis of the temple. Usually the eastern and western porticoes received special attention. In the Temple of Zeus at Olympia (Fig. 304) they were paved alike, but differently from the northern and southern porticoes. In the Parthenon they were paved in contrast to each other, as well as to the pavements of the long sides. In the Temple of Dionysos at Teos[1] similar blocks were used on all four sides and laid in the direction of the axis of each portico. Hence it is evident that some skill in composition was required in laying the paving blocks of peristyles. Pavements had also to be adjusted

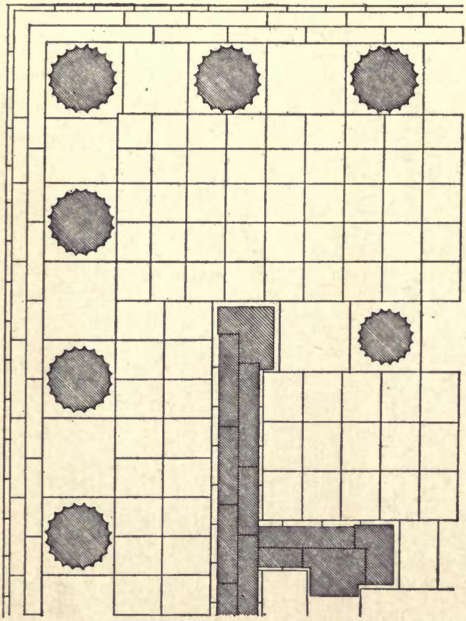


FIG. 304. — Front and lateral pavement of the Temple of Zeus at Olympia.

[1] *Ion. Antiq.*, IV, Pl. 22.

as to level. When under cover, they could be laid horizontally; when exposed, they were laid so as to carry off the rainfall by a gentle slope, as may be seen in the North Portico of the Agora at Priene,[1] or in the platform of the Temple of Athena in the same town. When the stylobate of a temple was curved, and the front and lateral stylobates followed the arcs of the same circle, the pavement would correspond in level to the surface of a great dome; but when the front and lateral curvatures were in different arcs, as, for example, in the Parthenon, the level of the pavement would correspond to the extrados of a huge cross-vault, with surfaces sinking at the angles so as to form a channel. It is safe to say that Greek temple pavements never exhibited this peculiarity; nevertheless, the angles of a curved platform must have presented a problem which required some kind of practical adjustment.

2. Walls. — Walls may be combined with other walls, or with towers, columns, piers, and pilasters. The simplest problem, that of combining one wall with another, was solved in primitive masonry by making the two walls meet without interpenetration. Such independence, however, was ill suited to walls constructed of cut stone. When walls of regular cut masonry meet, they usually interpenetrate. This interpenetration was sometimes effected by the use of quoin blocks (*λίθοι γωνιαῖοι*), cut so as to turn the corner, a method employed by Philon in the Arsenal of the

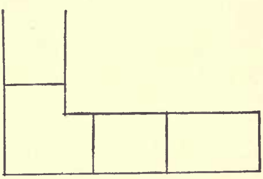


Fig. 305. — Corner blocks of the Arsenal at the Peiraieus.

[1] *Priene*, 203.

Peiraieus (Fig. 305). Usually, however, the corner blocks were superposed alternately in the direction of the two walls, either with or without notching (Fig. 306). In late Greek and in Roman buildings, such as the Ionic Temple on the theatre terrace at Pergamon, the juncture of two walls was sometimes emphasized by angle pilasters.[1]

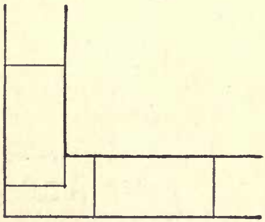


FIG. 306. — Notched corner blocks from Pergamon.

In the composition of walls with towers, on account of the disparity of form and structure, interpenetration was impracticable. Philon of Byzantium[2] lays down the principle in fortification that it is bad construction to bond together towers and curtain walls. The relation of towers to the curtain walls seems to have been a matter of experiment. The ancient method of projecting the towers at right angles to the walls was frequently practised, but not thoroughly approved. Philon suggested that they be set obliquely to the curtain wall; Vitruvius,[3] that round or polygonal towers be substituted for those of square form.

In the combination of walls with columns, piers, and pilasters we have already observed, in the chapter on technique, the tendency to replace independence of construction by interpenetration. Here it remains for us to describe the way in which walls were related to the columns in peripteral buildings. Early in the archaic period, as Koldewey and Puchstein[4] have shown, the

[1] *Pergamon*, IV, Taf. 27–33.
[2] De Rochas, 43.
[3] Vitruvius, I, 5, 4.
[4] Koldewey und Puchstein, 197, 203.

cella walls were placed without regard to the columns of the peristyle. Later an alignment of the columns with the cella walls was effected for the front colonnade, and still later for the lateral columns. In the Parthenon the outer walls of the cella are in line with the axes of the columns adjoining the angle columns, and the faces of the antae are in line with the axes of the third lateral columns, but the columns of the pronaos and the opisthodomos, though regularly placed with reference to the cella, have no definite relation to the peripteros (Fig. 307). In later buildings, such as the Temple of Athena at Priene, the cella walls and the columns of the peristyle were placed with strict reference to each other.

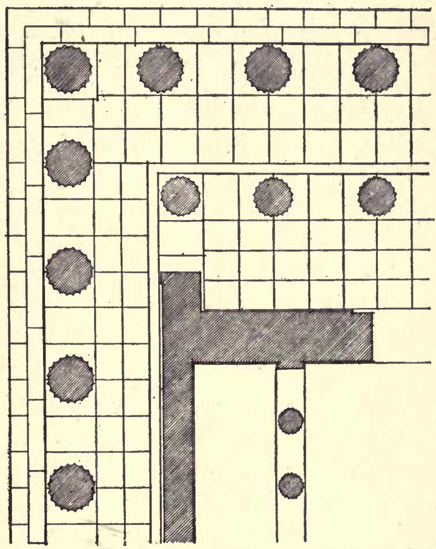


Fig. 307.—Relation of the pronaos and peripteros columns in the Parthenon.

3. Antae and Pilasters.—In earlier chapters we have noted various modifications of the structure, form, and decoration of antae and pilasters. It remains here to add a few remarks concerning complex antae, which arose from their association with colonnades.

When an anta became part of the composition of a wall with a row of columns, a complex anta was produced, which represented the termination of both wall and colonnade. The shaft of such an anta was, in part, a flat pilaster and, in part, an engaged column. This duplex form well expressed its double function. Then arose the problem of forming appropriate bases and capitals for complex antae. At the entrance to the stadion at Olympia a complex shaft has an unbroken base and a single capital (Fig. 308). A second type may be seen in the peribolos of the temple at Kangovar (Fig. 309), where each portion of the anta capital has its own capital, and the base mouldings are broken about the rectangular and semicircular portions of the complex shaft in a way which foreshadows the bases of Gothic piers.

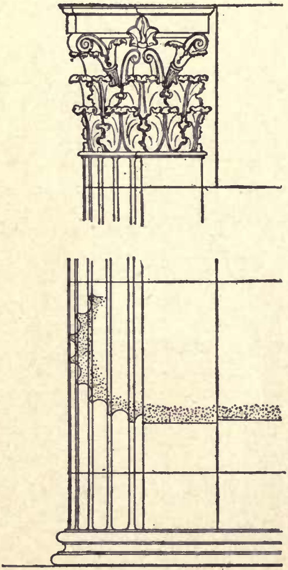


FIG. 308. — Complex pilasters from the Stadion Gate, Olympia.

A second problem in the composition of antae consisted in the establishment of their planes in elevation. Penrose[1] has observed, in the case of the Parthenon, that the antae are given a forward inclination. Hence, of the three planes in the elevation of the Parthenon antae, the front slopes outward, the side toward the pronaos is vertical, and the side toward the peristyle has the same inward slope as the cella wall. The forward inclination is explained, in part, as a struc-

[1] Penrose, 106.

tural device permitting a shorter ceiling beam, and, in part, on the aesthetic ground of producing, with the inward slope of the outer columns, a pyramidal effect. In any event, antae with only one side posed vertically show how their form was modified to suit their surroundings.

4. Doors and Windows. — Having described the structure, forms, proportions, and decoration of doors and windows, little remains to be said concerning their composition in Greek buildings. Balance in composition was considered of great importance. The entrance to a Greek temple was in the central axis of the building; windows, as in the Pinakotheke of the Propylaia,[1] or in the east wall of the Erechtheion,[2] were equally balanced on either side of a central doorway. When a series of openings or niches occurred, the principle of alternation so frequently represented in Greek ornament led to the use of alternately round-headed and square-headed openings, as in the Monument of Philopappos at Athens, and frequently in Roman architecture.

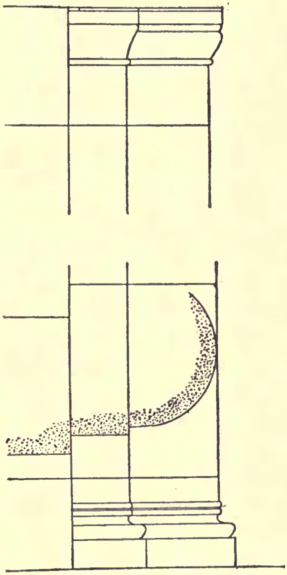


Fig. 309. — Complex pilasters from Kangovar.

Doorways not preceded by porches were adapted

[1] Bohn, Taf. 7, 9.

[2] Stevens, in *A.J.A.*, X (1906), 47 ff.

in size and style to the interior requirements and to the exterior character of the building. The addition of porches introduced a new element into doorway composition. It necessitated their being related to the columns in front of them. Many experiments were made

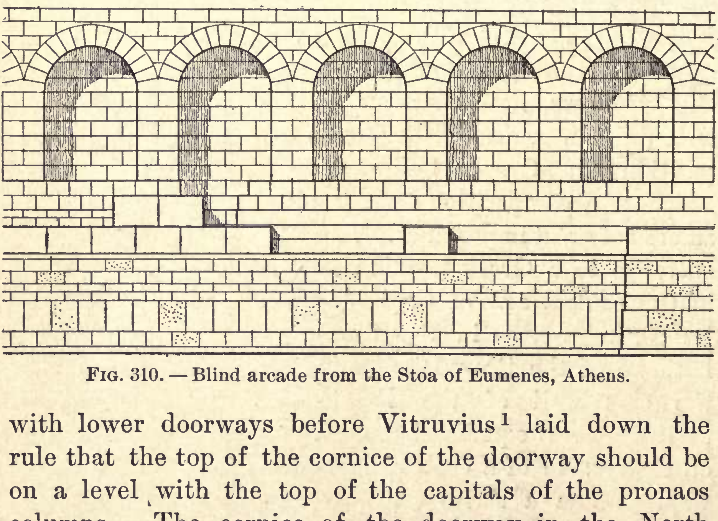


FIG. 310. — Blind arcade from the Stoa of Eumenes, Athens.

with lower doorways before Vitruvius[1] laid down the rule that the top of the cornice of the doorway should be on a level with the top of the capitals of the pronaos columns. The cornice of the doorway in the North Porch of the Erechtheion is distinctly below the level of the capitals of the columns; the Temple of Herakles at Cori and later buildings often follow the rule given by Vitruvius.

5. PIERS AND COLUMNS. — Piers supporting arches and forming arcades are rare, but not unknown, in Greek architecture. In the large courtyard of the pre-Hellenic palace at Phaistos[2] large bases occur in alternation with small ones, suggesting an arcade with alternating piers

[1] Vitruvius, IV, 6, 1. [2] *Mon. Ant.*, XII, Fig. 17, Tav. 2.

and columns. A sustaining wall composed in part of piers and connecting arches, on the south side of the Acropolis at Athens (Fig. 310), dates from the time of Eumenes II. In general, however, the arcade did not develope into an important architectural feature before the Romans undertook the transformation of Greek architecture.

The column and the colonnade presented many problems in architectural composition. The most elementary of these was to establish the proper relation of column to column. In the earliest colonnades considerable irregularity prevailed; in the archaic period an effort was made to equalize the intercolumniations, but there were many exceptions to this rule. Some early temple colonnades accentuated the short and long sides by a difference in the intercolumniations. Sometimes the columns of the short sides were more closely set, as in Temple D, Selinous, and in the Enneastylos at Paestum; sometimes they were more widely spaced, as in Temple C, Selinous. In fully developed Doric temples, like the Temple of Zeus at Olympia, greater harmony prevailed. The spacing of the columns on the long and the short sides was practically the same. The intercolumniation opposite the doorway of a temple was, to the earlier architects, a matter of indifference; in later days it was wider than the rest and, according to Vitruvius,[1] demanded in the frieze an extra triglyph. Another and far-reaching cause of irregularity arose, in Doric temples, from the desire to have the colonnade harmonize with the entablature, so that the position of the triglyphs would form a regular cadence with the axes of

[1] Vitruvius, IV, 3, 4.

the columns and the centres of the intercolumniations. This could have been easily done, had the Greeks been content, with Vitruvius, to leave metopes or halves of metopes at the ends of the frieze. But they preferred to have the frieze end with triglyphs. To secure this they admitted various irregularities in the frieze. For example, in the Temple of Zeus at Akragas[1] much broader metopes are found near the extremities than elsewhere in the frieze, and in the Parthenon[2] the sizes of the triglyphs and the metopes were quite irregular. The spacing of the colonnades was also modified in that the terminal columns were brought closer together. Sometimes this contraction[3] was confined to the terminal intercolumniations, which made a strong contrast with the rest of the colonnade; but in fully developed Doric temples it was extended, as in the Parthenon and in the Temple of Concordia at Akragas, to the next to the last intercolumniations. The many modifications required in harmonizing the Doric colonnade and its entablature led Roman architects to reject this order as *mendosum et disconveniens*.[4] They preferred the Ionic and Corinthian, in which there was no such problem.

Another problem in the composition of colonnades concerns the emphasis or lack of emphasis to be placed upon the corners of a peristyle. In the case of the Temple of Apollo at Corinth (Fig. 311) and in the Temple of Zeus at Olympia,[5] we find, not merely the corner column, but all the columns of the façade, of greater diameter than those of the long sides. Here the most

[1] Durm, 125.
[2] Penrose, Pl. 7.
[3] Koldewey und Puchstein, 197–200.
[4] Vitruvius, IV, 3, 1.
[5] *Olympia*, II, 7.

important colonnade received the emphasis. In the Theseion and the Parthenon greater harmony prevailed in the sizes of front and lateral columns. It was not the entire façade, but merely the angle columns, that were given superior thickness. In the Theseion a very delicate emphasis is laid on the corner column. It is of the same diameter, but has less diminution than the other columns of the peristyle.[1] Vitruvius[2] maintains that corner columns should be one-fiftieth larger in diameter than the rest. His argument, that corner columns being seen against the sky appear to be slenderer than those seen against the temple walls, is not supported by modern writers. The theory of Philander[3] that thicker corner columns produced a sense of greater stability in peristyles seems nearer the truth. In the stoa and the agora the corners were emphasized by larger columns,[4] by quadrangular piers,[5] or by piers with engaged columns (Fig. 312), which served as frames and

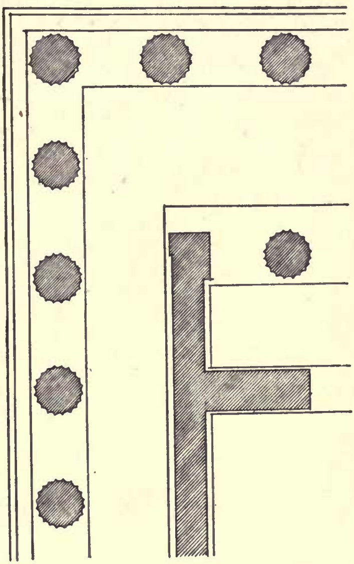


FIG. 311. — Relation of frontal to lateral columns in the Temple of Apollo, Corinth.

[1] Reinhardt, 10.
[2] Vitruvius, III, 3, 11.
[3] Marini, I, 147, note 22.
[4] *Pergamon*, II, Taf. 33.
[5] *Priene*, Taf. 13.

connecting links of aesthetic rather than structural consequence.

A further problem arose in the case of double colonnades. In archaic temples when a double row of columns preceded the temple cella, the inner columns were sometimes heavier than those of the outer peristyle, as in Temple C at Selinous.[1] In the classic period, however,

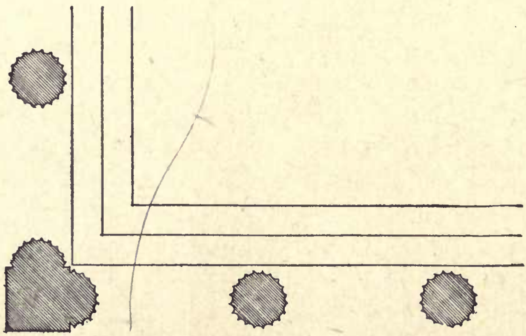


Fig. 312. — Corner pier from Magnesia.

the inner row was composed of perceptibly slenderer columns, as in the Parthenon.[2] This practice became the rule in later days. Vitruvius[3] tells us exactly how much slenderer the inner row should be, and that the apparent slenderness should be increased by additional channellings.

The composition of the colonnade and walls with respect to elevation furnished a new problem in the case of the peripteral temple. Were the outer face of the cella wall vertical and the column shafts cylindrical, the

[1] Koldewey und Puchstein, 99. [2] Penrose, Pl. 3.
[3] Vitruvius, IV, 4, 2.

colonnade would harmonize best with the cella walls if it too were vertically set. But when the outer face of the wall sloped inward, and the columns diminished in diameter toward the top, a colonnade posed on a vertical axis would form a porch wider at the top than at the base, and thus apparently lack stability. According to Garbett, the colonnade in front of the British Museum, being thus posed, appears in danger of falling outward.[1] To correct this fault was a practical necessity. It is also held by some writers that when a line of tapering columns are set on a vertical axis, they present a fanlike appearance. Choisy[2] assures us that this is the case with the Pantheon and the Palais du Corps Législatif in Paris. It may also be remarked that, in the case of convex stylobates like those of the Parthenon, if an attempt were made to pose each column perpendicularly to the stylobate, a fanlike divergence would actually occur. Hence columns were harmonized with the walls by being given a similar inward inclination, and the fanlike divergence was corrected chiefly by means of the counter inclination of the angle columns. In peristyles an angle column belonged to two colonnades, each of which demanded of it a different counter inclination. This double demand was met by inclining the angle column in the direction of the diagonal of the temple base. Sometimes only the corner columns supplied the counter inclination; in other cases the columns adjoining the angle columns also shared in it. An inclination of the colonnade toward the walls is found in the best Athenian buildings, as the Parthenon, the Propylaia, the Theseion, and even in the Erechtheion;[3] but in other fine Doric

[1] Garbett, 155. [2] Choisy, I, 406. [3] Penrose, 36–38.

temples of the classic period, like the Temple of Apollo at Phigaleia [1] and the Temple of Concordia at Akragas,[2] and in some of the best Ionic temples, as the Temple of Athena at Priene,[3] it does not occur. Vitruvius [4] required a stronger inclination than is found in Greek temples, insisting that the axis of the colonnade be inclined toward the walls far enough to overcome the diminution of the column and render the inner profile perfectly vertical.

The art of composition included also the decoration of columns. In the great majority of cases the same type of base, shaft, and capital was repeated throughout a colonnade. But decorative composition of a more complex type was found in the archaic as well as in the Hellenistic Temple of Artemis at Ephesos,[5] where variety was exhibited not only in the sculptured shafts, but also in the bases and capitals. In the North Porch of the Erechtheion a very delicate symmetry was produced by the use of concave bands in the braids which decorated the bases of the corner columns, while convex bands were used for the others. In the Artemision at Magnesia [6] horizontal and vertical leaf decoration was applied alternately on the bases of the columns of the peristyle, while the bases of the columns of the pronaos and opisthodomos were decorated with braid ornament. The façade of the decastyle Temple of Apollo near Miletos [7] presented a most elaborate scheme of decorative composition. Here the bases and capitals of the corner columns corresponded

[1] Cockerell, 64.
[2] Koldewey und Puchstein, 173.
[3] *Priene*, 89.
[4] Vitruvius, III, 5, 4.
[5] Hogarth, 264–271.
[6] *Magnesia*, 53.
[7] Haussoullier, 134–177.

with those of the columns of the lateral colonnades. The remaining bases, and probably the capitals also, were arranged in pairs, each pair differing from other pairs and in some cases individual bases differing from their mates, the pairs being arranged so as to produce a rhythmical alternation of forms as well as a symmetrical balance of decorative motives.

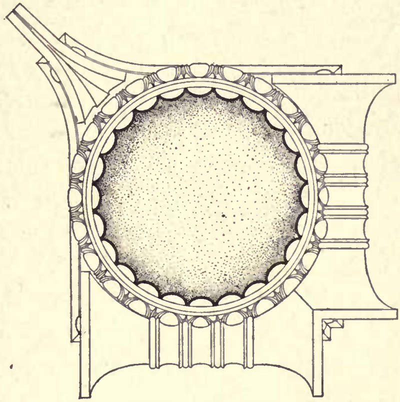


Fig. 313. — Plan of Ionic corner capital.

It may be further remarked that when the Ionic order was used, the corner columns of a peristyle presented a problem in composition in the spirals of their capitals. At the exterior angle (Fig. 313) the spirals were usually drawn out in a direction corresponding to the diagonal of the abacus, and the angle was sometimes marked with an ornamental palmette. The interior angles of such corner capitals were especially awkward, but at Priene they were relieved by decorative palmettes (Fig. 314). Doric and Corinthian capitals did not involve this difficulty.

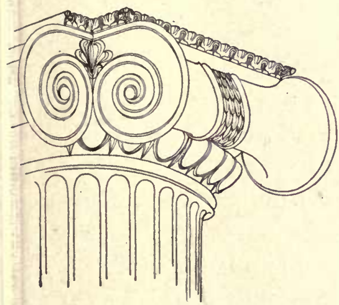


Fig. 314. — Inner view of Ionic corner capital.

6. Entablatures. — In treating of composition in the entablature we shall consider first the epistyle, and then the frieze and cornice.

The epistyle blocks were fashioned so as to compose in various ways with each other. In rectilinear or circular colonnades the problem was purely technical, and solved by fine jointing and proper clamps. In turning the corners of a rectangular colonnade, the difficulty consisted in selecting a proper joint. When the epistyle consisted of a series of single blocks, a half mitre, half butt joint was used, as in the Propylaia at Pergamon (Fig. 315). When double blocks were employed, as in Temple E, Selinous, only the inner blocks were mitred (Fig. 316). In the Temple of Zeus at Olympia,[1] where a triple series of blocks met at the corners, the outer blocks formed a butt joint and the inner blocks were mitred.

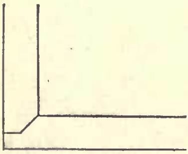


Fig. 315. — Plan of corner epistyle blocks from the Propylaia, at Pergamon.

The epistyle should also compose well with the frieze, and with the colonnade. Its composition with the frieze was partially formal. Both followed, of necessity, the same plan, and shared the same curvilinear modifications. But frequently epistyle and frieze differed in form, and were united chiefly through their decoration. In the Doric order the regulae occurring beneath the cap moulding of the epistyle serve no other function than to bind together decoratively

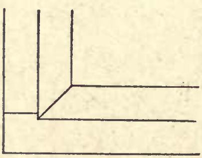


Fig. 316. — Plan of corner epistyle blocks from Temple E, Selinous.

[1] *Olympia*, I, Taf. 13.

the epistyle and frieze. In the Ionic order epistyle and frieze differ markedly in form, but their cap mouldings usually present some decorative motive in common. The composition of the epistyle with the colonnade required more careful adjustment than is usually supposed. The early builders at Selinous (Fig. 317), Metapontum, and Paestum timidly posed their epistyles behind or flush with the upper face of the colonnade. At Aegina (Fig. 318) and at Athens, in the classic period, the epistyle was advanced well beyond the face of the columns.[1] In cases where the colonnade inclined inward so as to harmonize with the walls the epistyle was given an analogous inclination, only rather

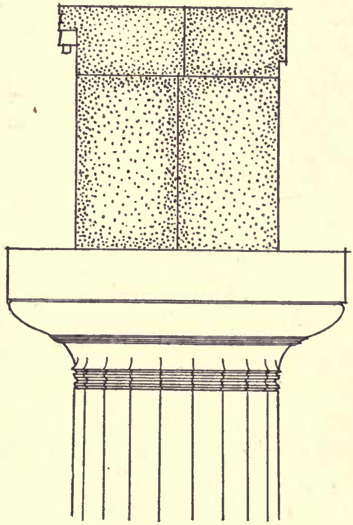


FIG. 317. — Relation of epistyle to shaft in Temple C, Selinous.

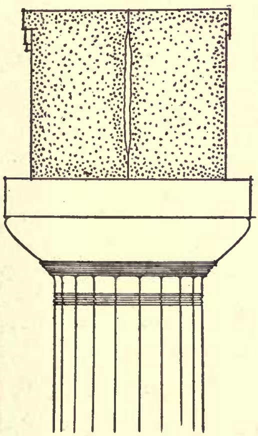


FIG. 318. — Relation of epistyle to shaft in the Temple of Aphaia, Aegina.

[1] Krell, 84, 101.

greater in amount (Fig. 319). The frieze followed the epistyle. Even the tympanon of the triangular gable shared this inclination, but to a less degree. This was the case in the Parthenon, the Theseion, and the Propylaia.

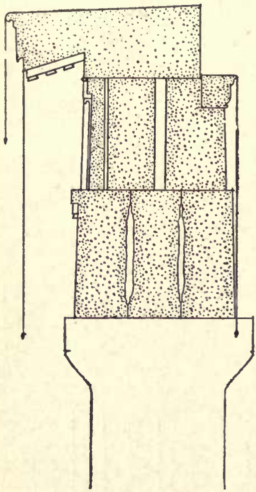


Fig. 319. — Inward inclination of the entablature, Parthenon.

It would be interesting to know just what inclination, if any, was given to the entablature of the Erechtheion, where the inward inclination of the columns was exceedingly slight. In the Porch of the Maidens the vertical faces of the epistyle were perfectly vertical,[1] but here the Maidens themselves were vertically posed. However, in the interior of the Propylaia the Ionic columns were vertically posed, and yet the epistyle was given a forward or outward inclination (Fig. 320). This tilting forward of the entablature in Ionic colonnades was a rule with Vitruvius,[2] who argues that the upper portions of epistyles, friezes, cornices, gables, and acroteria, being remoter from the eye of the spectator than their lower portions, would appear to slope inward and

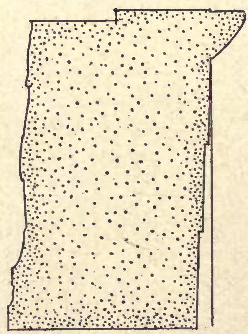


Fig. 320. — Outward lean of the epistyle, Propylaia, Athens.

[1] Iwanoff, I, Taf. 13.

[2] Vitruvius, III, 5, 13.

hence must be tilted outward in order to produce the effect of perpendicularity.

The details of the epistyle do not always follow its general disposition. Thus, in the Parthenon, though the epistyle is tilted inward, the face of its taenia is vertical and that of the regulae is given an inward slope.[1] In the North Portico of the Agora at Priene[2] the taenia, as well as the regulae and their trunnels, was tilted inward. The significance of these variations is not always obvious. In the composition of the regulae at the corners of buildings the practice in the archaic and classic periods was to juxtapose the two regulae, carving six trunnels on each (Fig. 321). Later the two regulae were united at the corners, and a corner trunnel made its appearance (Fig. 322). The number of trunnels sometimes differed from the canonical number, six. Thus the regulae of the poros epistyles from Athens[3] show four and five trunnels; those of the Temple of Dionysos at Pergamon,[4] seven; those of

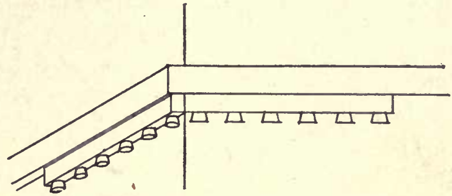


FIG. 321. — Corner regulae of the Parthenon.

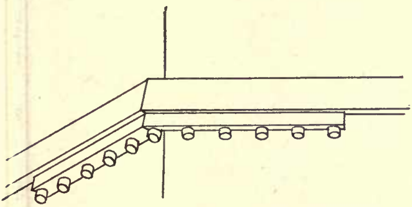


FIG. 322. — Corner regulae of the North Stoa, Priene.

[1] Penrose, Pl. 22.

[2] *Priene*, 194.

[3] Wiegand, 150.

[4] Bohn, *Temp. Dion. Perg.*, 7.

the Monument of Thrasyllos at Athens,[1] a continuous row.

The frieze, as an intermediate member, presented several problems. Its relation to the epistyle, to the contiguous frieze, to the cornice, to the colonnade, and to the cella walls had to be properly adjusted.

The frieze was posed in the Doric order usually with its triglyphs flush with the epistyle, the metopes being set back. In the Temple of the Nemesis at Rhamnous[2] the face of the triglyphs appears to have been set slightly behind the face of the epistyle, but this method of lightening the superstructure of the entablature was seldom attempted. In the Parthenon the antithema of the frieze was slightly set back, and a space left between the external frieze and its antithema. In the Ionic style the frieze was frequently set flush with the lowest fascia of the epistyle, as in the Temple of Athena Nike.[3] In the Erechtheion[4] the face of the frieze was set farther back, in order to avoid too marked a salience of the applied relief. As we have already noted, the frieze shared also the inclination and the curvature of the epistyle.

Friezes, whenever carried around a portico or building, had to be adjusted to contiguous friezes. In archaic buildings the façade sometimes had triglyphs broader than those of the sides.[5] In the classic period the front and lateral triglyphs were of equal breadth. When a frieze was continued around a corner the problem of uniting the two friezes was a simple one. In the

[1] Stuart and Revett, II, Ch. 4, Pl. 4.
[2] Mauch, Taf. 10.
[3] d'Espouy, Pl. 7.
[4] *Ibid.*, Pl. 11.
[5] Wiegand, 8.

Doric order this was accomplished by a corner triglyph (τρίγλυφος γωνιαῖα), which presented the appearance of two triglyphs at right angles to each other, with a half groove in common (Fig. 323). An unusual type of corner triglyph, with two half grooves at the angle, is found in the Palace of Hyrkanos in Syria. In Ionic friezes the problem concerned chiefly the decorative reliefs, and was solved by means of figures near the angles which served like punctuation marks for the successive phases of the figured theme. When the triglyphal frieze was applied only to the front of a building, as in the Treasury of the Megarians at Olympia, the adjustment at the corner was not so happily solved (Fig. 324).

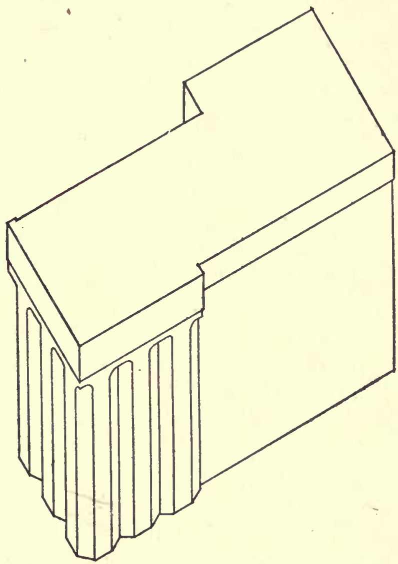


Fig. 323. — Corner triglyph from the Treasury of Selinous, Olympia.

The harmony of the frieze with the cornice required not only a proper regard for the length of the blocks, so as to avoid coincidence in jointing, but also some similarity in form or decoration. Thus, in the Doric order, the triglyphs and metopes determined the position of the mutules of the cornice, a mutule occurring in regular cadence over each triglyph and over each metope. A panelled cornice, such as that of the Temple of Demeter at Paestum, seems also to have been regulated with reference to the subdivisions of the triglyphal frieze. The forms of mouldings and their decoration were also utilized to establish a closer harmony between frieze and cornice. Thus the trunnelled regulae were reëchoed in the trunnelled mutules, and the cap mouldings of the frieze were repeated as a whole or in part in the crowning mouldings of the cornice.

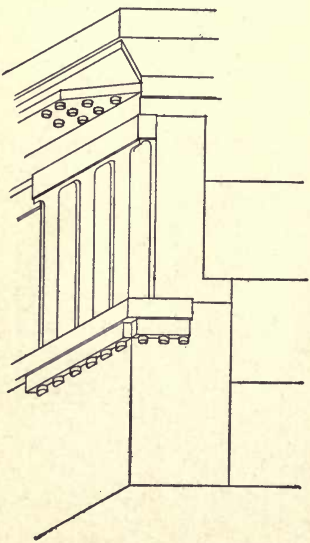


FIG. 324. — Corner triglyph from the Treasury of Megara, Olympia.

The relation of the frieze to the colonnade made further demands upon the architect's skill in composition. The difficulties were numerous in the use of the Doric order. He had first to determine the number of triglyphs to be distributed in the frieze. When the columns were closely set, as in the Temple of Apollo at Syracuse, it is possible that one triglyph was placed over each column and a metope or an opening over each intercolumniation. This system may be termed monotriglyphal (μονοτρίγλυφος).[1] The usual type of Doric frieze was ditriglyphal (διτρίγλυφος), and exhibited a triglyph over each column and one

[1] Koldewey und Puchstein, 64; Boetticher, 206–210; confused in Vitruvius, IV, 3, 7.

over each intercolumniation. Polytriglyphal systems were also in use. Two triglyphs are found above the central intercolumniations of the Propylaia at Athens;[1] three over each intercolumniation of the lower order, and four over those of the upper order, of the Stoa at Pergamon;[2] five between the columns of the Tomb of Theron at Akragas; six are found between the columns of the Doric Niche in the Stoa at Pergamon,[3] and seven between the pilasters of a Doric tomb façade at Antiphellos.[4] But the chief difficulty in adjusting the triglyphal frieze to the colonnade arose from the twofold endeavor to adhere to the system of posing triglyphs above the axes of columns, and at the same time to terminate the frieze with triglyphs rather than with a half metope. The result was that, even in so carefully constructed a building as the Parthenon, triglyphs, metopes, and epistyle blocks were not uniform in size, the triglyphs were rarely posed above the axes of the columns or of the intercolumniations, and the plumb line from the apex of the gable did not divide equally the central intercolumniation.[5]

The Romans set a higher value on rigid uniformity, posed the terminal triglyphs above the axes of the columns, and did not hesitate to leave a portion of a metope at the angle.[6]

Triglyphal and figured friezes were sometimes applied for other purposes than for colonnades. At Phaistos[7] we find the base of a bench decorated with a triglyphal frieze;

[1] Bohn, Taf. 4–5.
[2] *Pergamon*, II, Taf. 21.
[3] *Ibid.*, II, Taf. 26, 28.
[4] Texier, III, Pl. 197.
[5] Cockerell, 69; Penrose, 17.
[6] Durm, *Bauk. Etr. Röm.*, 378.
[7] *Mon. Ant.*, XII, 46, 47, Tav. 7.

at Corinth,[1] the outer wall of a fountain; at Olympia,[2] a circular altar. Friezes were also applied above doorways, or as string courses upon walls, or as crowning ornament. In the Temple of Zeus at Olympia,[3] a sculptured frieze decorated the pronaos and also the opisthodomos; in the Theseion,[4] the frieze of the pronaos was carried across the pteromata to the colonnade of the peristyle ; at Sounion,[5] it was carried not only across the pteromata, but completely around the interior of the front porch ; at Phigaleia, a frieze encircled the interior of the naos ; in the Parthenon, it decorated the exterior of the pronaos, the opisthodomos, and the cella walls.

The composition of the dentil band required a harmonious relation to frieze and cornice. This was effected chiefly through similarity of decorative mouldings. The connection of this band with the colonnade was somewhat remote. The axis of the column, if continued upward, would strike indifferently a dentil or an interdentil.

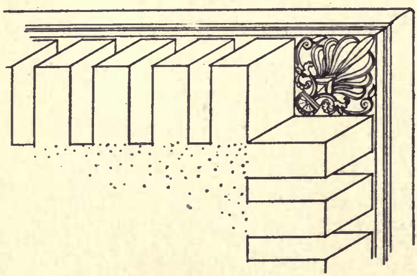


FIG. 325.—Corner dentils from Priene viewed from below.

When one dentil band met another, as in rectangular buildings, the composition of the corner dentils sometimes received special attention. To one who gazed upward from below the square space left at the angle looked awkward.

[1] *A.J.A.*, VI (1902), 306–320.
[2] *Olympia*, II, Taf. 95.
[3] *Ibid.*, I, 10, Taf. 10.
[4] Stuart and Revett, III, Ch. I, Pl. 4.
[5] *Ath. Mitt.*, IX (1884), 325, Taf. 16.

This was remedied, in the Temple of Asklepios at Priene, by the introduction of a decorative motive, such as a palmette (Fig. 325). To one who viewed the face of the building, the side of the lateral dentil made a striking contrast with the fronts of the other dentils (Fig. 326). This was corrected in later buildings, such as the Temple of Zeus at Labranda, by the introduction of a pendent ornament resembling an egg or a pine cone. In the Ionic Temple on the theatre plateau at Pergamon twin dentils were used at the corners — but this appears to have been an exceptional solution of the problem (Fig. 327).

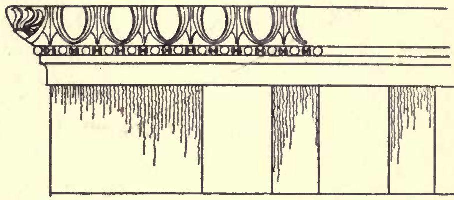


FIG. 326. — Corner dentils from Priene ; front view.

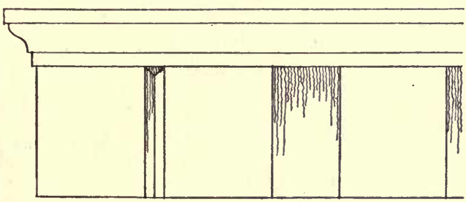


FIG. 327. — Twin dentils from the Ionic Temple at Pergamon.

Cornice composition consisted in establishing harmonious and suitable relations with the frieze, the dentils, and adjoining cornice. In the Doric style the mutular system of the cornice was determined by the system of the frieze. Thus in the monotriglyphal system of the Temple of Apollo at Syracuse the cornice was doubtless unimutular, exhibiting one mutule above each triglyph and none above the metopes. In Temple C, Selinous, the cornice was sesquimutular, as it exhibits one mutule above each triglyph, and a half mutule above each metope. The usual Doric cornice was bimutular, and contained a mutule above each triglyph and one above each metope. The mutules were harmonized with the epistyle by the exhibition of trunnels similar to those of the regulae. The number of trunnels upon a mutule depended somewhat upon their width and the overhang of the cornice. A normal mutule contained eighteen trunnels, arranged in three rows, with six in each row. The half mutules of Temple C, at Selinous, contained but nine trunnels, three in a row. In the Old Temple of Athena at Athens[1] the full mutules contained twelve trunnels, arranged in two rows of six each; the intervening mutules were narrower and contained only eight. The correlation of cornice and frieze is well illustrated at the Treasury of the Megarians at Olympia. On the façade, where there was a triglyphal frieze, the cornice was provided with mutules; on the sides, where there was no frieze, the cornice had no mutules. Here and elsewhere the raking cornices of the gables, being only remotely related to the frieze, had no mutules. The face of the cornice in many cases was posed in a vertical plane, but in buildings where the inward inclination of the entablature was pronounced the cornice inclined outward like the abacus of the capital.[2] The Ionic cornice was brought into harmony with the frieze or with the dentil band chiefly through a general similarity in the treatment of the decorative mouldings. The repetition of an echinus, cyma reversa, or cavetto moulding unified the composition, especially when the method of decoration was similar. The Romans did not hesitate to repeat even the dentils in the raking cornice.

[1] Wiegand, 16, Taf. 1.

[2] Penrose, 37, 105.

The composition of the gable with the horizontal cornice required, at the outset, some experimentation before an adequate solution was reached. In the megaron of Demeter at Gaggera the two cornices met without modification and left an awkward angular profile (Fig. 328). In Temple C, Selinous, a vertical profile seems to have been secured at the angle by a bend in the raking cornice (Fig. 329). The normal solution was to cut the raking cornice so as to mitre it to the horizontal cornice at the angle (Fig. 330).

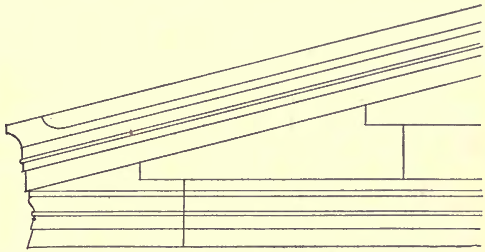


Fig. 328. — Corner of the gable of the megaron of Demeter, near Selinous.

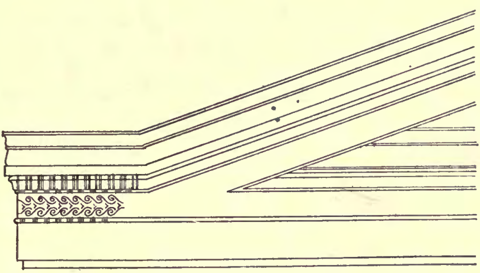


Fig. 329. — Corner of gable of Temple C, Selinous.

The tympanon, or gable wall, was posed in a vertical plane, except in buildings like the Parthenon[1] which exhibited an inward inclination in the colonnade and entablature. In such cases it shared this inward inclination. When arranged for the exhibition of gable sculptures, the tympanon wall, in archaic buildings, was set back, as in Temple C, Selinous.[2] In the Temple of Zeus at Olympia

[1] Penrose, 37.

[2] Hittorff et Zanth, Pl. 24.

the wall, and consequently the sculptured groups, were thrown forward to the extreme limit (Fig. 331). According to Vitruvius, the tympanon should be in line with the face of the epistyle and the necks of the columns.

7. CEILINGS AND ROOF. — Except in the case of peristyles, ceilings presented little difficulty. When a

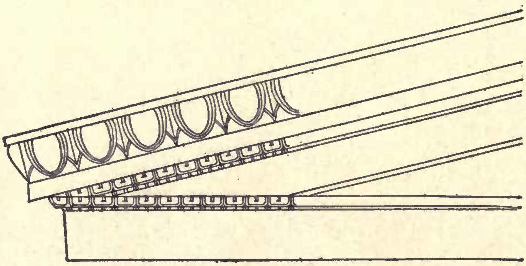


FIG. 330. — Corner of the gable of the Propylaia, Athens.

coffered ceiling was applied to the peristyle of a circular building, the cofferings became trapezoidal in shape, as in the Tholos of Epidauros,[1] or lozenge-shaped, as in the Philippeion at Olympia.[2] In the case of rectangular buildings the chief difficulty consisted in adjusting the ceiling beams to the colonnade. When the columns were closely set, as in the Temple of Apollo at Syracuse, it is possible that the ceiling beams corresponded in position with the triglyphs or columns, one beam for each column and none for the intercolumniations. A two-beam system, with one ceiling beam for each column and one for each intercolumniation, is found in the North Porch of the Erechtheion. This is the system which we find most frequently in developed Doric peristyles. It is illustrated in the lateral porticoes of the Theseion (Fig. 332), where,

[1] Lechat et Defrasse, 118. [2] *Olympia*, II, Taf. 82.

however, the beams do not correspond with the central axes of the columns nor with the centres of the intercolumniations. In the front and rear the ceiling beams were set at equal distances apart, but show no regard for the intercolumniations of the peristyle or of the pronaos. In the Parthenon this lack of cadence is even more apparent, as there are two porches, the ceiling beams of which are not regularly related to the friezes and not regularly related to each other (Fig. 333). To adjust the ceiling beams to the unequally spaced colonnade of a Doric façade was difficult, and constituted the *vitium lacunariorum* in the eyes of a Roman architect.[1] Even the Greeks felt this and invented a beamless ceiling.

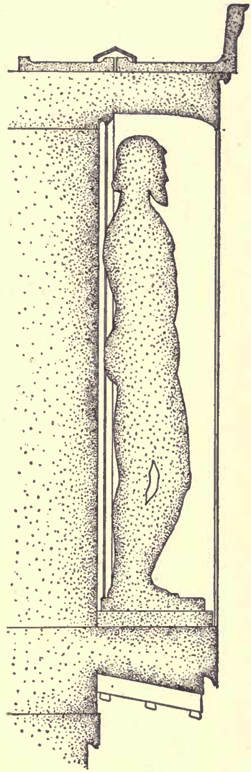


Fig. 331.—Overhang of gable on the Temple of Zeus, Olympia.

When the trabeated type of ceiling was used in peripteral buildings, its application was not always the same. In some early temples, such as Temple C at Selinous, it was probably applied only in front. In the Temple of Apollo at Phigaleia[2] it was applied to both front and rear of the peristyle. In the Parthenon it was applied also to the pronaos and opisthodomos.

[1] Vitruvius, IV, 3, 5.

[2] Cockerell, Pl. 9.

In the Theseion the trabeated ceiling was applied to the entire peristyle, and also to the pronaos and opisthodomos; but, inasmuch as the front and rear of the peristyle were considerably deeper than the pteromata and had heavier ceiling beams, their ceilings were cut off from those of the wings by very heavy beams. A perfectly harmonious

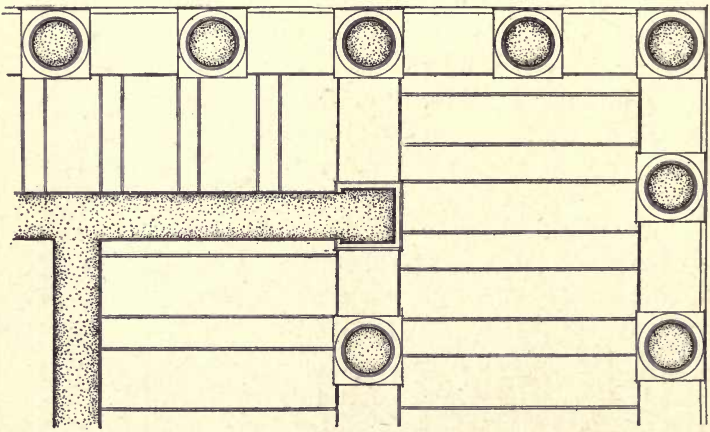


Fig. 332. — Plan of ceiling beams of the Theseion.

system, giving the same value to all sides of the peristyle, was devised by Pythios for the Temple of Athena at Priene (Fig. 334). An unusual form of ceiling, with beams cutting diagonally across the corners, is found in the Sepulchral Monument at Mylasa.[1]

The disposition of simae required a consideration of their application in relation to the roof and to the colonnade. Being designed to regulate the flow of water from the roof, the simae were applied, on gable fronts, to the raking cornice alone, although in some archaic buildings,

[1] *Ion. Antiq.*, II, Pls. 24, 25, 30.

like the Treasury of Gela at Olympia,[1] the sima was applied also to the horizontal cornice. This horizontal sima on gable fronts defeated the purpose for which the form was designed, inasmuch as it retained, rather than dispersed, the rainfall. It was accordingly omitted in the classic period. Simae were sometimes posed vertically,

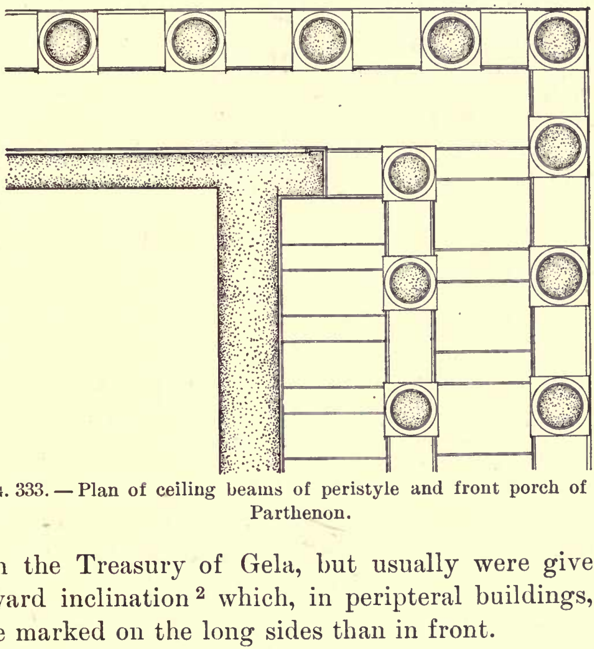


FIG. 333. — Plan of ceiling beams of peristyle and front porch of the Parthenon.

as in the Treasury of Gela, but usually were given an outward inclination[2] which, in peripteral buildings, was more marked on the long sides than in front.

In the Parthenon the sima was continued for a short distance only on the long sides of the building, and was then replaced by a system of antefixes; in the Temple of Zeus at Olympia,[3] and elsewhere, it extended along the

[1] *Olympia*, I, Taf. 41. [2] Penrose, 37.
[3] *Olympia*, I, Taf. 11.

entire length of the pteromata. The antefixes, and the lion heads of simae, were set at regular intervals, and were employed, sometimes separately, sometimes in combination with each other. Thus, in the Heraion at Olympia,[1] disk-like antefixes decorated the end of each

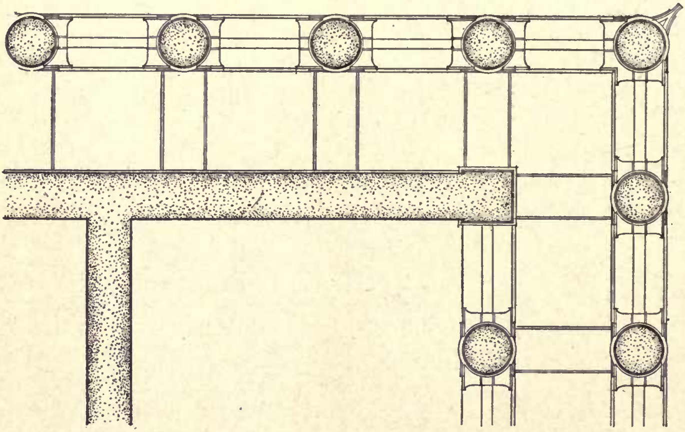


FIG. 334. — Plan of ceiling beams of the Temple of Athena, Priene.

line of cover tiles; in the Parthenon,[2] an anthemion type of antefix was set at every alternate line of cover tiles; in the Temple of Zeus at Olympia,[3] the lion heads of the sima occur at similar intervals; in the Leonidaion,[4] both antefixes and lion heads are found, the former at the ends of the cover tiles, the latter between them. Antefixes and the lion heads were regularly related to the frieze, and therefore to the colonnade. The normal type of leontokephalic sima appears to be one in which a lion head was centrally superposed above each mutule, which

[1] *Olympia*, II, Taf. 98.

[2] Penrose, Pls. 1, 17.

[3] *Olympia*, I, Taf. 11.

[4] *Ibid.*, II, Taf. 99.

amounts to saying that one lion head occurs above each column and three above each intercolumniation. Other systems seem also to have been employed, in some of which the number and pose of the antefixes and lion heads had no definite relation to the colonnade.[1]

In the composition of acroteria, their size, height, and character had to be considered. In some countries the acroteria were inordinately large;[2] elsewhere they were insignificantly small. Their height was accordingly made the occasion for many experiments. In the Temple of Aphaia at Aegina[3] the heights of the acroteria are very far from the standards set later by Vitruvius,[4] who directed that the acroteria at the lower ends of the gable should reach in height the apex of the tympanum, and that the acroterion at the apex should be one-eighth higher than those at the ends. There must also be some conformity between the character of the acroterion at the apex and those at the sides. In the Heraion at Olympia terra-cotta disks sufficed for all the acroteria. When figured sculpture was introduced at the apex of a gable, as in the Temple of Asklepios at Epidauros, similar figured acroteria were placed at the lower ends.

Two further steps may be noted in the composition of acroteria. In some cases the lateral acroteria were adapted to the peripteral plan by being returned around the corner. This was more common in small structures, like sarcophagi, than in important buildings. Another development was the multiplication of ornaments at other points on the raking cornice. This appears to have been

[1] *Olympia*, I, Taf. 66.
[2] Renan, Pls. 50, 61.
[3] Furtwängler, Taf. 33, 38.
[4] Vitruvius, III, 5, 12.

the case in the Temple of Jupiter Capitolinus at Rome,[1] and to have been revived in the decoration of Lombard and Venetian portals of the Renaissance period.

8. STYLE. — After having considered in detail the technique, forms, proportions, and decoration of the various architectural members, and having pointed out how they were modified when associated with each other, little remains to be said about style, except to point out the fact that certain architectural features were naturally grouped together so as to form distinct styles. These styles may be distinguished as the Doric, Ionic, and Corinthian, to which may be added the Mixed, and the Miscellaneous. Of these the Doric and Ionic stand in strong contrast, distinguished from each other by a number of particulars. The Corinthian style agrees in so many details with the Ionic that we might well refuse to give it the standing of a separate class, were it not that the ancient writers[2] all agree in so recognizing it.

In the Doric style the column had no base; its shaft had a strong diminution and entasis, and was adorned with channellings of elliptical section separated by sharp arrises; its capital was of circular plan and hyperbolic profile and was capped by a rectangular abacus; its proportions were heavy. Upon this type of column rested a heavy entablature, consisting of a plain epistyle crowned by a rectangular moulding, a frieze divided into triglyphs

[1] Daremberg et Saglio, *s.v.* Capitolium, Figs. 1146–1151.

[2] Vitruvius, III and IV; Pliny, *N.H.*, XXXVI, 56, 1; Paus., VIII, 45, 5. The Tuscan style, included by Vitruvius and Pliny, was a form of Roman rather than of Greek architecture.

and metopes, and an overhanging cornice, with mutules or cofferings, capped by a beak moulding. The Doric style was abundantly represented in the Peloponnesos, in Sicily, and in southern Italy. The Parthenon (Fig. 335) may be taken as the most refined, though not the strong-

FIG. 335. — Doric order of the Parthenon.

est, or most characteristic, example of its class. The individual forms which composed the Doric order differed according to varying conditions of time or place, but the general combination has come down with slight change to the architecture of modern times.

The Ionic style was associated in its early history with Asia Minor, where various modifications of type were produced. In general, the Ionic column was provided with a base; its shaft had but slight diminution and entasis, and was adorned with channellings of semicircular section separated by flat arrises; its capital was composed of an echinus moulding, painted or carved with the egg and dart, above which were spirals and lateral bolsters crowned with a low abacus. Its proportions were slender. Above this was laid a light entablature consisting of an epistyle subdivided into successive fasciae; a frieze unbroken, but often adorned with sculpture in low relief, and a cornice of graceful profile normally supported on dentils and crowned with delicate mouldings. The Ionic style flourished in the great cities on the west coast of Asia Minor, reached a most refined stage at Athens, and passed almost without change into Roman and later European architecture. The Mausoleion at Halikarnassos (Fig. 336) furnishes an excellent example.

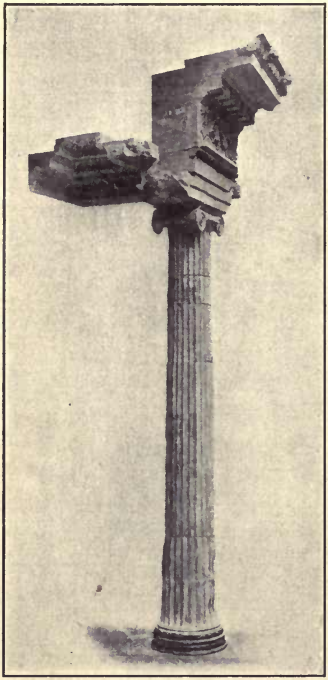


Fig. 336. — Ionic order of the Mausoleion at Halikarnassos.

The Corinthian style in most details was identical with the Ionic, and differed from it only in the type of the capital, in a preference for curved friezes, and for cornices supported by consoles. The Corinthian capital was essentially a calyx capital decorated with lanceolate, or acanthus leaves.[1] The frieze might have a plane surface, but, in the later period in which this style flourished, curved friezes were frequently associated with Corinthian columns.[2] The Corinthian cornice was often supported on brackets, or consoles,[3] and thus distinguished from the cornices of the other orders. It may also be noted that the acanthus decoration was not confined to the capitals of columns, but was used to adorn the frieze, the cornice, and various mouldings. The Corinthian capital occurs for the first time in the interior of the Temple of Apollo at Phigaleia; it was first associated with a curved frieze in the interior order of the Tholos at Epidauros, and with a bracketed cornice in the interior of the Tower of the Winds at Athens. As an exterior order it first appears in the Choragic Monument of Lysicrates, and in the Olympieion at Athens, whence it spread to Asia Minor, and to Rome.

Mixed styles are found in various periods, and in widely scattered parts of the Greek world. Two or more styles were represented in the same building in the Propylaia at Athens, the Temple of Apollo at Phigaleia, the Temple of Athena Alea at Tegea, the Tholos at Epidauros, and in many other buildings. But a closer mingling, such as the columns of one style bearing the entablature of a different style, occurred more frequently than we are accustomed to suppose. Mixed styles of architecture are pictured on Athenian vases of the sixth and fifth centuries.[4] These probably reflect architectural practice, and in fact are

[1] See Figs. 252–262.
[2] See Figs. 134–136.
[3] See Fig. 140.
[4] R. Vallois, in *Rev. Arch.*, XI (1908), 383.

found in the Peiraieus,[1] as well as in Epidauros, in Crete,[2] in the Stoa of Eumenes at Pergamon,[3] and in the so-called Tomb of Theron at Akragas.[4]

Miscellaneous styles are represented in buildings where Caryatids,[5] Telamones, Atlantes, and Persians[6] are substituted for columns. These supports carry entablatures borrowed from the other styles.

[1] Doerpfeld, in *Ath. Mitt.*, IX (1884), 285, Taf. 4.

[2] *Ibid.*, 286.

[3] *Pergamon*, II, Taf. 33–34.

[4] See Fig. 33.

[5] See Fig. 221.

[6] Vitruvius, I, 1, 6; Paus., III, 11, 3; Stuart and Revett, III, Ch. 11, Pls. 45–49.

CHAPTER VI

MONUMENTS

It remains for us to consider the various types of Greek architectural monuments. We shall briefly review the way in which the Greeks designed their towns, and protected them with walls and towers; erected temples to the gods; civic buildings for purposes of government; market places for commerce; gymnasia, stadia, baths, and other structures for the physical, and libraries, museums, theatres for the intellectual welfare of the people; palaces and houses for their shelter on land; ships to traverse the sea, and finally memorial and sepulchral buildings for the dead.

1. Towns and their Defences. — In the earliest periods villages (κῶμαι) were preferably built in the vicinity of a hill, which, fortified as a residence for the chief and a refuge for the people in case of war, was known as the acropolis (ἀκρόπολις). Troy, Tiryns, and Mycenae suffice to illustrate this type of settlement. With the increase of population commercial interests became more important, and seaboard cities, like Ephesos, Miletos, Athens, and Corinth, became typical centres. In many such cases the old town on the hill survived and was connected by walls with the seaport, as at Athens, Megara, Corinth. With Hippoda-

mos of Miletos, in the fifth century, began the architectural planning of cities. Open squares, broad avenues (πλατεῖαι) crossing at right angles to each other, public buildings distributed with a view to artistic effect as well as practical convenience distinguished this class of cities.[1] The Peiraieus, Alexandria, and Antioch may be cited as typical examples. The conception of a city as a work of art reached the limit of extravagance in the proposition of Deinokrates to convert Mount Athos into the statue of a man holding a spacious city in his left hand, and in his right a cup, into which flowed all the streams of the mountain.[2]

The extreme regularity of the late Greek cities led naturally to the square or circle as the form to be followed by the enclosing walls. The square was, in fact, the type of Babylonian and Assyrian cities, and later that of the Roman stationary camp. But the walls of Greek cities more frequently enclosed an irregular space, and even Vitruvius[3] argues in favor of winding walls in order that the enemy may be seen from many points of view.

The hilly character of many Greek cities led to the construction of level spaces and terraces, which required retaining walls, such as that of the Altis at Olympia or of the Stoa of Eumenes at Athens. Streets were often narrow and rough, sometimes paved. As early as the time of the Second City at Troy (Fig. 337) they were covered with irregular stone pavements (στρώματα). In the time of Peisistratos the streets of Athens were pro-

[1] Hirschfeld, *Typologie;* Erdmann, *Hippodamos von Milet;* Merckel, 379–465.

[2] Vitruvius, II, praef.

[3] *Ibid.*, I, 5, 2.

vided with gutters,[1] examples of which may also be seen at Priene and at Cyrene. At a later period the streets of Antioch were paved with carefully shaped blocks of marble and of granite. Sidewalks in the early Greek

Fig. 337. — Paved road at Troy.

cities were rare, though one has been found at Corinth. Later, as at Ephesos, Antioch, and Palmyra (Fig. 338), the principal streets were lined with single or double colonnades of great magnificence. The establishment of sacred ways (ἱεραὶ ὁδοί) leading to temples, even more than the necessities of traffic, led to the improvement of roads outside of city walls.[2] To prevent the shaking of

[1] Doerpfeld, *Ath. Mitt.*, XXI (1896), 459.

[2] E. Curtius, *Zur Geschichte des Wegebaues bei den Griechen*, in *Abh. Berl. Akad.*, 1854.

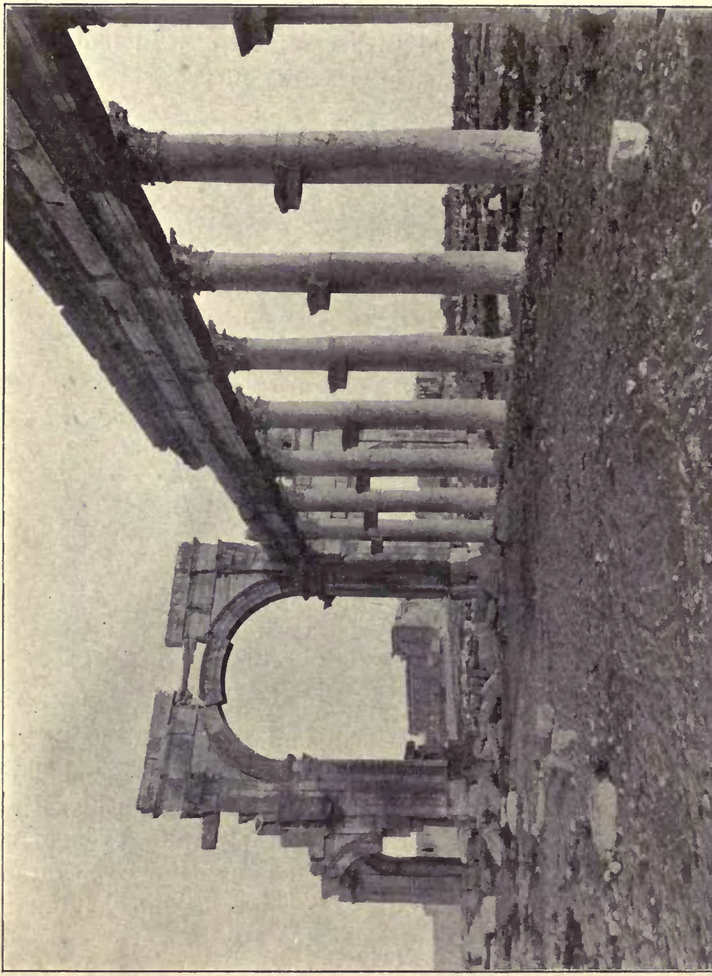


FIG. 338. — Street with colonnades at Palmyra.

the sacred treasures deep ruts were cut, even through rock, forming a fixed track for the wheels of the chariots. Grooves also were sometimes cut to prevent the feet of the beasts from slipping.[1] Through marshy regions causeways were erected, and bridges were built over the streams. At irregular intervals, shrines, tombs, and benches were stationed. Greek bridges were narrow, steep crossings, supported upon piers connected by arches. A few examples only remain.[2]

The defence of many Greek towns was aided by the steep, rocky declivities common in mountainous lands. But walls and towers were used for protection from the earliest times, and were not confined to cities in the plains. We may distinguish three types of fortification, according to the value set upon walls and towers. The earliest fortifications, such as those at Troy, Tiryns, and Mycenae, show that their builders relied most upon the walls, although bastions, angular turns, and towers all occur at irregular intervals. These walls were built of huge blocks of stone, and in some cases, as at Tiryns, were so broad as to permit of galleries and rooms within the walls. Such fortifications, being open to continuous lines of attack, called for continuous lines of defence, and were better adapted to small hill towns than to large cities in the plain. The second type may be illustrated by the fortifications of Assos, Athens, Messene (Fig. 339), and Syracuse. In these cases, towers, representing centres of defence concentrated at more or less regular intervals, are of more importance than the walls. Projecting from the line of the walls, these towers were especially designed for flanking the enemy. The third type, explained by

1 Frazer, *Paus.*, II, 42.

2 Guhl und Koner, 186.

Philon of Byzantium,[1] adds moats, earthworks, mines, and advance walls, devices designed to meet more complicated systems of warfare.

The city wall (τεῖχος, περίβολος) consisted usually of towers (πύργοι) and curtain walls (μεσοπύργια), and was

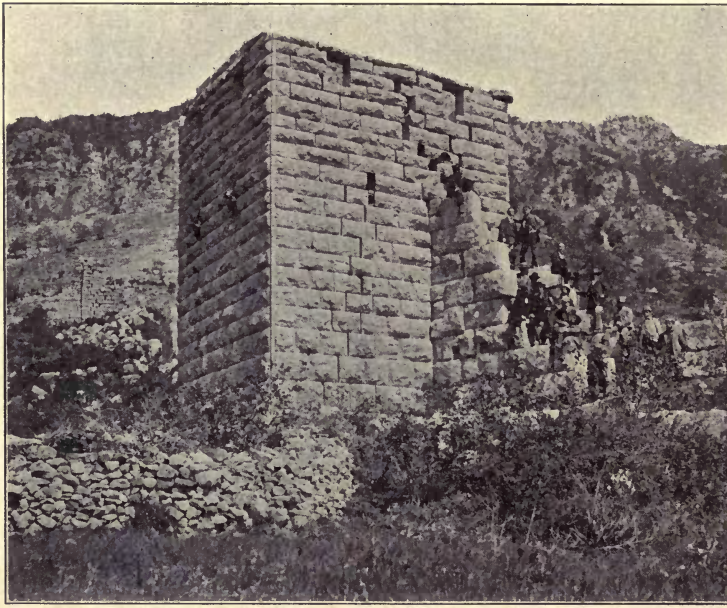


Fig. 339. — Tower at Messene.

provided with one or more principal entrances (πύλαι), and subsidiary, or postern, gates (πυλίδες). Various types of walled towns may be distinguished by the number of the enclosing walls. Thus, Sparta gloried in having no walls at all; Messene was proud of its single line of

[1] Translated by de Rochas, *Rev. de Philol.*, 1879.

defence; the Isthmus of Corinth was protected by a double wall[1]; Orchomenos in Arcadia seems to have had three lines of walls[2]; Mideia had four lines of defence[3]; six walls had to be passed before one reached the citadel of Epeion in Elis.[4] The number of important gates was another consideration in the distinction of cities. Thus Thebes was characterized by its seven and Athens, in early days, by its nine gates.

Towers varied in form. Square towers, the earliest type, are represented in all periods. Polygonal towers are found at Antioch, Samos, and elsewhere. Round towers were preferred by Philon and by Vitruvius because of their superior strength in direct resistance, and because of the ease with which they diverted missiles. They were, however, seldom used in the finest Greek fortifications, such as those of Messene and Assos. The interior chambers, the form of which did not always correspond with that of the exterior, were provided with narrow loopholes (*θυρίδες τοξικαί*) which were singly or doubly splayed, and with larger openings (*δίοδοι*) on the side toward the town. The flat roof was surrounded with battlements (*ἐπάλξεις*) which made an ornamental crown, and also afforded opportunities for offensive and defensive fighting. The most highly developed of Greek fortress-towers was the Euryalos at Syracuse.[5] Isolated towers (*φρούρια*), like those on the islands of Keos, Andros, and Tenos,[6] served as watch-towers as well as forts. They sometimes formed a series of signal stations, as at Phigaleia, Argos, and elsewhere,[7] from which messages could be

[1] Frazer, *Paus.*, III, 5.
[2] *Ibid.*, IV, 225.
[3] *Ibid.*, III, 231.
[4] *Ibid.*, III, 475.
[5] Lupus, 275–284.
[6] Guhl und Koner, 175.
[7] Droysen, 258, note 1.

quickly signalled over a considerable extent of country. Wooden towers made of separable parts which could easily be put together (*πύργοι φορητοί*), and towers on wheels (*πύργοι ὑπότροχοι*) with various devices such as the drawbridge (*ἐπιβάθρα, σαμβύκη*) and grappling-hooks (*κόρακες*), were utilized in making an attack upon walled towns. These were developed by Demetrios Poliorketes into immense structures, such as the 'Taker of Cities'[1] (*ἑλέπολις*), with which he attacked the Cretan Salamis and the city of Rhodes.

Between the towers of a fortified town were the curtain walls (*μεσοπύργια, μεταπύργια*), which were sometimes like the towers in having loopholes and battlements, and were broad enough to provide on top a peridromos or passage-way (*περίδρομος, περίοδος*). Vitruvius[2] advised that the towers be left open toward the interior, and that across the opening be constructed wooden bridges which might be removed in case of necessity. The peridromos was usually uncovered; but the walls of Athens[3] were covered with a roof. Where there was no peridromos on top of the walls, Philon[4] advised, on the interior and near the top, a wooden gallery supported by corbels — a disposition found at Herakleia in Latmos.[5] Between the walls and the houses of the town Philon[6] would leave a space (*παράστασις*) ninety feet broad for the transport of engines of war and of troops, and, in case of necessity, advised the erection of inner works of defence. This had no religious significance as had the Etruscan and Roman *pomoerium*.

The great gateways (*πυλῶνες*) with their heavy gates

[1] Smith, *s.v.* Helepolis; Droysen, 215.
[2] Vitruvius, I, 5, 4.
[3] Choisy, *Études*, 51.
[4] *De re fortificat.*, § 3.
[5] Choisy, *Études*, 52, note 10.
[6] *De re fortificat.*, § 2.

(πύλαι) differed in many ways from one another. Usually there was but a single passageway. The Northwest Gate

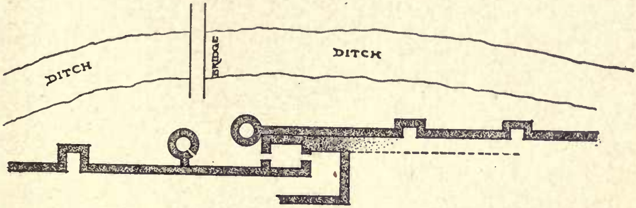


FIG. 340.—Gate D at Mantineia.

at Athens had a double opening (δίπυλον); the gate at Klazomenai had a triple opening (τρίπυλον), as had also the Herculaneum Gate at Pompeii. From the earliest period the approaches were sometimes arranged, as at Tiryns, so that the enemy should expose his right or unshielded side. This was not the invariable rule in Greek practice, although accepted as a primary maxim by Vitruvius. It was far more common to flank the entrance with two towers and to protect the narrow passage by a series of gates, as at Mantineia (Fig. 340). The Arcadian Gate at Messene (Fig. 341) offers the best example of the protection afforded by

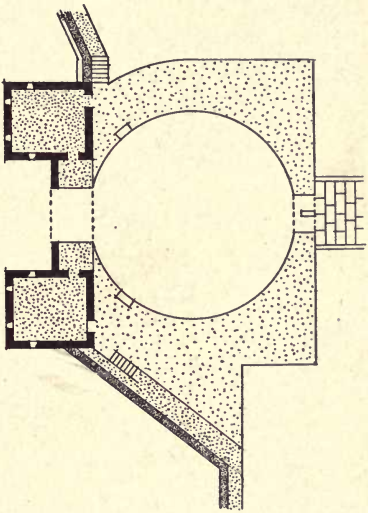


FIG. 341.—The Arcadian Gate, Messene.

annexing an inner court of defence to the city gate. The earliest gates were severe in style, but at a later period some gates, such as the Dipylon at Athens, the principal gateway at Patras, and the Arcadian Gate at Messene, were decorated with reliefs and figured sculpture.[1] The portcullis[2] (*καταρράκτης*), which we are apt to associate chiefly with mediaeval fortresses, is mentioned by Aineias Taktikos in the fourth century B.C. The Herculaneum Gate at Pompeii testifies to its use in Italy.

The moat (*τάφρος*), the mound (*χῶμα*), and the palisades (*χάραξ*) characterized late Greek fortifications. At Aegina the city wall was protected by a moat one hundred feet wide and from ten to fifteen feet deep, cut in the solid rock.[3] Philon[4] prescribed that all fortifications should have at least three moats. Greek methods of attack — whether scaling by ladders, or effecting breaches by means of the ram or by mines — were met by corresponding methods of defence, the description of which would carry us beyond our prescribed limits.

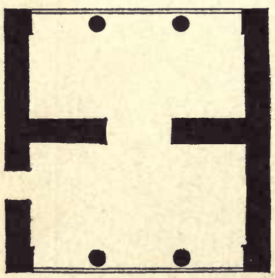


FIG. 342. — Propylaia at Tiryns.

The gateways (*προπύλαια, πρόθυρα*) of palaces, as at Tiryns, Phaistos, and Palatitza, or of sacred enclosures, as at Delos, Athens, Eleusis, and Olympia, or of market-places, as at Athens, are found within the city gates, and

[1] Curtius, *Abh. Berl. Akad.*, 1854, II, 276; Krause, 147.

[2] Smith, *s.v.* Cataracta.

[3] Frazer, *Paus.*, III, 263.

[4] *De re fortificat.*, § 10.

take their character not from the defensive walls but from the buildings to which they lead. The plan of the Propylaia at Tiryns (Fig. 342), with its two porches set back to back, remained unchanged, except for the greater complexity, in the magnificent Propylaia designed by Mnesikles for the Acropolis at Athens (Fig. 343). The Propylaia at Tiryns had a single doorway; that at

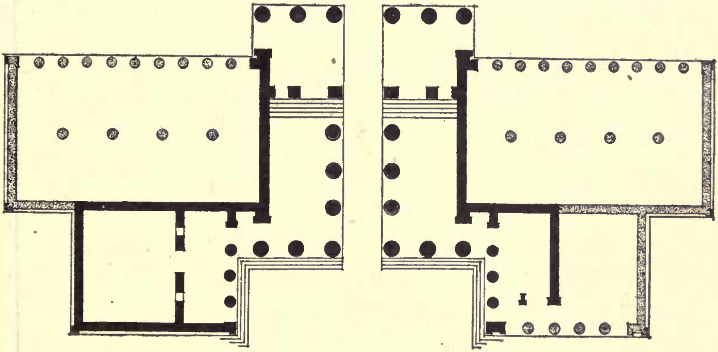


FIG. 343. — The Propylaia at Athens.

Phaistos[1] had two openings; that of the Temple of Athena at Priene, three; that of the Acropolis at Athens, five.

2. WATER SUPPLY. — Next to the erection of works of defence, suitable provision had to be made in the building of towns for the water supply. Women, by carrying water from a neighboring stream or spring, could meet the wants of a small settlement in time of peace, but large towns required securer means of supply. The hill towns in Greece and Italy, from the earliest times to the present day, have made use of open channels. But these could be so easily tampered with, or destroyed, that subterranean chan-

[1] *B.S.A.*, XI (1904–1905), 188.

nels of various kinds, such as terra-cotta or lead pipes (σύριγγες, αὐλοι), or rock-cut or constructed aqueducts (ὑδραγωγεῖα, ὑπόνομοι, ὀρύγματα), were substituted for them. The water supply of the Peiraieus was in part concealed beneath the bed of the Ilissos, and in part protected by the long walls from Athens.[1]

The Greeks did not always recognize the value of uniformity in aperture, or in strength, in their pipes, but they did understand that water would reach the level of its source, and carried their pipes through valleys and over hills in accordance with this principle. At Patara in Lycia[2] an aqueduct, apparently of Greek workmanship, traverses a valley on an elevated structure; but, in general, Greek aqueducts were subterranean. Where practicable these subterranean aqueducts were aerated by vertical shafts (φρεατίαι), which extended to the surface of the ground. The most remarkable work of this character is the sixth-century aqueduct constructed by Eupalinos in the island of Samos,[3] where the water is carried from springs through a mountain by means of a tunnel more than a thousand metres long. Before being distributed, the water was usually gathered into large cisterns or reservoirs (ἐνδοχεῖα, δεξαμεναὶ, ὑποδοχαὶ, λάκκοι). These were sometimes rock cut, sometimes constructed. A fine example of a circular cistern of the Hellenistic period may be seen at Peligriniatza.[4] It is built of fine jointed masonry, held together by a very hard cement. At Thouria in Messenia there was

[1] Ziller, *Ath. Mitt.*, II (1877), 107–131.
[2] Texier, III, 224 and Pl. 179.
[3] Fabricius, in *Ath. Mitt.*, IX (1884), 165–192.
[4] Heuzey, *Mont Olympe*, 329, Pl. 8.

a triply subdivided cistern. Italy, Africa, and Turkey still preserve remains of elaborate cisterns, sometimes several stories high, consisting of a number of chambers, through which the water passed, leaving the dregs behind. A climax was reached in the Bin-Bir-Direk,[1] or cistern of a thousand and one columns, at Constantinople, which is attributed to the architect Philoxenos of the time of Constantine the Great. Springs, wells, and fountains (*κρῆναι*) lent themselves more readily to architectural decoration. In some early examples, as at Kos,[2] the well-house was a mere subterranean enclosure, or receptacle, with an air shaft, an apartment for the guardian, and an exit. From the archaic and the classic period, however, most towns were provided with fountains of running water. These street fountains might be simple niches, as at Priene,[3] or more elaborate columnar structures, like the fountain at Ephesos (Fig. 344), and that built by Theagenes at Megara,[4] and the fountain of Peirene[5] at Corinth, or exedrae, like that built by Herodes Atticus at Olympia.[6]

3. Religious Monuments: Altars and Temples.— Greek worship frequently demanded little of the architect. Hilltops and other high places, trees of venerable age or mighty spread, with branches swayed by invisible causes, caves with mystic vapors and resounding echoes, springs with ever bubbling and refreshing water, were in themselves sufficient to encourage worship. The sacrifices which accompanied such worship required some form of

[1] Daremberg et Saglio, *s.v.* Cisterna.
[2] Guhl und Koner, 177.
[3] *Priene*, 78.
[4] Paus., I, 40, 1.
[5] Richardson, in *A.J.A.*, IV (1900), 204–239; VI (1902), 321–326.
[6] *Olympia*, II, 134.

altar. This altar[1] ($\beta\omega\mu\acute{o}\varsigma$, $\grave{\epsilon}\sigma\chi\acute{\alpha}\rho\alpha$, $\pi\upsilon\rho\acute{\alpha}$, $\grave{\epsilon}\sigma\tau\acute{\iota}\alpha$) might be a mere mound of earth or accumulation of ashes, or

FIG. 344. — Fountain at Ephesos.

built of wood, brick, stone, or marble. Constructed altars were either circular or rectangular in form, and

[1] Daremberg et Saglio, *s.v.* Ara.

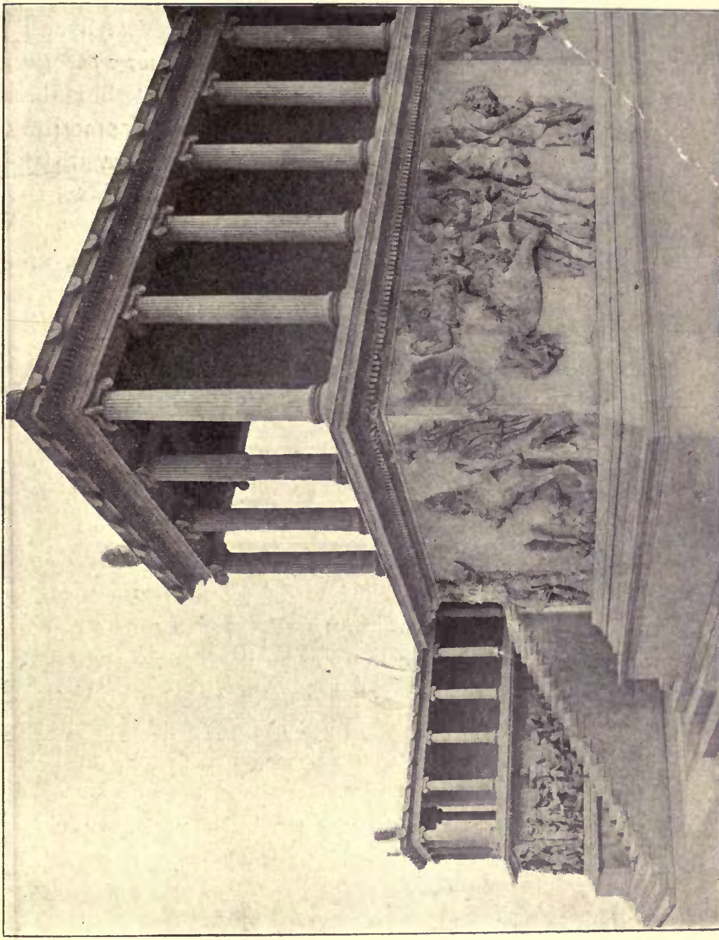


FIG. 315. — Altar from Pergamon, restored.

decorated with emblems of offerings. They were either independent, or connected with temples or houses. In the latter case, the altar of burnt offering was usually placed in front of the house or temple (βωμὸς πρόδομος, βωμὸς πρόναος), and the altar for incense and bloodless offerings stood within the building, and was sometimes replaced by a table. In the larger altars we may distinguish the base (κρηπίς), the steps (κλίμακες), the platform (πρόθυσις), and the altar proper (θυμέλη). Some of these altars, like those at Pergamon (Fig. 345), Parion, and Syracuse, were large monuments, decorated by colonnades and sculptured friezes. Sometimes several divinities were worshipped at a single altar. Thus at Oropos[1] an altar, divided into five parts, was shared by various divinities, heroes, and others.

The introduction of images of the gods led to their being housed in shrines and temples. In the Mycenaean period the megaron of the palace may well have served as a temple. Its plan distinctly foreshadows that of the temple. The Greek temple (ναός, νεώς) was, in fact, a house (οἶκος), though usually distinguished from other houses by being set upon a high base, and surrounded by a columnar porch (περίστυλος). The various types of temples arise, therefore, from variations in the disposition of the house, its base, its porch, and its roof.

Most Greek temples were essentially rectangular in plan, but some were circular, and others, very rarely, cruciform. The rectangular type was single, double, triple, or even more complex. The single type consisted of one room for the statue of the god, like the Temple of

[1] Paus., I, 34, 3.

Demeter at Gaggera, near Selinous, or the cave-temple of Apollo at Delos. This type evolved by gradual stages, and first by the addition of a front porch (*πρόναος*, *πρόδομος*), as in the Temple of Themis at Rhamnous (Fig. 346).

In the pronaos were sheltered the lustral vases, from which the priest sprinkled his head, face, and hands before approaching the statue of the god. Here were sometimes statues, for example, the Graces in the pronaos of the Heraion at Argos,[1] or thrones, like those found in the Temple of Themis at Rhamnous,[2] or paintings, like those by Polygnotos and Onasias in the Temple of Athena Areia at Plataia.[3]

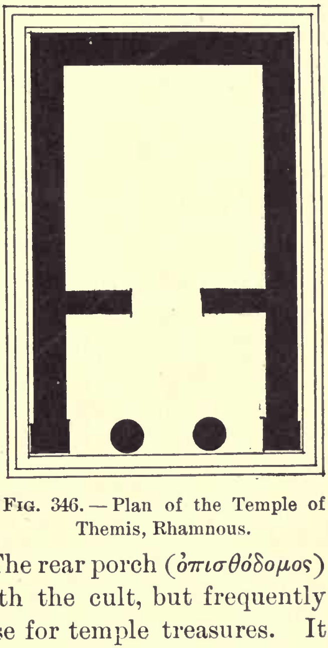


FIG. 346. — Plan of the Temple of Themis, Rhamnous.

The single temple remained unchanged, except for the addition of subsidiary features as, for example, a second pronaos, a porch in the rear, or a porch or porches extended about the building. The rear porch (*ὀπισθόδομος*) was not usually associated with the cult, but frequently became a *ταμιεῖον*, or storehouse for temple treasures. It is a feature which occurs in some of the oldest buildings at Troy,[4] in the Heraion at Olympia, and in most Greek peripteral temples. It is lacking, however, in many small religious or communal buildings, like the so-called Treasu-

[1] Paus., II, 17, 3.
[2] Frazer, *Paus.*, II, 453.
[3] Paus., IX, 4, 2.
[4] Doerpfeld, Taf. 3.

ries of Olympia[1] and Delphi, and in some large temples in Asia Minor, like the Temple of Apollo at Miletos. The effect of the opisthodomos was to give the Greek temple a bifacial character. Although this did not disturb the axis of the building, nevertheless, a temple which looked in two directions inevitably lost something of the significance of its orientation, that is, its relation to the sun or to the stars. The Greeks preferred symmetry to orientation.

The innermost sanctuary, the *ναός* proper, or the inapproachable (*ἄδυτον*), was specifically the seat (*ἕδος*), or closed abode (*σηκός*), or apartment (*θάλαμος*) of the divinity. It was frequently raised a few steps higher than the pronaos.[2] On the other hand in the Temple of Apollo near Miletos the level of the naos was some five metres below that of the peristasis or temple platform. But a depressed naos, like this, was exceedingly rare. In the naos was the cult statue, set on a pedestal and sometimes screened by a lattice (*κιγκλίς*), or fencing (*ἔρυμα*), and a veil (*παραπέτασμα*). In an open or hypaethral temple, like the Temple of Apollo near Miletos, the statue was protected by a tabernacle (*ναίσκος*, *οἰκίδιον*, *τετρακιόνιον*). Before it was the sacred couch, or table for offerings. On every side were votive offerings of various kinds.

Further subdivision of the single temple was also effected by additional rooms, or by colonnades. In the Temple of Apollo near Miletos, between the naos and pronaos, was a room called the chresmographion (*χρησμογράφιον*), a waiting-room for the receipt of the oracular deliverances. Above it was another room, apparently the prytaneion. In Temples C, D, and F at Selinous, behind

[1] Dyer, *J.H.S.*, XXV (1905), 294–319. [2] *A.J.A.*, VI (1890), 51.

the naos was a closed room, possibly a treasure chamber (θησαυρός), accessible from the interior only (Fig. 347). Colonnades also subdivided the interiors of some small and

Fig. 347. — Plan of cella of Temple C, Selinous.

most of the larger temples. They were probably introduced to simplify the construction of the roof and to assist in its support. In some cases, as in the Temples of

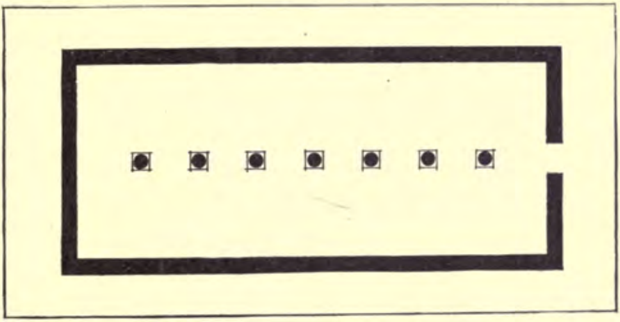


Fig. 348. — Plan of the Temple of Apollo, Neandreia.

Apollo at Neandreia (Fig. 348) and at Thermon,[1] and in the Enneastylos at Paestum, a single colonnade divided the temple cella into two naves. These temples were, however, not well planned for dedications to a

[1] *Eph. Arch.*, 1900, 175.

single divinity, nor could the entrance remain single and imposing. Hence the introduction of two colonnades subdividing the cella into a central nave and lateral aisles (*στοαί*) — a disposition which permitted still further expanse of roof. In most cases the aisles were restricted to the long sides of the naos, as in the Temple of Aphaia at Aegina; in the Parthenon (Fig. 349) they

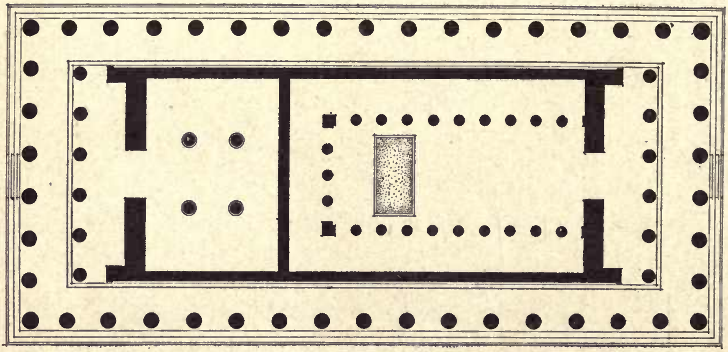


FIG. 349. — Plan of the Parthenon.

turn corners at the rear so as to form an ambulatory on three sides of the naos. In lofty buildings architects were led naturally to the use of superposed colonnades, with or without galleries. In the Temple of Zeus at Olympia[1] there were galleries (*στοαὶ ὑπερῷοι*) by means of which one might approach the image of Zeus. The so-called Temple of Poseidon at Paestum, and that of Aphaia at Aegina, appear also to have had galleries,[2] which, however, were probably inaccessible to visitors. They added to the stability of the colonnade and may have been used for storage. In very large temples, such as Temple G

[1] Paus., V, 10, 10. [2] Choisy, I, 437–439.

at Selinous,[1] there may have been a triple series of colonnades with superposed galleries.

The double temple (ναὸς διπλοῦς) was dedicated to two divinities, and arranged in various ways. At Sikyon Pausanias[2] tells us there was a double temple, of which the outer chamber contained an image of Hypnos, and the inner, an image of Apollo-Karneios; on the road from Argos to Mantineia[3] there was a double temple dedicated to Aphrodite and to Ares, with one entrance on the east and another on the west; and another at Mantineia,[4] divided by a partition wall in the central axis, which separated the image of Asklepios from that of Leto and her children. The Acropolis of Athens furnished famous examples of the double temple from Homeric times,[5] when Athena established Erechtheus in her own rich temple. It was represented in the archaic period by the Old Temple[6] of Athena (Fig. 350), and later by the Erechtheion. The present perplexing plan of the Erechtheion[7] may have been designed to follow more closely that of the Old Temple of Athena. The plan of the Parthenon itself is that of a double temple, and may have been designed for the old and new images of Athena, or possibly for a double cult.[8] Different potencies of the same divinity, such as Aphrodite-Promachos and Aphrodite-Morpho, were sometimes separately worshipped in the

[1] Hittorff et Zanth, Pls. 73, 74. Against galleries, Koldewey und Puchstein, 201.

[2] Paus., II, 10, 2.

[3] *Ibid.*, II, 25, 1.

[4] *Ibid.*, VIII, 9, 1.

[5] *Iliad*, II, 549 ff.

[6] Frazer, *Paus.*, II, 553–582; Fowler, *A.J.A.*, VIII (1893), 1–17; Cooley, *A.J.A.*, III (1899), 345–408.

[7] Doerpfeld, in *Ath. Mitt.*, XXIX (1904), 101.

[8] Furtwängler, *Meisterwerke*, 171.

same building, as in the two-storied temple at Sparta.[1] Temples with more than one story were very rare. Pausanias speaks of the one at Sparta as the only one known to him, although so important a temple as that of Apollo near Miletos[2] had superposed rooms at least in one portion of the temple. Crypts (κρυπταί), subterranean chapels or treasuries, though uncommon, occur occasion-

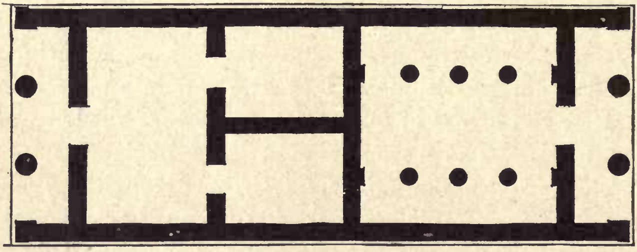


FIG. 350. — Plan of the Old Temple of Athena, Athens.

ally, as in the Tholos at Epidauros and in the Temple of Zeus at Aizanoi.

The triple temple (ναὸς τριπλοῦς), and more complex types, may have been represented in Greece as they were in Italy. But the prevailing tendency was against them. Complex groups of cult statues, as in the temple near Lykosoura,[3] or side chapels (καλιάδες) for separate images, as in the Heraion at Olympia,[4] were preferred to complex structures.

Round temples (θόλοι, οἰκήματα περιφερῆ) were not uncommon, though generally of small dimensions. At Corinth a circular building was dedicated to Palaimon;

[1] Paus., III, 15, 10. [2] Haussoullier, 92–94, Pl. 13.

[3] Paus., VIII, 37; Frazer, *Paus.*, V, 622; Daniel, *J.H.S.*, XXIV (1904), 41–57. [4] Paus., V, 17, 1–3; *Olympia*, II, 27, Taf. 18–23.

at Sparta[1] such a building contained images of Zeus and Aphrodite; at Epidauros[2] the Tholos (Fig. 351), called also the Altar (θυμέλη), was a beautiful structure built by Polykleitos the younger; at Olympia the Philippeion[3] was a circular building of semi-religious character; and at Delphi the Temple of Athena Pronaia,[4] a charming example of a circular temple.

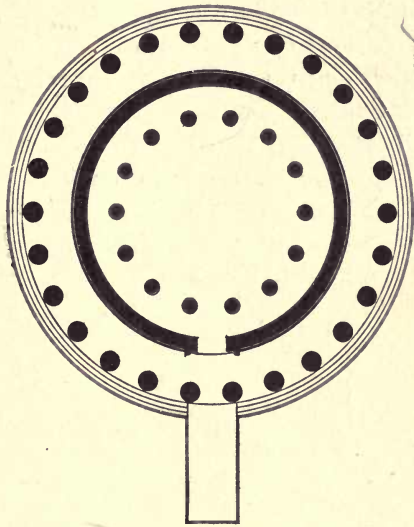


FIG. 351. — Plan of the Tholos at Epidauros.

The larger of these buildings, like the Tholos at Epidauros, were provided with an internal colonnade which aided in the support of the roof usually of conical form. In external appearance, a circular temple might consist of a cella without a colonnade (ἄπτερος), as was the case at Delphi; or of a circular colonnade without a cella, inaptly called monopteros (μονόπτερος) by Vitruvius;[5] or, like the Tholos at Epidauros and the Philippeion, of a cella with a colonnade (περίπτερος).

Cruciform temples existed only in germ in ancient

[1] Paus., III, 12, 11; Frazer, *Paus.*, III, 325.
[2] Lechat et Defrasse, 95–128; Cavvadias, 13–16.
[3] *Olympia*, II, 129–133.
[4] Homolle, *Temp. Ath. Pron.*, 4.
[5] Vitruvius, IV, 8, 1.

times. But something of this character may be recognized in the projecting lateral porches (προστάσεις) of the Erechtheion,[1] and is possibly described by Vitruvius[2] in the phrase, "columnis adiectis dextra ac sinistra ad umeros pronai."

Besides the cella, a characteristic feature of a Greek temple was the base (κρηπίς) on which it was set. The variations of the base are, however, of little value in establishing types. In some cases the stepped base occurs only in front of the temple, in others it is carried around all sides. The character of the approach to the principal entrance of a temple also varied from a gently inclined ramp to steps of uncomfortable height. As we have seen in a previous chapter, the number of steps in the krepidoma varied according to no set law. Vitruvius[3] directs that the steps in front of a temple be uneven, so that the first and last step be made with the right foot, but this superstition, though it may have been a very ancient one, seems to have had little influence in determining the character of the Greek temple base.

The most obvious characteristic of the Greek temple was its porch, and the variations of this feature have been long recognized as the basis for distinguishing various types. These may be distributed into two general classes: non-peripteral and peripteral porches.

Non-peripteral porches are those which do not make the entire circuit of the temple cella. Of these there are several varieties. The simplest is generally known as a porch in antis (ἐν παραστάσιν), and is treated as an enclosure with lateral walls terminated by antae (παρα-

[1] Doerpfeld, *Ath. Mitt.*, XXIX (1904), 101.

[2] Vitruvius, IV, 8, 4.

[3] *Ibid.*, III, 4, 4.

στάδες). The temple itself, characterized by its porch, was called a *ναὸς ἐν παραστάσιν.* The number of columns between the antae varied. One column sufficed for one of the chapels of a *ἱερὸς οἶκος* at Priene;[1] two columns were common, as in the temples at Rhamnous; three occur in the inner porches of the Enneastylos at Paestum;[2] four in the pronaos of the Temple of Apollo near Miletos; and six at the Temple of Amphiaraos at Oropos.[3] Peculiar modifications of these types are found in the Temple of Diana Laphria at Messene[4] with its double antae, and in a temple near Kourno[5] with its false antae.

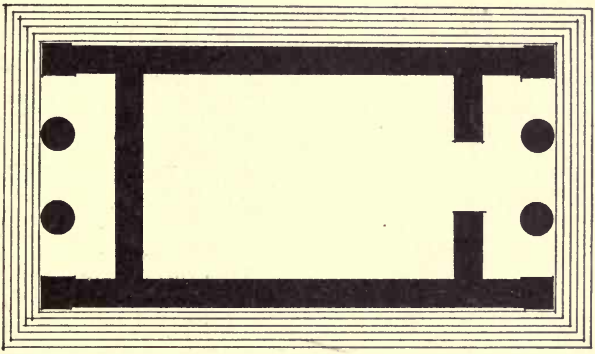


Fig. 352. — Plan of the Temple of Artemis, Eleusis.

In many temples, as in the Temple of Artemis at Eleusis (Fig. 352), a porch in antis was applied at both ends of the cella. The porch was styled prostyle (*πρόστυλος*) when, as in the so-called Temple of Empedocles at Selinous (Fig. 353), the lateral walls were

[1] *Priene*, 173.

[2] Koldewey und Puchstein, 17, Fig. 15.

[3] Frazer, *Paus.*, II, 466.

[4] Reinach-Lebas, *Arch. Pelop.*, I, Pls. 2–3.

[5] *Ibid.*, II, Pl. 9.

partially or entirely omitted, and the front consisted in a complete colonnade. When a colonnade was applied in the rear as well as in front of a temple, as was the case with the Temple of Athena Nike at Athens, the type was called amphiprostyle (ἀμφιπρόστυλος). A very unusual form of a non-peripteral, or partially peripteral, porch may be seen in the Temple of Athena at Sounion,[1] where a portico was attached to the front and one of the sides of the temple cella.

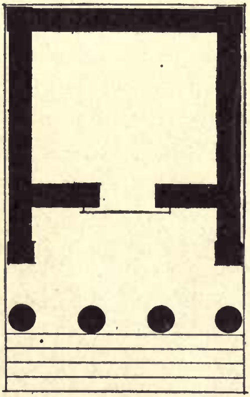


FIG. 353. — Plan of the Temple of Empedocles, Selinous.

Peripteral porches extended around the entire temple cella. A temple with such a porch was called peripteral (ναὸς περίπτερος) or, in view of its columns, peristyle (περίστυλος). It seems hardly likely, as Lechat[2] supposes, that the Greek temple evolved naturally from the in antis type, through the double in antis, to the peripteral type. If this had been the case, the temple cella and its surrounding porch would have been in accord with each other from the first. It is more likely that the peripteral porch was deliberately applied to the temple as a sign of religious distinction[3] — possibly suggested by the Egyptian royal aedicula — and that a considerable time elapsed before it became properly adjusted to the temple cella. The variations of the peripteral

[1] Staes, *Eph. Arch.*, 1900, col. 122, Pl. 8.

[2] Lechat, *Le Temple Grec*, 28–30.

[3] Noack, *Neue Jhb.*, I (1898), 581 ; *Jhb.*, XI (1896), 233.

porch were not many. Ordinarily it was supported by a single row of columns, as in the Temple of Zeus at Olympia (Fig. 354). Sometimes, as in the Temple of Zeus at Akragas, the porch was omitted and the cella walls were decorated with engaged columns and entablatures, so as to suggest a peripteral porch. Such temples were styled pseudoperipteral (ψευδοπερίπτερος). The Temple of Zeus at Akragas was completely pseudope-

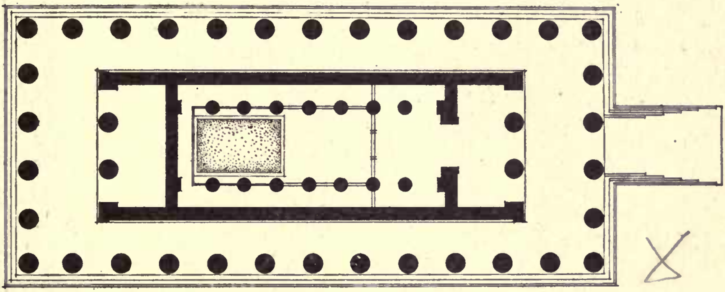


Fig. 354. — Plan of the Temple of Zeus, Olympia.

ripteral; the Temple of Fortuna Virilis at Rome and the Maison Carée at Nîmes were only partially so. When the peripteral porch was constructed with a double row of columns, the temple was called dipteral (δίπτερος). The Temple of Apollo near Miletos and the Olympieion at Athens were examples of this class. When a peripteral temple by a wide porch and a frontal colonnade of eight or ten columns suggested the dipteral arrangement without possessing it, the building was called pseudodipteral (ψευδοδίπτερος). The invention is attributed to the architect Hermogenes,[1] and is well illustrated by the Temple of Artemis at Magnesia (Fig. 355). The

[1] Vitruvius, III, 3, 8.

type, however, seems to date from an earlier period, as the Greek Temple at Pompeii,[1] even if correctly restored as hexastyle, was essentially pseudodipteral.

In examining the plans of temples it may be observed that the peripteral porch was applied to buildings of very different types. Thus, in Temple D at Selinous, it sur-

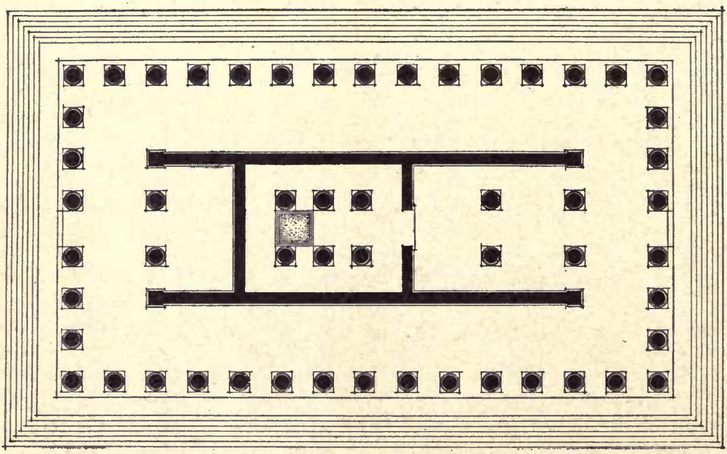


FIG. 355. — Plan of the Temple of Artemis, Magnesia.

rounds a temple in antis; in the Temple of Zeus at Olympia, one doubly in antis; in Temple C, Selinous, a prostyle; and in the Parthenon, an amphiprostyle temple.

Another classification of temples notes merely the number of columns exhibited in the façade. Thus the Temple of Artemis at Eleusis, which has two columns only, is called distyle; the Temple of Athena Nike, exhibiting four columns, tetrastyle; a coin of Abdera[2]

[1] Von Duhn und Jacobi, Taf. 2. [2] Stieglitz, I, 139; II, 48, note p.

shows a pentastyle temple; the Theseion at Athens was hexastyle; the Temple at Thorikos, heptastyle; the Parthenon, octastyle; the so-called Basilica at Paestum, enneastyle; and the Temple of Apollo near Miletos, decastyle. Philo's Porch at Eleusis was dodecastyle.

A final character, by means of which Greek temples were classified, was the roof. They were usually completely covered, but very large buildings, like the Temple of Apollo at Miletos and the Olympieion at Athens, and possibly some smaller ones like the Apollo Temple at Phigaleia, were hypaethral[1] (*ὕπαιθρος*, *ὑπαίθριος*), that is, in part, at least, roofless. In such instances the statue of the divinity could be sheltered in a special aedicula, as was probably the case at Miletos, or in a special room, as at Phigaleia.

The amount of light which entered through the door was deemed sufficient for the purposes of the Greek cult. It is, accordingly, unnecessary, with Fergusson,[2] to imagine for the Greek temple a clerestory system of lighting. The roof, however, was sometimes lighted by windows, as in the Temple of Concordia at Akragas.

Greek temples had various accessories. Ordinarily they were provided with altars, chthonic temples with pits; oracular shrines had sacred trees or caves; curative establishments had their hospices and colonnades; and memorial temples were erected over or near some hero's burial-place. All temples might have their dwellings for priests.

Temples were frequently set upon sacred ground (*τέμενος*) and surrounded by a wall, with a more or less

[1] Doerpfeld, *Ath. Mitt.*, XVI (1891), 334–344.

[2] Fergusson, Pls. 3, 4.

imposing entrance and covered walks. At Athens and Olympia groups of temples were contained within the sacred enclosure.

The value which the Greeks set upon the orientation of their temples is not always obvious. The astronomical theory of Penrose,[1] that the axis was originally directed towards some star in the heavens, leads to extravagant conclusions, and the geographical theory of Choisy,[2] that temples of Aphrodite faced Kythera and those of Apollo faced Delos, had certainly a very limited application. That a solar tradition of some sort influenced the orientation of Greek temples is evident from the fact that in most cases the façade was toward the east. In the case of double temples, set back to back, such orientation for both parts was manifestly impossible. Hellenistic sanctuaries appear to have been placed with less regard to the sun than those of earlier date. According to Vitruvius[3] the courses of rivers and the directions of public streets are of more importance than solar considerations in determining the axes of temples.

4. Governmental Buildings. — Although some light has been cast on this subject by recent excavations, it is not possible, at present, to give a satisfactory sketch of Greek governmental buildings as a whole.

The foundation of Greek government was in the voting assembly of the people; the superstructure was the deliberative council, the magistrates, the judges, and other officers.

The place of assembly for the voters (*ἐκκλησιαστήριον*) was the market-place, the theatre, or a specially prepared

[1] Penrose, *Philos. Trans. Roy. Soc.*, Vol. 190 (A), 43.
[2] Choisy, I, 425. [3] Vitruvius, IV, 5.

area, like the Pnyx[1] at Athens. The only requirements were a platform for the speakers, and standing room, or seats, for the voters. The Bouleuterion (*βουλευτήριον*), or Council House, on the other hand, required a roof. The type may be studied from the ruins at Priene

FIG. 356. — Bouleuterion at Priene.

(Figs. 356, 357) and Miletos. At Priene the building was almost square. On one side was a niche with a raised stage (*λογεῖον*, *βῆμα*) and lateral passages (*πάροδοι*), in the centre an open space with an altar, and on the three remaining sides were banked rows of benches (*θᾶκοι*, *βάθρα*), and at the top a surrounding passage (*διάζωμα*). At Miletos,[2] although the exterior of the building was

[1] Crow, *A.S.A. Papers*, IV, 207–260.

[2] *Milet*, 25–80.

rectangular, the banks of seats were arranged like those of a theatre, in concentric curves. In front of the Council House was an open court, entered through an imposing gateway and surrounded by covered porches. Buildings of a similar character have been found at Termessos [1] and elsewhere. At Megalopolis [2] the Thersilion, built for the meetings of the Arcadian Ten Thousand, was constructed with rows of wooden seats sloping from three sides towards a central area, while a stage and lateral passages were on the fourth side.

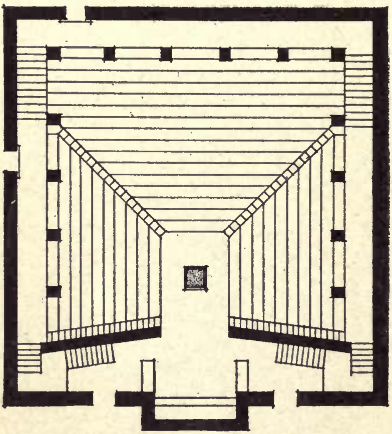


Fig. 357. — Plan of Bouleuterion at Priene.

A long, rectangular plan [3] was also employed for Bouleuteria. In such cases the seats sloped from two sides of the building. Of this type was probably the Phokikon, near Daulis,[4] in which there were long colonnades and, from the columns, banks of seats rising to each wall. The Curia at Pompeii [5] appears to be a variant of this type, with decorative columns at the side walls instead of colonnades. In this case movable seats were probably used.

Governmental buildings were frequently arranged in

[1] Lanckoronski, II, 43, 99.
[2] Frazer, *Paus.*, IV, 338–346; Schultz, 17–23.
[3] Vitruvius, V, 2.
[4] Paus., X, 5, 1–2.
[5] Mau, 121.

groups, as the so-called Bouleuterion[1] with its adjoining buildings at Olympia, or three buildings at Eleusis,[2] or the six governmental offices adjoining the Philippian colonnade at Megalopolis.[3] The buildings so associated with the Bouleuteria may have varied in different cities. Not far away, however, from the Bouleuterion should be the Prytaneion.

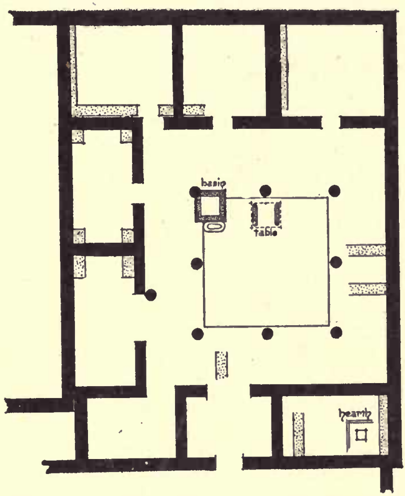


Fig. 358. — Plan of Prytaneion at Priene.

The Prytaneion[4] (πρυτανεῖον) was the official meeting-place of the Prytaneis. It contained the state hearth in which perpetual fire was kept burning; it was also a dining place reserved for the Prytaneis, honored citizens, and state guests. It probably originated in the royal palace, and continued to serve some of the purposes of a private house. If there was a typical form of Prytaneion, it is natural that it should resemble in some degree a private house. Priene furnishes us the most definite example (Fig. 358). Here the building consists of a peristyle court with rooms

[1] Olympia, II, 76–78; Frazer, *Paus.*, III, 636.

[2] Frazer, *Paus.*, II, 511.

[3] Paus., VIII, 30, 6.

[4] G. Hageman, *De Graecorum prytaneis*, Vratislaviae, 1881; J. G. Frazer, *Journal of Philology*, XIV (1884), 145 ff.

opening into it from three sides. The Prytaneia at Magnesia[1] and at Olympia[2] are of similar form. A second type of Prytaneion was the circular building (*θόλος, σκιάς*). Such was the Tholos at Athens,[3] and the Common Hearth of the Arcadians at Mantineia.[4] This type was preferred by the Romans for their temples of Vesta.

For various other officials were erected separate buildings, such as the Thesmotheteion, the Strategion, and the Ephoreion. Law courts[5] (*δικαστήρια*) were held sometimes in the open, sometimes in closed buildings. There seems to have been no typical form of building for this function of government, although there were certain features which characterized these halls of justice, such as the benches on which the judges sat, the raised tribunals for the advocates, and the bar or railing which separated the court from the public.

5. COMMERCIAL BUILDINGS: THE AGORA AND STOA. — Greek trade was both wholesale and retail. The wholesale merchants sold their goods by samples. The locality where such goods were exhibited was called the Deigma. These merchants were often importers, and had their storehouses at the seaports. Remains of some of these may be seen at Delos. For the use of these traders were also erected colonnades, such as those at the Peiraieus.[6]

Retail merchants and those who sold their own products sought the agora, or market-place[7] (*ἀγορά*), which in most

[1] *Magnesia*, 112, 137, Taf. 2. [2] *Olympia*, II, 58–60.

[3] Paus., I, 5, 1; Frazer, *Paus.*, II, 76.

[4] Paus., VIII, 9, 5; Frazer, *Paus.*, IV, 441.

[5] Daremberg et Saglio, *s.v.* Dikastai; Smith, Dict., *s.v.* Dicasterion.

[6] Frazer, *Paus.*, II, 24.

[7] Daremberg et Saglio, *s.v.* Agora; Krause, 164; Curtius, *A.Z.*, VI (1848), 292.

Greek cities was the heart of the town. The earliest type of market-place was an open space, where each merchant could expose his wares from a booth, or tent, and where shade was provided by means of trees. It had no well-defined form, and its functions were manifold. Temples and altars were erected in it; here also was likely to be found a group of governmental buildings. The agora was often peopled with statues. But the religious, political, and commercial interests in growing cities could not long continue to occupy the same ground. Hence they were separated, although the separation was not always complete.

In the classic and Hellenistic periods the agora became an architectural feature in Greek cities. The open space was more or less surrounded by porticoes, into which opened store-rooms. The agora at Priene[1] had covered walks on three sides; those at Magnesia (Fig. 359), Knidos,[2] and at Aphrodisias[3] had them on all four sides.

The form of the agora in Hellenistic cities corresponded with the general disposition of the streets, and was usually square or rectangular. Agoras with curved boundaries, however, existed in Asia Minor,[4] and a circular one at Constantinople.[5] Those of the archaic period were less regular in form. Pausanias[6] describes that of Olympia as built in "the Older Style," with separate colonnades, and streets between them. In the later or Ionian type the colonnades were united so as to form an enclosure without streets.

[1] *Priene*, 185, Taf. 13. [2] Newton, II, 306, Pl. 50.

[3] *Ion. Antiq.*, III, Ch. 2, Pl. 4.

[4] Sterrett, *A.S.A.*, III, 302; cf. *B.C.H.*, VI (1882), 492; VII (1883), 368. [5] Zosimos, II, 30. [6] Paus., VI, 24, 2.

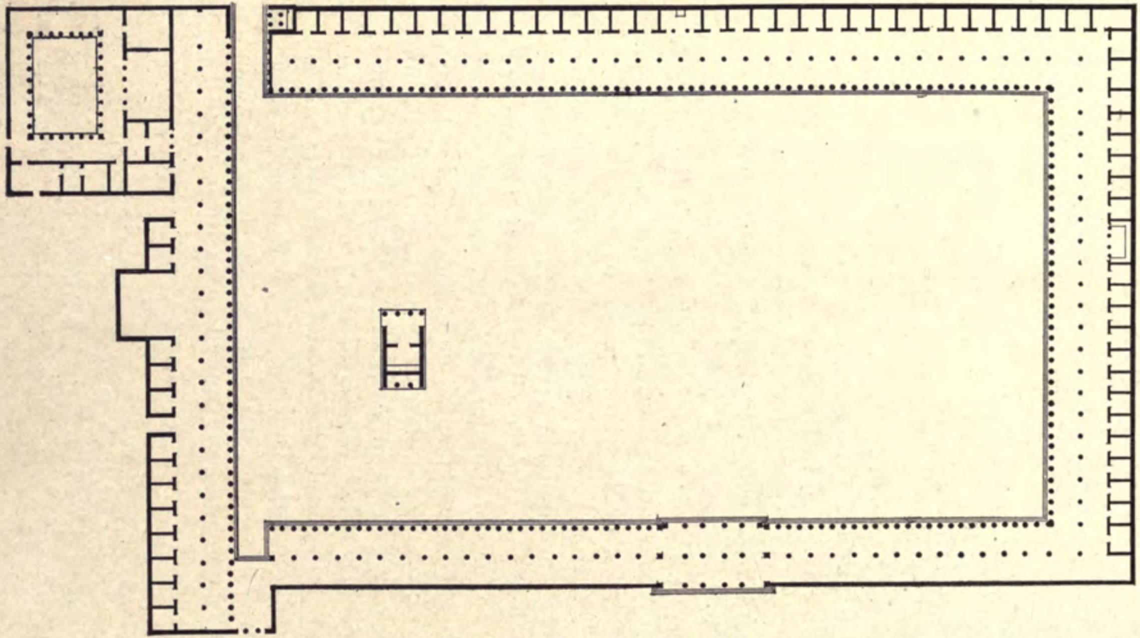


Fig. 359. — Plan of Agora at Magnesia.

The stoa (στοά), or porch, although associated with temples, political buildings, theatres, and other buildings, was the chief architectural feature of the agora. It

Fig. 360. — Stoa of Eumenes, Pergamon. Restoration.

existed in various typical forms. The simplest was the single-aisled porch (μονόστιχος), the pent roof of which sloped down from a wall to a single colonnade. Of this type were the Eastern and the Western Stoa of the agora at Priene.[1] This type was usually single-storied (μονόστεγος), but it might be two-storied (δίστεγος), as was the Stoa of Eumenes at Pergamon (Fig. 360). In two-storied porticoes the upper columns were posed directly above the lower ones, but differed from them in style and proportions.[2]

A second type was the two-aisled stoa (στοὰ δίστιχος), in which the double aisle resulted from the introduction of an interior colonnade. In some instances, as in the Philippian Colonnade at Megalopolis,[3] the outer and inner row of columns corresponded in size, number, and position. In this type the pent roof was probably retained. In other cases, as in the Stoa of Orophernes at Priene and in the agora at Magnesia (Fig. 361), the inner colonnade consisted of larger columns, which corresponded in position with every alternate column of the outer row. We may believe that this central colonnade supported the ridge-beam of a gable roof, which covered a single-storied porch.

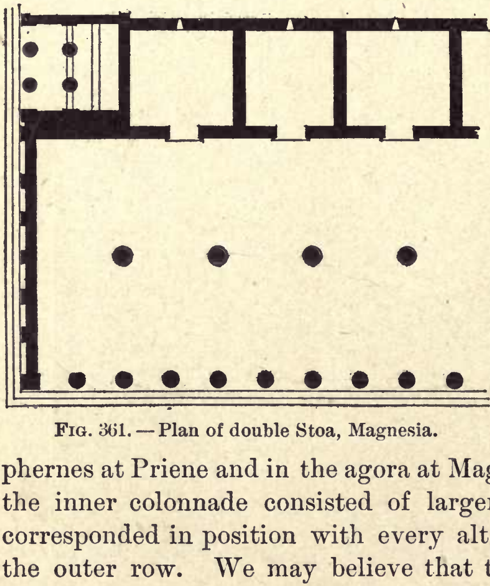


FIG. 361. — Plan of double Stoa, Magnesia.

A third type stoa was the three-aisled, which resulted

[1] *Priene*, Taf. 13.
[2] Vitruvius, V, 1, 3.
[3] Frazer, *Paus.*, IV, 321.

from the introduction of two inner colonnades. Of this type was one of the porticoes seen by Pausanias[1] at Olympia, and that built by Epigone at Mantineia.[2] It has been assumed[3] that the Stoa Basileios at Athens was, in its general disposition, a prototype of the basilicas of Roman and Christian architecture, and also that basilicas must have existed in many Greek cities in the Hellenistic period[4]; but excavations have not yet established the truth of these reasonable assumptions.

A stoa with more than three aisles was certainly rare, although Texier[5] restored the peribolos at Kangovar, and Curtius the Aristandrian Colonnade at Megalopolis,[6] as having three aisles enclosed by four rows of columns. Antioch[7], because of the double portico on each side of its principal street, is said to have had a four-aisled stoa. At least three basilicas at Rome were five-aisled.

In elevation two stories seem to have been the normal limit, but at Aegae[8] and at Alinda[9] porticoes were erected on top of two-storied buildings.

A new variety of stoa was produced by developing a porch on both sides of a central wall. This was called the double stoa (*στοὰ διπλῆ*). Pausanias[10] discusses a stoa of this kind at Elis known as the Corcyraean Colonnade.

The development of trade demanded the establishment of special markets, such as the grain market at Athens. It also stimulated private hospitality and led to the

[1] Paus., VI, 24, 2.
[2] Frazer, *Paus.*, IV, 211, 214.
[3] Lange, 60–104.
[4] Mau, in Pauly-Wissowa, *s.v.* Basilica.
[5] Texier, *Arménie*, I, 161.
[6] Frazer, *Paus.*, IV, 321.
[7] Sittl, 375, note 5.
[8] Bohn-Schuchhardt, Fig. 24.
[9] Reinach-Lebas, *Arch. As. Min.*, II, Pls. 4–5.
[10] Paus., VI, 24, 4.

erection of inns or khans (καταγώγια), hotels (πανδοκεῖα), and restaurants (καπηλεῖα).

6. Buildings for Physical Culture. — Athletic games flourished in Greece from an early period. Wrestling, boxing, foot-racing, jumping, weight-throwing, ball

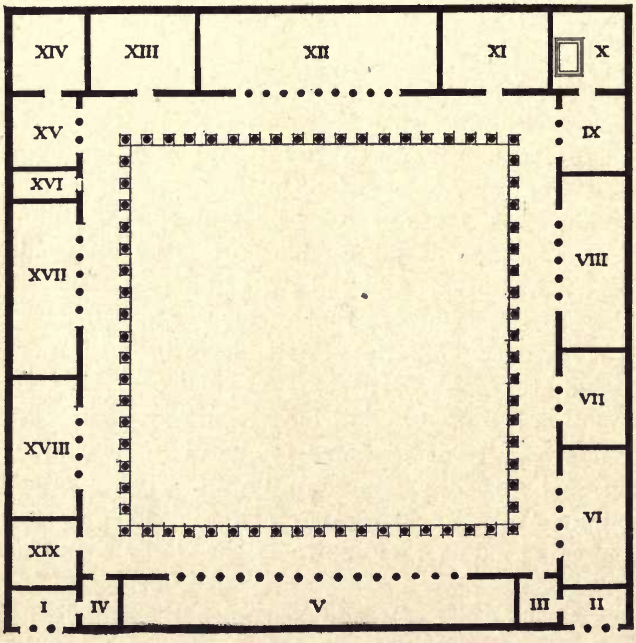


Fig. 362. — Plan of Palaistra at Olympia.

play, and other games, some of which may have been learned from Egyptians or Phoenicians, were practised in Greece from Homeric days. Those which the Phaeacians instituted in honor of Odysseus[1] took place in

[1] *Od.*, VIII.

the agora, but more frequently a levelled piece of ground was set apart for athletic purposes. In primitive times no covered structures for this purpose were thought necessary. In the archaic and classic periods buildings were erected which exhibited the essential features of the later gymnasium.[1] The surviving stone and marble examples belong to the Hellenistic period.

The palaistra[2] (*παλαίστρα*), or wrestling house, followed the type of the agora and consisted of a rectangular court surrounded by colonnades with adjoining rooms. Olympia[3] furnishes the best example of the type (Fig. 362). It was known as the square (*Τετράγωνον*) and had more or less imposing entrances (I, II) (*πρόθυρα*) with adjoining porters' lodges (III, IV) (*πυλώρια*), a commons room (XII) (*ἐφηβεῖον*) devoted to the use of young men, a bath-room (X) (*λουτρών*) provided with a tank or with a trough as at Priene (Fig. 363). There was also a dressing-room (XIX) (*ἀποδυτήριον*), a room where the athletes were anointed with oil (XIII) (*ἐλαιοθέσιον*), and another (XI), the konistra (*κονίστρα* or *κονιστήριον*), where the athletes were rubbed with dust. These two rooms, according to Vitruvius,[4] adjoined the Ephebeion, or commons room. Other rooms, when closed, were probably used for storing the athletic implements and, when open toward the court, for lounging or meeting rooms, where athletic instruction or literary entertainment might be given. A somewhat simpler palaistra of the second century B.C. adjoined the stadion at Priene;[5] another of the same period was at Delos.[6] In all these buildings it may

[1] Krause, *Gymnastik*, I, 93.
[2] Daremberg et Saglio, *s.v.* Gymnasium.
[3] *Olympia*, II, 113.
[4] Vitruvius, V, 11, 2.
[5] *Priene*, 265.
[6] *B.C.H.*, XV (1891), 246.

be observed that the bath was subsidiary to the main purpose of the building.

Bath-rooms and bathing establishments (βαλανεῖα) of various kinds, public and private, existed from earliest days in Greece. At Tiryns[1] a wooden lined bath-room

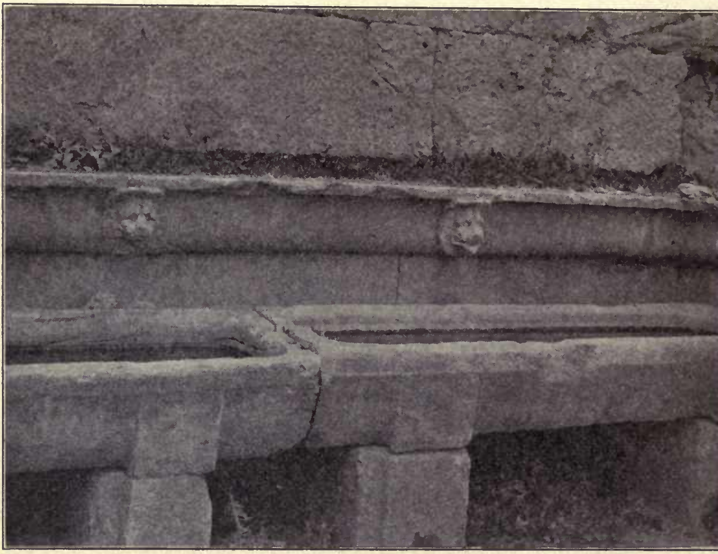


FIG. 363. — Water troughs in gymnasium, Priene.

contained fragments of a terra-cotta tub similar to that found at Mycenae.[2] At Knossos[3] there were not only bath-rooms for portable tubs, but also gypsum-lined, sunken tanks reached by steps. Similar bath-rooms were found at the palace at Palaikastro[4] in Crete.

[1] Schliemann, *Tiryns*, 230–232.
[2] *Priene*, 293.
[3] *B.S.A.*, VIII (1901–1902), 52–53.
[4] *Ibid.*, IX (1902–1903), 278, 291, Pl. 6.

A simple type of public bathing establishment adjoins the agora at Assos.[1] It consists of a long corridor, upon which open thirteen square rooms. In one at least of these rooms water was introduced from an elevation so as to provide a douche. In others may have been the large vases used for bucket douches. Vase-paintings provide us with illustrations of various kinds of bathing.[2]

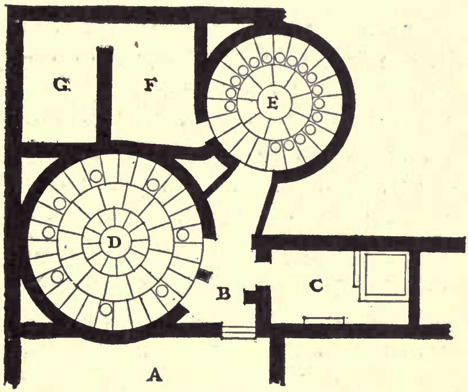


Fig. 364. — Plan of Bath at Oiniadai.

Hot baths (θερμὰ λουτρά), mentioned by Homer[3] but not generally practised by the Greeks of the classic period,[4] became more popular in the Hellenistic and Roman periods. Actual remains of bath-houses in Greek lands are rare. The unfinished excavations at Oiniadai[5] in Akarnania (Fig. 364) present an example of a hot-bath establishment dating apparently from the second century B.C. In this building is a rectangular room with a cold-water pool, corresponding to the frigidarium of Vitruvius;[6] a large circular room, possibly the tepidarium; a smaller circular room, the calidarium; and still smaller rooms

[1] Bacon, *Assos*, 8, 23, 25.
[2] Daremberg et Saglio, *s.v.* Balneum.
[3] *Iliad*, XIV, 6.
[4] Herod., IV, 75; Aristotle, *Problemata*, II, 29–32.
[5] Sears, in *A.J.A.*, VIII (1904), 216–226.
[6] Vitruvius, V, 11.

which may have served as anointing rooms. In the centre of the circular rooms probably stood large kettles or caldrons of boiling water, each provided with a cover. From these hot water may have been conveyed to the circular basins in the floor. Remains of similar circular bathrooms are found at Eretria,[1] where the basins in front of fixed seats were evidently arranged as foot-tubs. Similar tubs are found in the loutron of the palaistra and in a private house at Priene.[2]

The Akarnanian type of bath is seen in a more developed state at Pompeii (Fig. 365). In the Stabian Baths, the small baths near the Forum, and the Central Baths,[3] circular or domical rooms as well as rectangular rooms are found, the circular rooms being sometimes employed for the cold and sometimes for the hot vapor bath. Various improvements were introduced, such as small vaults in the walls of the apodyterion, to serve as lockers; the introduction of hot water by means of pipes; and especially the use of furnaces, the hot air from which circulated beneath the floors and through the hollow walls.

In Asia Minor the baths of the late Greek and Roman periods departed so far from the Assos type as to be hardly recognizable. The so-called gymnasium (*γυμνάσιον*) at Alexandria Troas[4] and the Opistholeprian Bath at Ephesos[5] retained the long corridor into which the principal rooms open, but the central court was replaced by rooms which correspond to the Ephebeion and the other apartments of a palaistra. To these were added enlarged facilities for bathing. In view of its general plan, such a

[1] *A.J.A.*, V (1901), 96. [2] *Priene*, 270, 292. [3] Mau, 180–206.

[4] Koldewey, in *Ath. Mitt.*, IX (1884), 36–48, Taf. 2, 3.

[5] Falkener, 88.

building might be styled a winter palaistra or gymnasium, but its disposition as a bathing establishment was suffi-

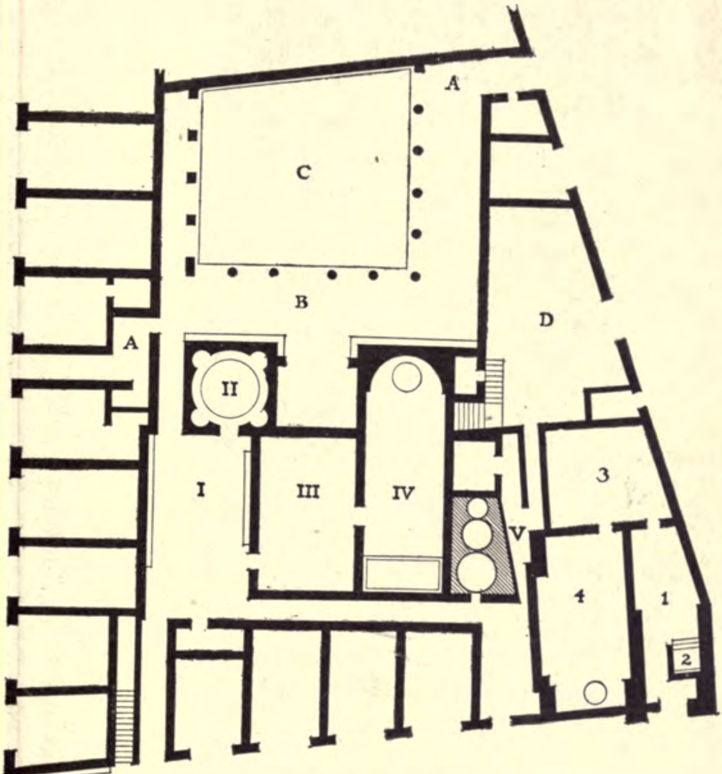


FIG. 365. — Plan of small Bath at Pompeii.

ciently emphatic to justify us in considering it a prototype of the great Roman baths, such as those of Caracalla or of Diocletian.

Foot-races and chariot-races required specially prepared courses, known as the stadion and the hippodrome. The stadion (σττάδιον), so named from the measure of length equivalent to six hundred Greek feet, provided seats for spectators and judges, and a course with start and finish for the runners. When practicable, a valley was selected, from the sloping sides of which the spectators could view the races. Where nature did not provide a suitable slope, an artificial mound of earth was erected as a theatron (θέατρον), or view place, for the spectators. Here they sat upon the ground or upon wooden

Fig. 366. — The Stadion, Delphi.

or stone benches. It was not until the second century of our era that Herodes Atticus (104–180 A.D.) provided the stadia at Athens and at Delphi with marble seats. The seats of the Isthmian Stadion were also of white marble. These seats resembled those of the theatre, in being arranged in successive tiers reached by flights of steps at regular intervals. At the base was a parapet and sometimes a drain. An interesting feature in the design of the theatron was that at the extremities of the stadion the two banks of seats were drawn closer together than at the middle. This appears to have been the case at Olympia [1] and also at Priene.[2] This feature is retained in the reconstructed marble stadion at Athens, where the two rows of seats approach each other on a curve which suggests the entasis of a column. The form of the stadion was in some cases, as at Olympia and at Epidauros, a long rectangle ; elsewhere, as at Athens and at Delphi (Fig. 366), the tiers of seats were continued at one end on a semicircular plan (σφενδόνη), so as to accommodate a larger number of spectators. At Aphrodisias and at Laodikeia the tiers of seats were arranged on this plan at both ends. Such a theatron is properly called an amphitheatron [3] (ἀμφιθέατρον).

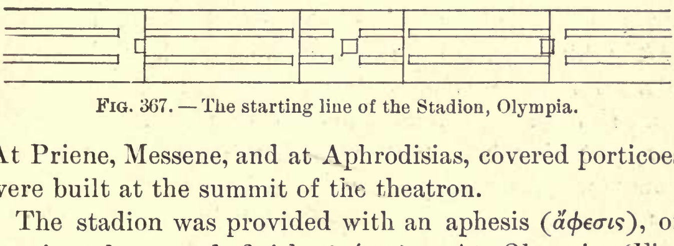


FIG. 367. — The starting line of the Stadion, Olympia.

At Priene, Messene, and at Aphrodisias, covered porticoes were built at the summit of the theatron.

The stadion was provided with an aphesis (ἄφεσις), or starting-place, and finish (τέρμα). At Olympia (Fig. 367) there appears to have been an aphesis at each end of the stadion,[4] so that the finish might be opposite the judge's stand, whether the runners went once over the course or traversed it twice. At the start the runners, arranged in line, were separated from each other by a

[1] *Olympia*, II, 63.
[2] *Priene*, 264.
[3] Pauly-Wissowa, *s.v.* Amphitheatrum.
[4] *Olympia*, II, 64.

series of low posts which carried cross-bars. At Olympia the holes for wooden posts occur at regular intervals in a series of marble sills. The blocks also show parallel furrows by means of which the runners may have been able to obtain a quick start. The cross-bars as barriers for runners are represented in a drawing from the Codex Ursinianus in the Vatican, and in a bas-relief in the Lateran.[1] At Epidauros iron posts appear to have been used. These were replaced in later days by semi-columns of the Ionic order.[2] At Priene[3] a device of the Olympian type was replaced later by a more imposing aphesis, in which marble piers were substituted for the wooden posts. When the runners traversed the course twice, the turn may have been made around a single post; or, as the arrangements at Olympia appear to indicate, each runner kept to his own track and made the turn about a separate post. The finish was marked by a rope or line drawn opposite the seats reserved for the judges.

The hippodrome[4] (*ἱππόδρομος*), or track for horse and chariot races, was an enlarged stadion. The theatron was similarly disposed, although regular tiers of seats may not have been built until the Roman period. The course was necessarily wider than the stadion, and double its length. Special devices were necessary to secure a fair start. Pausanias[5] describes the aphesis of the hippodrome at Olympia as resembling the prow of a vessel, the beak (*ἔμβολον*) of which was turned towards the course and contained stalls (*οἰκήματα*) from which the

[1] Kern, in *Röm. Mitt.*, V (1890), 150–156, Taf. 7.

[2] Cavvadias, *Asklep. Temp.*, 96.

[3] *Priene*, 260.

[4] Krause, *Gymnastik*, I, 147–168; Daremberg et Saglio, *s.v.* Hippodromos.

[5] Paus., VI, 20, 10–15.

horses issued. The ropes or barriers of the stalls furthest from the beak were lowered first, then those of the adjoining stalls, and finally those nearest the beak (Fig. 368).

A second device necessary for the hippodrome was the spina, which consisted of a low wall in the central axis of the course. This protected the outgoing and returning chariots from clashing with each other. A turning-post (*νύσσα*, *καμπτήρ*) was set at either end of the spina. The spina of the hippodrome at Constantinople still survives. While no remains of a spina have been found in earlier Greek hippodromes, it may be assumed that some

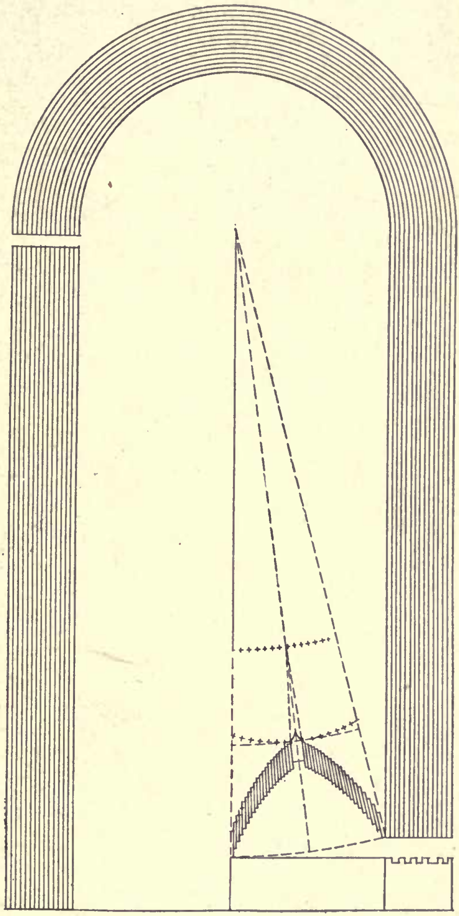


Fig. 368. — Plan of a Hippodrome.

effective method was provided to avoid the clashing of chariots. The finish, as in the stadion, consisted in crossing a line in front of the seats reserved for the judges.

7. Buildings for Intellectual and Social Purposes. — Intellectual and social demands led to the establishment of special buildings for schools, libraries, clubs, theatres, and music or concert halls.

Greek education[1] in the earlier periods aimed chiefly at the production of soldiers. Hence gymnastics was a fundamental branch of education, and with it training in poetry, music, reading, and writing were associated. The palaistra, or gymnasium, naturally represented the school and developed so as to include literary and philosophical exercises. At Athens the Academy, where Plato taught, and the Lyceum, the school of Aristotle, and the Herakleion or Kynosarges, the school of Antisthenes, were all primarily athletic establishments, quadrangular courts surrounded by colonnaded porticoes. Instruction appears to have been also given in the public agora, and in private houses, but the teaching place (*διδασκαλεῖον*) had no fixed type. At Teos, where teachers of various kinds were paid from the public treasury, the formal examinations to test the progress of students were held in the gymnasium or in the bouleuterion.

In the Hellenistic period educational establishments began to assume more specific form. The University to the Muses[2] (Μ*ουσεῖον*), dedicated at Alexandria by Ptolemy Philadelphos about 280 B.C., had, according to Strabo, a portico (*περίπατος*), a lecture-room (*ἐξέδρα*), and a large hall (*οἶκος μέγας*). Since fourteen thousand students at a time are said to have pursued here the study of litera-

[1] Daremberg et Saglio, *s.v.* Educatio. [2] Strabo, XVIII, 794.

ture, mathematics, astronomy, and medicine, the building must have been more extensive than is indicated by Strabo. The so-called Stoa of Hadrian at Athens,[1] with its exedrae and large rooms, appears to be a building of similar character.

Greek libraries (*βιβλιοθῆκαι* or *ἀποθῆκαι βιβλίων*) began with private collections of books, such as those

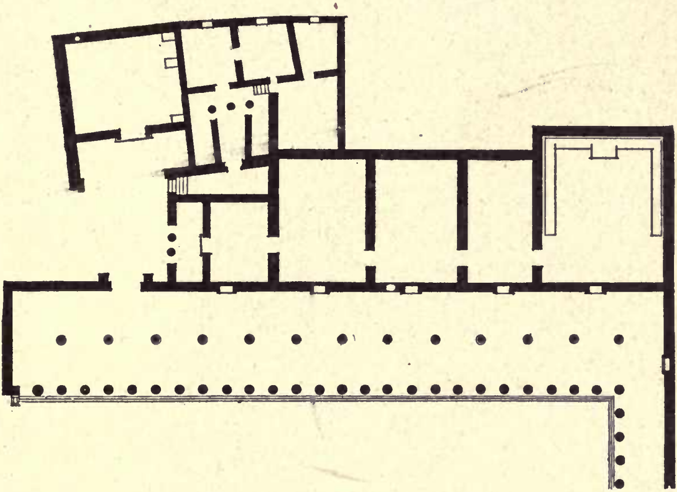


FIG. 369. — Plan of Library at Pergamon.

made by Polykrates of Samos, Peisistratos of Athens, or Aristotle. Such libraries required a closed room with shelves, cabinets, or closets in which to store papyrus and parchment rolls. The large libraries of later days, such as those at Pergamon and Alexandria, were furnished with reading-rooms, dwellings for the librarians, and cloistered walks. The library at Pergamon[2] (Fig. 369), established

[1] Harrison and Verrall, 197.

[2] *Pergamon*, II, 56.

by Eumenes II, affords a typical Greek solution of the library problem. It consisted of a series of rooms, some of which were evidently intended as dwellings, others for lectures, for reading, and for the storing of books. The room for the latter purpose has been identified by the holes in the walls in which were fastened the supports of the cabinets or shelves for which the foundation still exists (Fig. 370). These rooms were preceded by a double portico. The Roman library of C. Asinius Pollio was established in the atrium of the Temple of Liberty, and the two libraries founded by Augustus were also connected with porticoes.[1]

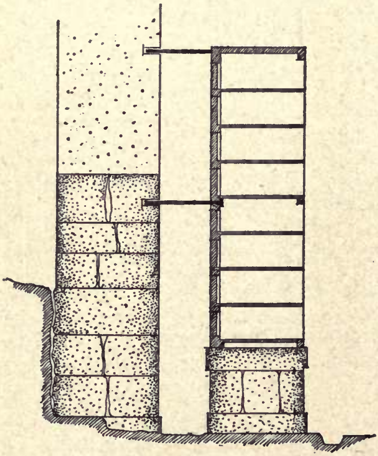


FIG. 370. — Book shelves at Pergamon, Restoration.

The club-house (λέσχη) met the social requirement of a place for conversation. As this want was also met in various other ways, there seems to be no fixed type for such a building, and it is idle to speculate as to its form.[2] Fortunately, the excavations at Delphi seem to have brought to light the most celebrated building of this class, the Lesche erected by the Knidians[3] (Fig. 371) and decorated with paintings by Polygnotos. It consisted of a single rectangular room, in the interior of which eight

[1] Pauly-Wissowa, *s.v.* Bibliotheken. [2] Lange, 120.
[3] Homolle, in *B.C.H.*, XX (1896), 633–639; Frazer, *Paus.*, V, 635.

pillars or columns helped to support the roof. Whether the paintings which adorned the walls were illuminated from an opening in the roof, from windows, or merely from the door cannot now be determined.

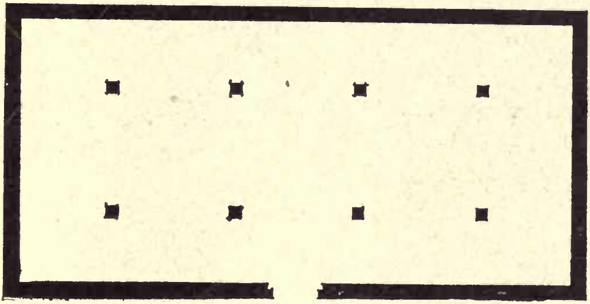


Fig. 371. — Plan of the Lesche of the Knidians, Delphi.

The Greek theatre[1] (θέατρον) was designed for the presentation of plays in which choral songs and dances were prominent features. The architect was called upon to provide a dancing ground for the chorus, an auditorium, or place for seating the spectators, and a skene with dressing-rooms for the actors.

The fundamental feature was the orchestra (ὀρχήστρα), or dancing ground for the chorus; for this a level space was required. The floor of the orchestra was usually of rolled or pounded earth. At Delos,[2] however, it was coated with plaster, and at Athens, in the Roman period, it was covered with a marble and mosaic pavement. When covered with sand for gladiatorial contests, it was known as the Konistra (ἡ κονίστρα). In the centre of the orchestra was an altar

[1] For bibliography consult the Preface to Haigh, *The Attic Theatre.*
[2] *B.C.H.*, XVIII (1894), 163.

around which moved the chorus. In the course of time the altar lost its central significance. At Priene it was relegated to the periphery of the orchestra; in later theatres it was often omitted altogether. The form of the orchestra was not invariably the same. At Thorikos[1]

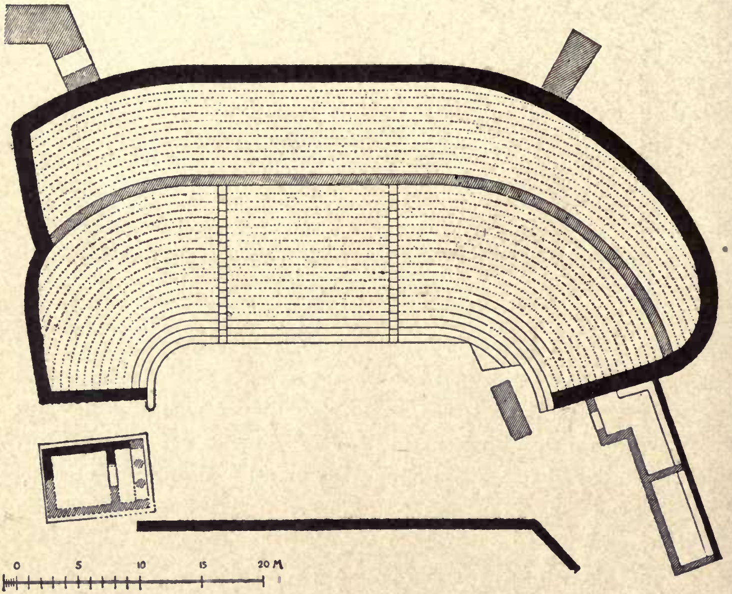


FIG. 372. — Plan of Theatre at Thorikos.

(Fig. 372) it was a rectangle with rounded ends, but in most Greek theatres of the classic period it was nearly if not entirely circular. The theatre of Dionysos at Athens,[2] though subjected to many changes, still retains some of the blocks of the retaining wall of a circular

[1] W. Miller, in *A.S.A.*, IV, 1–34; Doerpfeld und Reisch, 110.
[2] Doerpfeld und Reisch, 366, Taf. 1; Haigh, 112, Fig. 3.

orchestra dating apparently as early as the sixth century. Epidauros (Fig. 373) has the distinction of exhibiting an orchestra whose circular form is emphasized by a ring of limestone. This was decorated by a roundel moulding on the half of the circle towards the auditorium. Such a ring may have proved a stumbling-block to the people entering and leaving the theatre and was elsewhere omitted.

A special device by means of which actors could suddenly make their appearance, or as suddenly disappear, was a subterranean passage (*κρυπτὴ εἴσοδος*), connecting the orchestra and skene, and provided with steps at either end. These passages were probably closed with trap-doors. Examples of such subterranean passages are found at Eretria[1] and Sikyon.[2]

Next in importance to the orchestra was the theatron (*θέατρον*), or view place, for the spectators. In fact, an orchestra and a theatron, the chief necessities of a Greek theatre, are all that are found in the theatre at Thorikos. The general requirement for a theatron was a sloping bank or hollow (*κοῖλον*), which could be further excavated, or built up, so as to furnish spectators with a view of the orchestra. Where necessary, it was supported by retaining walls. The excavated theatre had little or no exterior for architectural decoration. When, however, a theatre was constructed in a plain, as was the case with many late Greek and Roman theatres, the enclosing walls furnished an excellent field for architectural ornamentation.

The plan of the theatron followed that of the orchestra. At Thorikos it was rectangular with irregularly rounded

[1] Brownson, in *A.J.A.*, VII (1891), 275–280.
[2] McMurtry, in *A.J.A.*, V (1889), 278–279.

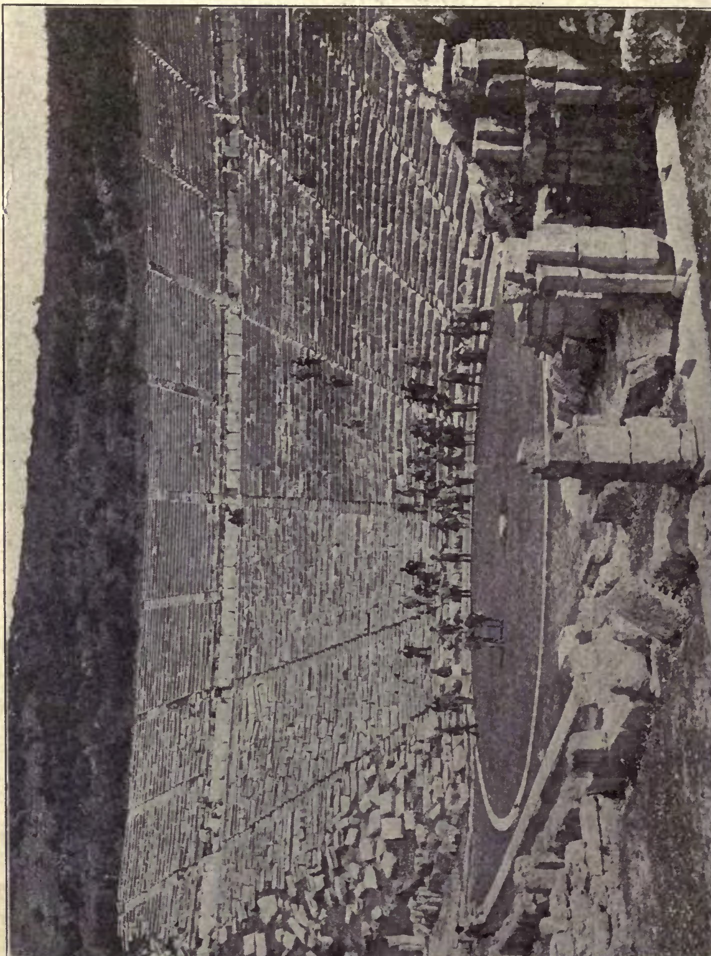


FIG. 373. — The Theatre at Epidauros.

extremities, but elsewhere followed, in part at least, a circular plan. At Aspendos[1] it barely exceeded a semicircle; at Sagalassos[2] it occupied two-thirds of a circle; at Athens[3] it resembled the end of a stadion, and consisted of semicircular banks of seats continued in straight lines towards the skene; at Epidauros[4] it followed the line of a three-centred curve (Fig. 374). This widened the diodos (δίοδος), or passageway, at the base of the theatron, without sacrificing a continuous curvature in plan. At Epidauros, and elsewhere, beneath this passageway was a channel, which carried off the surface drainage of the orchestra and of the theatron. At Athens the open drain between the theatron and the orchestral circle was less practical.

The theatron in all large, and in some small, theatres was subdivided into the theatron proper and an epitheatron (ἐπιθέατρον), or upper theatron, by means of diazomata (διαζώματα), or horizontal passages. There is but one such dividing passage at Epidauros, and in most theatres of moderate size. Where two occur, as at Argos[5] and probably at Megalopolis,[6] one was usually narrower than the other. At Epidauros, Megalopolis, and in general, the epitheatron was semicircular in plan and concentric to the theatron. At Delos, however, it terminates in a pointed arch, and at Athens in a horseshoe arch. The block of seats was still further subdivided by the stairways (κλίμακες), which were known also as furrows (ὁλκοί). The stairways radiating from a common centre divided the block of seats into wedge-

[1] Lanckoronski, I, Taf. 21.
[2] *Ibid.*, II, Taf. 26.
[3] Doerpfeld und Reisch, 42.
[4] *Ibid.*, 122.
[5] Blouet, II, Pl. 58.
[6] *Megalopolis*, 39–40, Fig. 27.

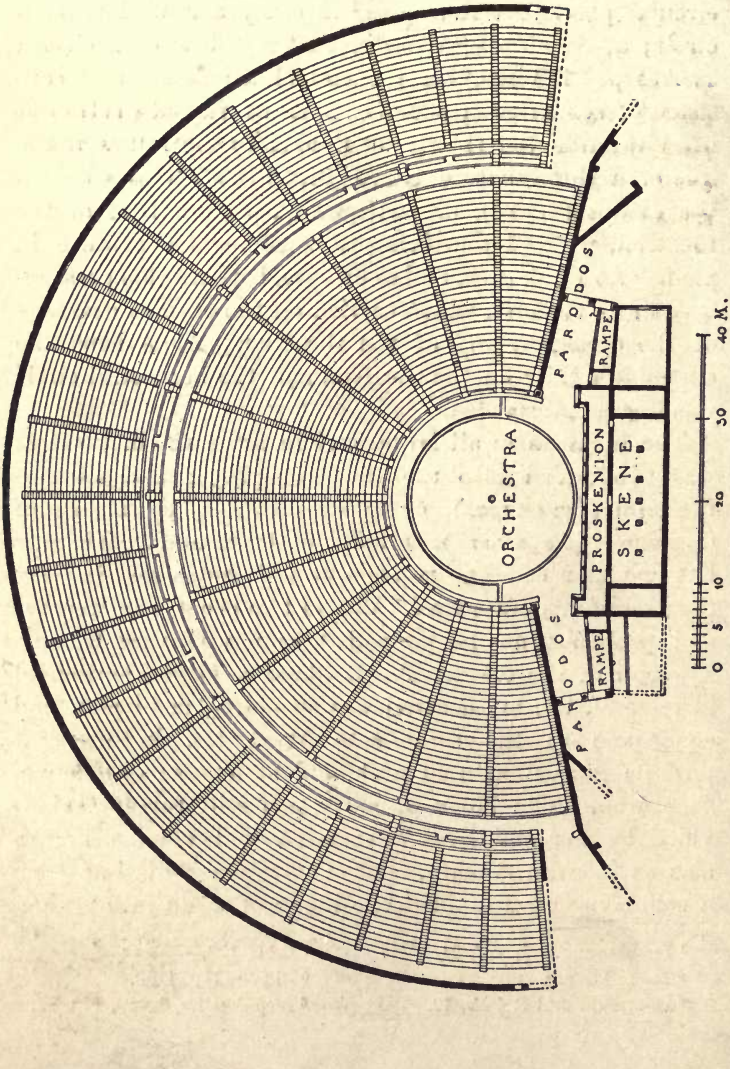


FIG. 374.—Plan of the Theatre at Epidauros.

shaped sections (κερκίδες). As these wedges widened towards the upper rows additional stairways were required. Thus at Epidauros the stairways were continued through

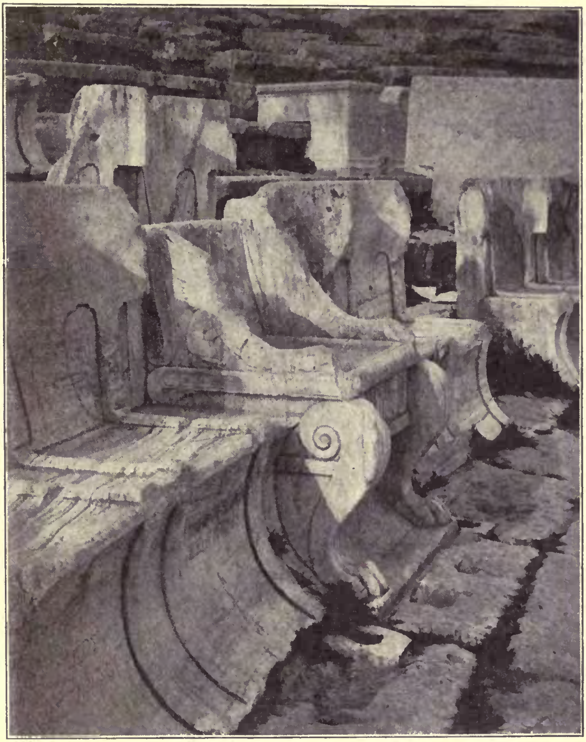


Fig. 375. — Front seats in the Theatre of Dionysos, Athens.

the epitheatron, where intermediate stairways (μέσαι κλίμακες) were added. Vitruvius generalizes this practice into the rule that above every horizontal passage the number of stairways should be doubled.

The seats consisted of thronoi (θρόνοι, προέδραι), or seats of honor, and the ordinary rows of benches (ἕδραι, ἴκρια, ἑδώλια). The former, which were marble chairs or benches with backs, were placed, at Priene, in the orchestra directly in front of the passage at the base of the theatron; at Megalopolis, in the theatron but on the level of the orchestra; and at Athens, slightly above the orchestra level. Occasionally, as at Epidauros, there was, at the base of the epitheatron, a second row of seats of honor. The thronoi were sometimes finely carved. Of this class that of the priest of Dionysos Eleuthereus at Athens (Fig. 375) is the most noteworthy. At Argos the form of the ordinary benches was of extreme simplicity, with risers and treads like an ordinary stairway. Usually, however, there was a depression in the face and top of each step to accommodate the feet of those seated in the next higher tier. Steps of this character are found in the theatres at Megalopolis, Athens, and Epidauros (Fig. 376). In Asia Minor, as at Miletos (Fig. 377) and at Iassos, the benches were given more decorative form by the use of double-curved profiles, and near the stairways were terminated with claw feet. Beyond the topmost bench was a passageway, terminated, at Delos, by slabs of stone posed vertically and crowned by a capstone or

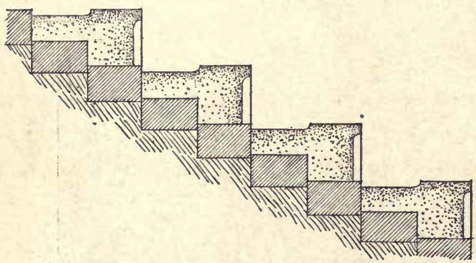


Fig. 376. — Benches of the Theatre at Epidauros.

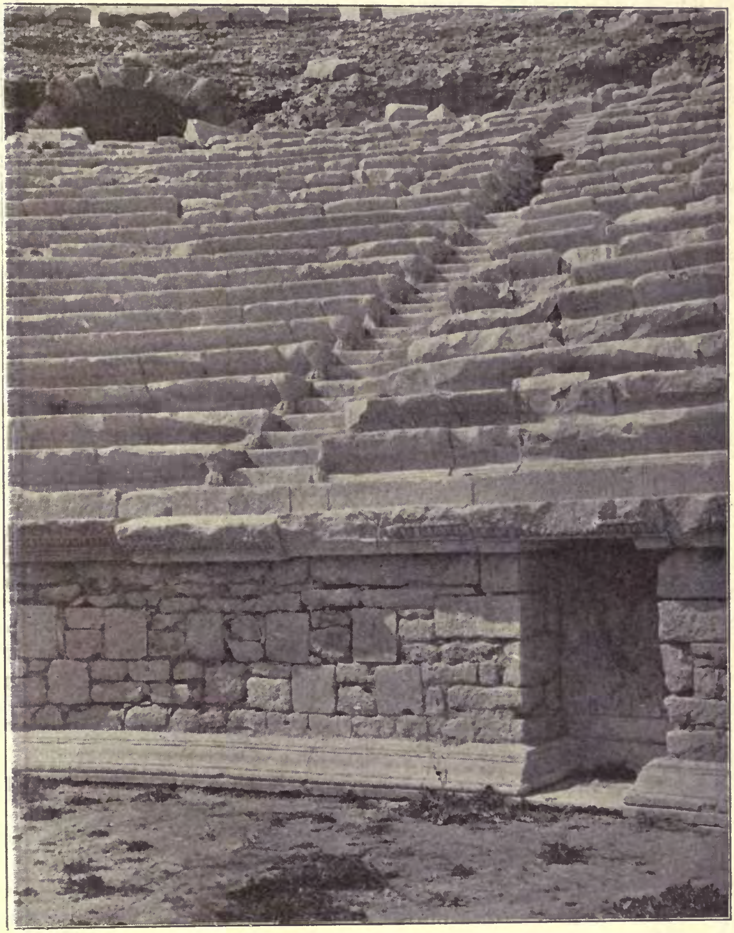


Fig. 377. — Benches of the Theatre at Miletos.

railing. In late Greek and Roman theatres, as at Aspendos and at Orange, an arcade or a colonnade protected this passageway.

The entrance to, and the exit from, the theatron was ordinarily through parodoi (πάροδοι), side passageways, between the theatron and the stage. These parodoi were usually closed by gates. Gate-posts still remain at Epidauros and at Priene (Fig. 378). Occasionally, as at Athens and at Segesta, a direct entrance to the epitheatron was possible from a higher level. At Syracuse there were separate entrances for each diazoma. In Roman theatres the parodoi became vaulted passages beneath the theatron, and exit from the theatre was further facilitated by means of vomitoria, or openings into passages which honeycombed the substructure of the theatron and led, by means of stairways, to the exterior.

The third factor in the Greek theatre, and the last in order of development, was the skene (σκηνή), or stage-building, with its robing-rooms and property-rooms, and the logeion (λογεῖον), or actors' platform. In the earliest theatres a tent sufficed for robing purposes, and the actors, who mingled with the chorus in the orchestra, seldom required a raised platform. Their costume sufficiently distinguished them from the chorus. As occasion demanded they could elevate themselves above the chorus by standing on the steps of the altar platform, or upon a temporary stand (βῆμα, τράπεζα). In theatres of the classic period the skene was built of wood, stone, or marble, and in the luxurious theatres of the late Greek and Roman periods, polychromatic marbles, bronze, silver, and gold and ivory were employed in the decoration of the stage façades. Throughout the fourth century the

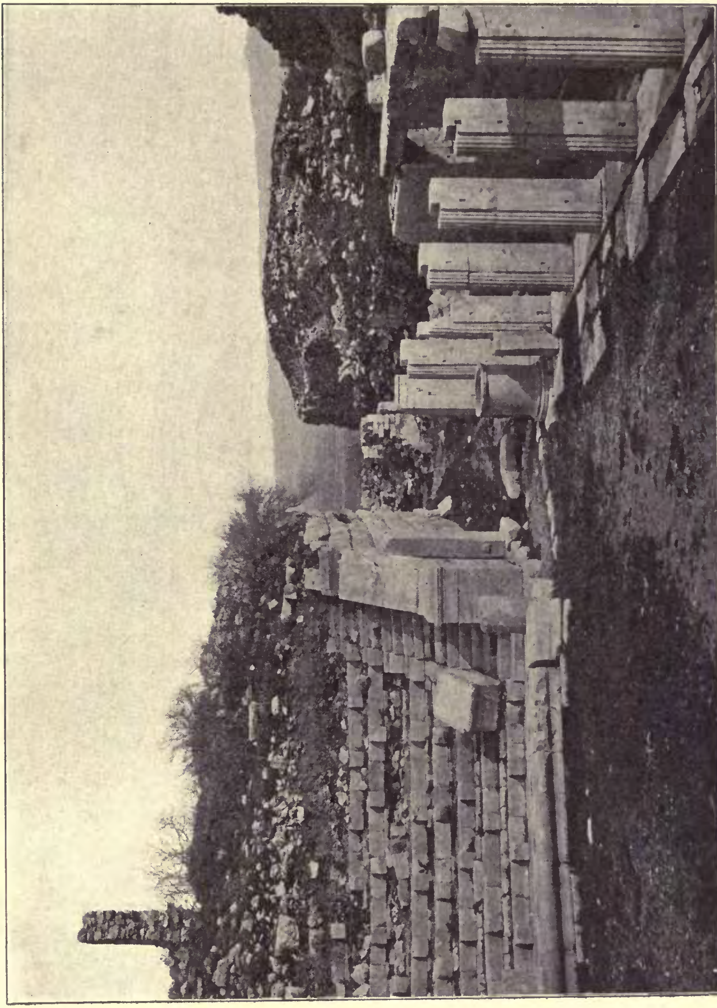


FIG. 378. — Parodos of Theatre at Priene.

skene was located outside of the perimeter of the orchestra circle. In the late Greek plays the part played by the chorus diminished and that of the actors increased.

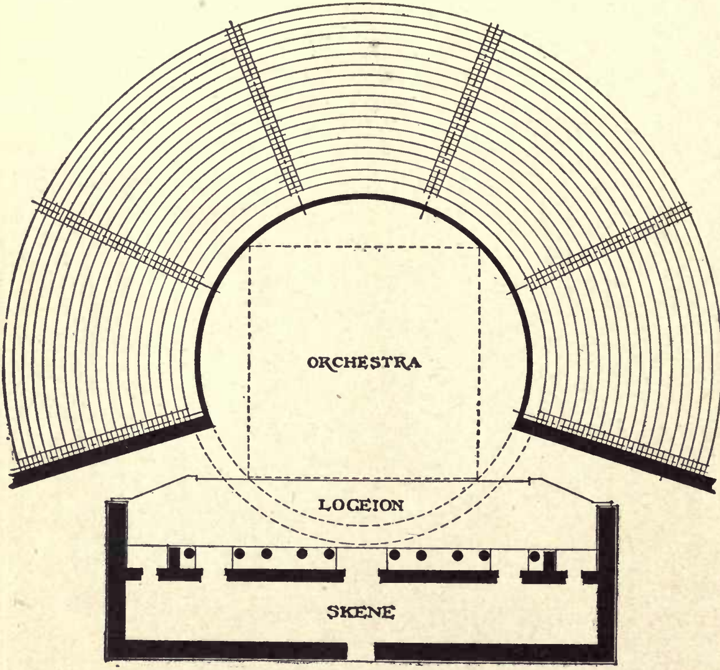


Fig. 379. — Plan of the Theatre at Termessos.

This change is reflected in Graeco-Roman theatres, such as those at Termessos (Fig. 379) and Sagalassos,[1] where the logeion of the stage building encroached somewhat upon the full circle of the orchestra.

The geometrical rules laid down by Vitruvius[2] for

[1] Lanckoronski, II, Taf. 10, 26.

[2] Vitruvius, V, 7; Choisy, I, 486; Doerpfeld, *Ath. Mitt.*, XXII (1897), 453.

planning a Greek theatre are based upon theatres of the Graeco-Roman period. In theatres of the Roman type the stage-building, with its enlarged logeion, encroached

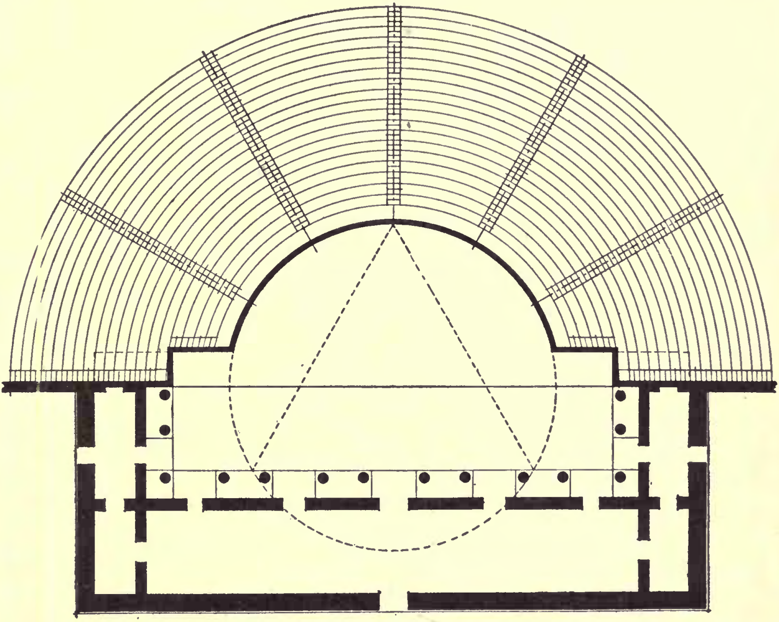


FIG. 380. — Plan of a Theatre according to Vitruvius.

still more until it occupied one-half of the orchestral circle (Fig. 380).

In plan the skene was, almost without exception, a rectangle with, or without, a projection in front, or on the sides, or in the rear. The central portion of the skene is called in a Delian inscription[1] ἡ μέση σκηνή; hence, it may, for convenience, be called the mesoskenion (μεσοσκήνιον).

[1] *B.C.H.*, XVIII (1894), 163.

In length the mesoskenion was usually equal to the diameter of the orchestra with the surrounding passageway. This may be seen in the theatres at Eretria, Delos, and Priene. In later Greek theatres, such as those at Termessos and Sagalassos, the skene has no lateral projection, but has increased in length to about one and a half orchestral diameters. In the Roman theatre, according to Vitruvius,[1] the length of the skene should be double the diameter of the orchestra. Thus the stage-building gradually gained in length. The mesoskenion was ordinarily subdivided by cross walls into three rooms, to which access from the orchestra was given by three doors. It was seldom more complicated.[2]

In elevation the skene consisted originally of a single story. In the classic period it had two stories, the lower of which may be called the hyposkenion (*ὑποσκήνιον*), as the upper was called the episkenion (*ἐπισκήνιον*). Thus the term *hyposkenion* sometimes referred to the inner and lower rooms of the skene.[3] In the late Greek, and in the Roman, theatre the hyposkenion, or ground floor, lost value and presented to the spectator the appearance of a mere support to the actors' platform.[4] It retained usually three or more doorways. The episkenion, however, increased in importance, and was decorated with columns and entablatures. At Termessos and at Sagalassos[5] a single order

[1] Vitruvius, V, 6, 6.

[2] The six rooms of the mesoskenion at Sikyon, as published by Doerpfeld and Reisch (p. 117), are believed by the American excavator (McMurtry, in *A.J.A.*, V (1889), 274–275, Pl. 9) to result from a crossing of Roman with Greek walls.

[3] Doerpfeld und Reisch, 300.

[4] Pollux, IV, 132: *ὑπὸ τὸ λογεῖον κείμενον.*

[5] Lanckoronski, II, 98, Taf. 11, 29.

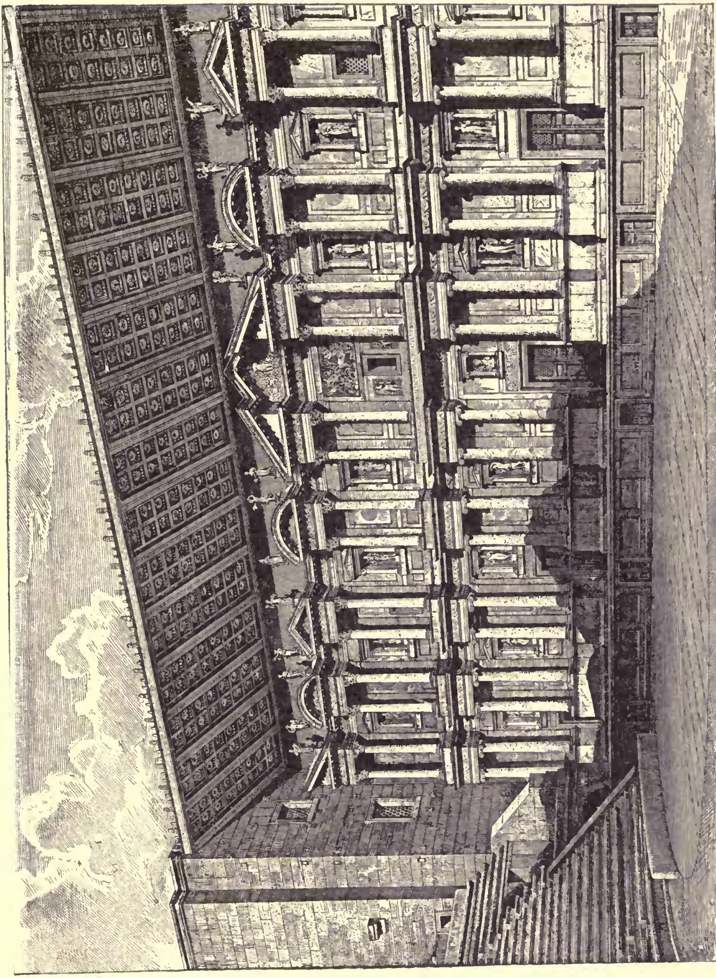


FIG. 381. — Skene of the Theatre at Aspendos.

sufficed, but at Aspendos (Fig. 381) two orders occur, and in the theatre of M. Scaurus at Rome,[1] three orders were required to decorate the *scenae frons*. Vitruvius[2] demanded that the height of the skene should equal the height of the roof of the portico at the summit of the theatron. Thus the skene gradually gained also in height.

A further development of the skene consisted in the projection of wings on one or more sides. The front wing was named the proskenion (*προσκήνιον*), the lateral wings paraskenia (*παρασκήνια*), and the rear wing we may call the opisthoskenion (*ὀπισθοσκήνιον*); of these the proskenion was the most important. In the classic period it consisted of a narrow projection, in length equal to the diameter of the orchestra, in breadth varying from two to three metres, and in height from two and a half to four metres. Originally the entire proskenion was made of wood; later its supports were made of stone, or marble, decorated so as to resemble a colonnade, the intercolumniations of which were filled with pinakes (*πίνακες*), or movable wooden panels. The theatres at Priene and at Oropos furnish the best examples of such proskenia and show how the pinakes were held in place.[3] Such proskenia were so high and so narrow as to suggest their use as backgrounds for plays given in the orchestra.[4] This, however, was not their only purpose. The top of the proskenion seems to have been as important as its façade. It was reached by doors from the mesoskenion, by open steps or by secret passages from the orchestra, by ramps from the parodoi, and in various ways from the para-

[1] Pliny, *N.H.*, XXXVI, 24, 11.
[2] Vitruvius, V, 6, 4.
[3] See Fig. 378.
[4] Doerpfeld und Reisch, 341–365.

skenia.[1] It was known also as the logeion (λογεῖον),[2] or speaker's platform. In late Greek and in Roman theatres the proskenion or logeion was deepened, so as to accommodate both chorus and actors, and lowered so as to allow a better view to the occupants of the front seats. From the mesoskenion three doors opened upon the logeion: a central or royal door (*θύρα βασίλειος*) for the principal

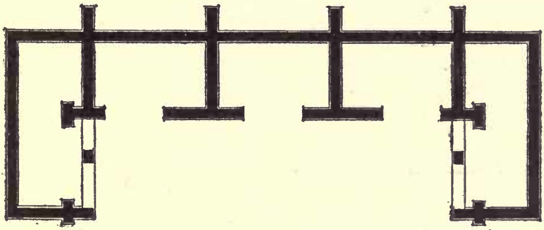


Fig. 382. — Skene of the Theatre at Eretria.

actor, on either side of which were the doors of the guests or strangers (*θύραι τῶν ξένων*).

The lateral extensions of the mesoskenion were known as paraskenia. At Eretria (Fig. 382), and elsewhere, on either side of the mesoskenion were projecting wings, from the upper story of which doors probably led to the logeion. In the theatre at Epidauros the paraskenia did not project beyond the front wall of the mesoskenion, but lateral access was given to the logeion by means of ramps. The two ramps may have served for such actors as were supposed to be arriving from the country or from the city. At Priene[3] such access was secured by continuing the logeion partially around the sides of the mesoskenion.

[1] Puchstein, 46 ff.

[2] Delos Inscription of 279 B.C., in *B.C.H.*, XVIII (1894), 162 ff.; Vitruvius, V, 7, 2.

[3] *Priene*, Fig. 229.

These lateral extensions of the logeion we may name paralogeia (παραλογεῖα), a typical example of which is found at Magnesia (Fig. 383). At Termessos a process of simplification is in evidence. Here the paraskenia are absorbed by the mesoskenion so as to form one long corridor, and the paralogeia, barely indicated by bounding walls, supply the outermost entrances. At Aspendos all

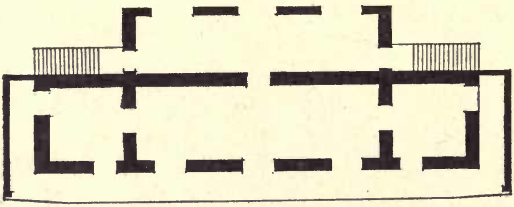


FIG. 383. — Skene of the Theatre at Magnesia.

reminiscences of paralogeia except the doorways have disappeared.

For the rear of the skene there was no demand for the creation of a fixed type. It was left undecorated at Oropos and Priene, whereas the large theatre at Pompeii and that at Aspendos were decorated with pilasters, cornices, and other architectural ornament. At Magnesia we find an opisthoskenion with three entrances; at Delos[1] the logeion was continued around the building, forming what may be called a perilogeion (περιλογεῖον). At Sikyon in this position was a portico, and at Megalopolis an assembly-hall known as the Thersilion. For the convenience of the populace as well as of the theatrical company Vitruvius[2] advised the erection of porticoes behind the skene.

[1] Doerpfeld und Reisch, Figs. 58–59.

[2] Vitruvius, V, 9, 1.

The Odeion (ᾠδεῖον), or music hall, was designed for musical contests and rehearsals of plays. This demand called for a building like the Greek theatre, but smaller and covered with a roof (θέατρον ὑπωρόφιον). Such was, in fact, the type of building represented by the Odeion of Herodes Atticus at Athens,[1] and other Odeia of the Roman period.[2] It is natural to assume that a similar type prevailed in the earlier periods.

8. BUILDINGS FOR DOMESTIC USE. — Greek houses,[3] whether designed for kings or private persons, were essentially Oriental in character. They were provided, as in Egypt and Assyria, with open courts and separate apartments for men and women. These features, which appear more or less distinctly throughout the entire history of the Greek house, indicate already a developed or complex type.

The courtyard (αὐλή) in the country house preceded the domestic apartments, and was used for stabling and other such purposes. In the town house it was situated within the walls of the house itself, and furnished a breathing place and source of air and light and warmth for the surrounding apartments. In the Mycenaean palace at Tiryns (Fig. 384), and in private houses of the late Greek period, a succession of courts are found, but in most Greek houses of the classic period a single court sufficed. These courts were frequently surrounded with porticoes, and may well be classified by the variations of this character. It was by no means necessary that a Greek courtyard should

[1] Tuckermann's plan in Baumeister, III, Figs. 1823–1824.

[2] Stieglitz, II, 222–240.

[3] Becker-Göll, II, 105; W. Lange, 7–48; Daremberg et Saglio, *s.v.* Domus.

be surrounded by colonnaded walks. There were no such colonnades in the fifth-century house at Dystos in Euboia[1] and few in the houses excavated at Priene.[2] A similar absence of columns usually characterized the atrium of the Roman house. The peristyle court, on the other hand, existed in various forms from the earliest days. The pre-Hellenic palace at Phaistos in Crete[3] had colonnades upon two sides of its great court; at Tiryns the court of the men had colonnades on three sides, which, with the porch of the megaron on the fourth side, made the court almost completely peristylar. Complete peristyle courts (*τετράστοοι*) existed in private houses in Egypt as early as the Twelfth Dynasty, as may be seen in the remains at Kahun.[4] In Greek lands they were not common until the Hellenistic and Graeco-Roman periods, when we find them represented at Delos,[5] Priene,[6] Thera,[7] and in Italy at Pompeii. Such peristyles may be distinguished from each other as tetrastyle, hexastyle, and so on, according to the number of columns involved. But another distinction preserved by Vitruvius[8] is of greater interest. He distinguishes between peristyle courts with uniform porticoes and those known as Rhodian (*περίστυλον Ῥοδιακόν*), in which the porch with the southern exposure was composed of loftier columns. The former type is represented in the houses at Delos and Pompeii, the latter at Priene. The court with uniform porticoes reflects the love of regularity which characterized Hellenistic

[1] Wiegand, *Ath. Mitt.*, XXIV (1899), 458. [2] *Priene*, 290.

[3] Pernier, *Mon. Ant.*, XIV (1904), Tav. 27.

[4] Petrie, *Kahun*, 7, Pl. 14.

[5] *B.C.H.*, VIII (1884), 473; XIX (1895), 460; XXIX (1905), 40.

[6] *Priene*, 297.

[7] Hiller von Gaertringen, III, 140. [8] Vitruvius, VI, 7, 3.

architecture in general, whereas the so-called Rhodian type was more like that of a Mycenaean palace in which the portico of the megaron dominated the rest. A house at Priene,[1] known as No. XXXIII, illustrates in a striking manner how naturally this type of court was evolved. Peristyle courts may also be distinguished as single storied and two storied. The latter variety seems not to have been confined to important houses, like the palace of Hyrkanos in Syria,[2] but was found in small houses like the one on the banks of the Inopos at Delos.[3]

The approaches to the court varied according to circumstances. Palaces were reached through imposing propylaia.[4] In ordinary town houses projecting porches (*πρόθυρα*), such as those of the houses at Tanagra,[5] were usually dispensed with as hindrances in the narrow streets. The entrance was protected by gratings (*προφράγματα*) and by a door which led to the court. Frequently there was a vestibule, and, when practicable, a porter's room. The rooms about the court, apart from those of the principal side, appear to have served various purposes. Some were undoubtedly store-rooms, others may be recognized as kitchens, dining halls, or as sleeping rooms. The principal apartment was known specifically as the oikos, or house (*οἶκος, δόμος, δῶμα*). It contained the family hearth, and was situated at the north end of the court, so as to receive the warmth of the winter sun.[6] In its earliest form the oikos was a mere enclosure to

[1] *Priene*, 297–300.

[2] De Vogüé, *Le Temple de Jerusalem*, 39; Lange, 149, Taf. 6.

[3] *B.C.H.*, VIII (1884), 483.

[4] Mackenzie, in *B.S.A.*, XI (1904–1905), 181–223.

[5] Lange, 129, note 1. [6] Xenophon, *Oecon.*, IX; *Memorab.*, III, 8.

which was added a prodomos (*πρόδομος*), or anteroom. The inner room developed internally through the addition of supports for its roof. The larger megaron at Tiryns had four columnar supports for its roof. When six or more columns were used to support the ceiling, it was called a Corinthian house (*οἶκος Κορίνθιος*); when superposed colonnades were employed and the central space lighted, as in a basilica, by clerestory windows, it was known as an Egyptian house (*οἶκος Αἰγύπτιος*); when a similar room was projected northward, having a central doorway with folding doors, and low, lateral windows allowing vistas into the garden, it was called Kyzikene (*οἶκος Κυζικηνός*).[1] The prodomos varied in disposition. It was treated as a single space, or subdivided by a wall, or columns, into an outer porch and inner vestibule. The porch might be without columns, or show one column between antae, as in house No. XXXII at Priene,[2] or two columns, as was commonly the case. Of more significance than the modification of the principal apartment is its relation to the rest of the house. Noack[3] has pointed out the isolation of the megaron as a distinguishing feature of Mycenaean palaces; whereas, in Cretan palaces, at least in those at Knossos and at Phaistos, the megara are more closely connected with the general series of apartments. Thus the Mycenaean palaces reflect warlike and aristocratic, those of Crete peaceful and democratic, conditions. Both types seem to have found their way into the private houses of ordinary citizens in later days. The houses excavated at Priene resemble those of the Mycenaean type, since the oikos, like the megara, was given an imposing prostas (*προστάς*) or

[1] Vitruvius, VI, 3, 10. [2] *Priene*, 325. [3] Noack, 7.

prodomos. The plan of house No. XXIV at Priene (Fig. 385) will show the significance still attached to this feature by an ordinary citizen in the second century B.C. Houses of this type developed around this central feature as a nucleus by the addition of rooms on one side only, or on both sides — in the latter case known to Vitruvius as thalamoi (θάλαμοι) and amphithalamoi (ἀμφιθάλαμοι). A higher degree of complexity arose when the apartments for the men (ἀνδρών, ἀνδρωνῖτις) were separated from those of the women (γυναικωνῖτις.) At Priene this was sometimes accomplished by juxtaposed apartments, as in house No. XXVI,[1] and sometimes by an upper story (ὑπερῷον), as in house No. XXXV.[2] Three-storied houses (τρίστεγοι οἶκοι), such as those at Alexandria[3] and one recently excavated at Pompeii, were uncommon. Sleeping rooms were sometimes, as at Tiryns, close to the principal apartment; elsewhere, as at Arne[4] (Fig. 386), they were relegated to the rear. The ruins in the latter town exhibit in a striking manner the use of corridors (λαῦραι, ῥῶγες) by means of which access could be had to widely separated portions of the building and greater privacy secured. Simi-

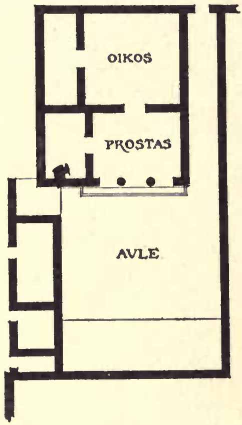


Fig. 385. — House No. XXIV at Priene.

[1] *Priene*, 295, Fig. 314. [2] *Ibid.*, 295, Fig. 313.

[3] Theophanes, *Chronographia*, p. 150, ed. Classen.

[4] A. de Ridder, in *B.C.H.*, XVIII (1894), 271–310, Pls. 10–11; Noack, in *Ath. Mitt.*, XIX (1894), 405–485.

lar narrow, double passages in Egyptian houses at Kahun led to the men's and women's quarters. The prevalence of long corridors at Priene also is noteworthy. Passages

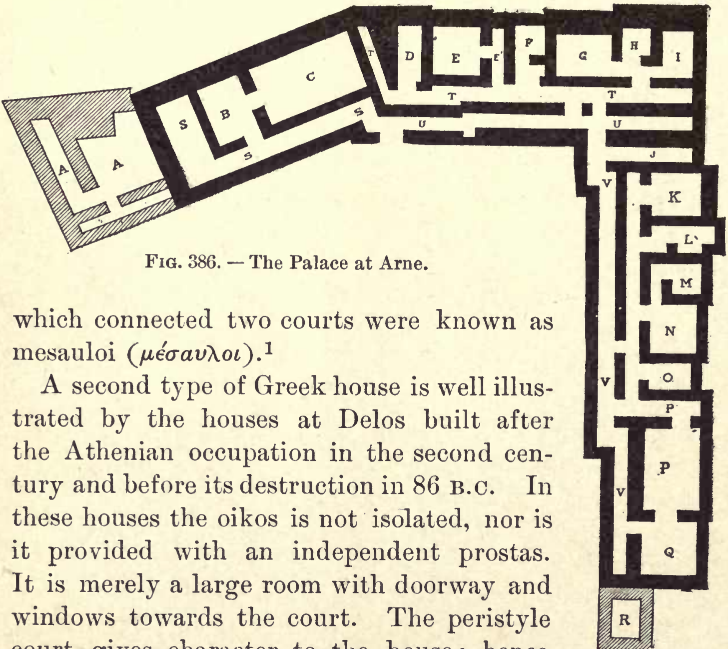


Fig. 386. — The Palace at Arne.

which connected two courts were known as mesauloi (μέσαυλοι).[1]

A second type of Greek house is well illustrated by the houses at Delos built after the Athenian occupation in the second century and before its destruction in 86 B.C. In these houses the oikos is not isolated, nor is it provided with an independent prostas. It is merely a large room with doorway and windows towards the court. The peristyle court gives character to the house; hence these houses may be designated as of the peristyle type. In the house on the street leading to the theatre (Fig. 387) the columns opposite the oikos were of greater diameter than the rest, but were not located with reference to its walls or doorway. The oikos presents its broadest face to the court and in this respect differs from that of the houses with a prostas. The peristyle type seems to have been

[1] Vitruvius, VI, 7, 5.

represented at Athens in the fourth century by the house of Kallias, in which Protagoras walked with his disciples in one portico (προστῴον), while Hippias[1] sat enthroned in the opposite (ἐν τῷ καταντικρὺ προστῴῳ). Both types of houses seem to have left their imprint on the Italic and Roman house. At Pompeii[2] the two types were frequently united in the same building (Fig. 388).

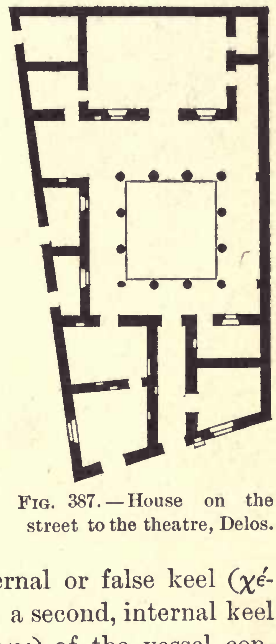


Fig. 387. — House on the street to the theatre, Delos.

9. Naval Architecture. — In this section we consider first the construction, forms, and decoration of Greek ships, then harbors, ship sheds, and arsenals.

The Greek ship (ναῦς) was constructed for service in an inland sea. It was, therefore, a small open boat, which could without difficulty be drawn up on a beach. Being constructed, for the sake of lightness, of such woods as pine, spruce, larch, and cypress, its solidity depended upon its construction. The shallow keel (τρόπις) was stiffened not only by an external or false keel (χέλυσμα) of beech or oak, but also by a second, internal keel (δεύτερα τρόπις). The walls (τοῖχοι) of the vessel consisted of planking attached to a series of ribs (ἐγκοίλια). These walls were strengthened on the exterior by horizontal waling pieces (ζωστῆρες) and sometimes on the interior by a second planking. Further rigidity was

[1] Plato, *Protagoras*, § 17; Krause, 511–512; Gardner and Jevons, 38–39.
[2] Mau, 239–360.

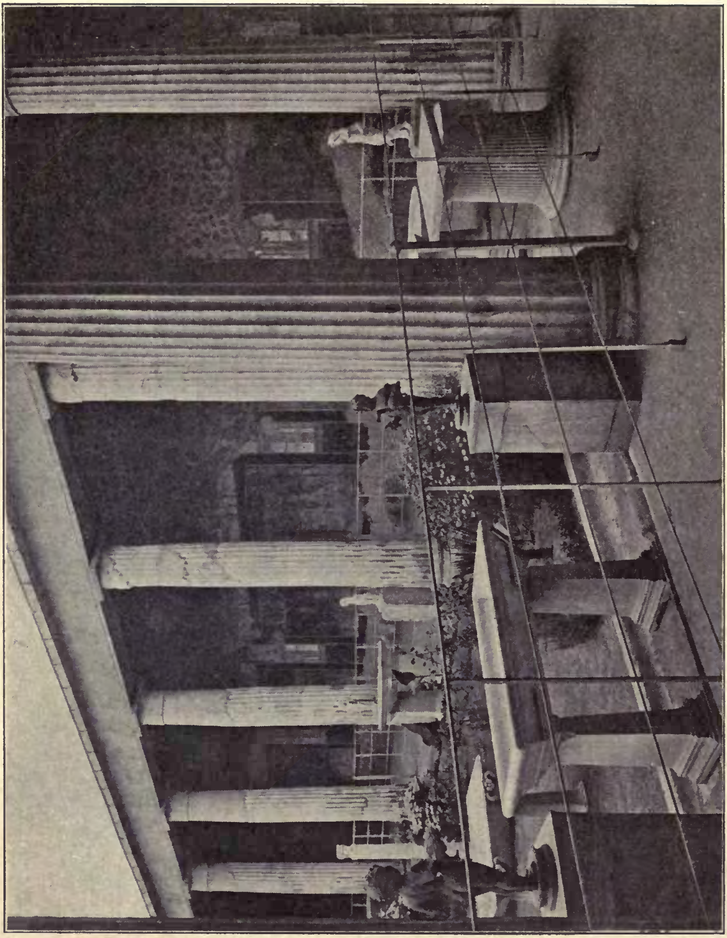


Fig. 388. — Peristyle court of the house of the Vettii, Pompeii.

secured by the fixed seats (ζυγά) for the oarsmen and, in the larger vessels, by the system of longitudinal and cross beams required for decking and other purposes. Even this did not suffice, and, in some representations of Greek as well as of Egyptian vessels,[1] we see ropes (ὑποζώματα)

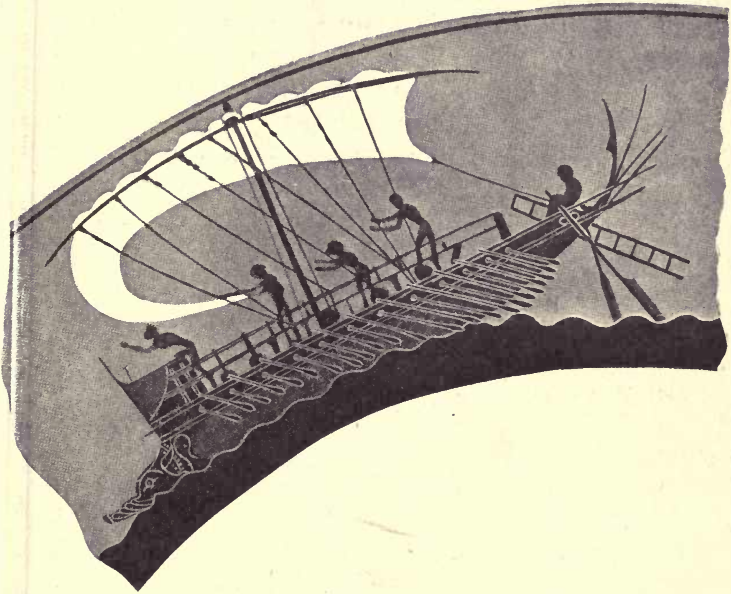


Fig. 389. — Warship from a Greek vase in the British Museum.

bound around the prow and stern in order to give additional strength to the general fabric.[2]

The forms of Greek vessels varied according to special requirements. The trading vessel was wide, capacious,

[1] Baumeister, III, Figs. 1656, 1671, 1675.

[2] Vessels were also strengthened by ropes extended horizontally. Cf. Vitruvius, X, 15, 6 : *funes ··· religati ··· a puppi ad proram.*

and slow. Its high bow and stern, with their platforms, and its single mast with square sails are features which it had in common with Egyptian vessels. The war vessel, long, narrow, and swift, depending for its speed upon oars rather than sails, owes more to Phoenician prototypes.[1] This type was adopted at an early date by the Greeks, and had a marked development. As the Greek potter learned to mould his vases into animal or human forms, so the Greek naval architect played with the forms of vessels. Frequently, if we may judge from the representations on vases, the ship resembled a fish[2] (*ἰχθύπρῳρος*) (Fig. 389); sometimes it was fashioned as a goose,[3] or a swan;[4] occasionally the bow presents the form of a boar's head[5] (*ὑόπρῳρος*), or the head of a horse.[6]

On either side of the bow were large eyes (*ὀφθαλμοί*), possibly used as hawse-holes, and projections, known as ears (*ἐπωτίδες*), for holding the anchor. The name of the vessel was sometimes inscribed on the bow.[7] The bow (*στεῖρα*) was provided with a metal-cased ram (*ἔμβολον*), at about the water level, and sometimes with a second, smaller one (*προεμβόλιον*) set somewhat higher. Above this the bow ended in a curved ornament called the akrostolion (*ἀκροστόλιον*). The stern terminated in a long curved ornament carved and painted to resemble the tail, or the neck and head of a bird or fish.[8] This ornament, known to Homer[9] as the *ἄφλαστον*, is found also on Roman and later vessels. The outer walls of Greek vessels, being covered with tar, were almost entirely black, relieved occa-

[1] Layard, Pl. 71.
[2] Baumeister, III, Fig. 1661.
[3] Guhl und Koner, Fig. 588.
[4] *Ibid.*, Figs. 591–593.
[5] Smith, *s.v.* Navis, 220.
[6] *J.H.S.*, XXVIII (1908), 327.
[7] *Burl. Mag.*, XIV (1908), 71.
[8] Furtwängler und Reichhold, I, Taf. 13.
[9] *Iliad*, XV, 717.

sionally by patches of color on the bows. But late Greek and Roman ships were sometimes decorated, especially at the stern, with elaborate figure paintings.[1]

As the war vessel was propelled chiefly by oarsmen, it is natural that the rowing system should be made the principal object of development. At first the length of the vessel was increased so as to admit of a greater number of rowing benches. But a limit appears to have been reached in the pentekontoros (πεντηκόντορος), which had fifty oarsmen seated on twenty-five benches. When it was no longer practicable to increase the length of the boat, the number of oars was increased by their arrangement in superposed banks (στοῖχοι).[2] Representations of Phoenician,[3] Greek,[4] and Roman[5] vessels seem to prove that vessels with two, three, and even four such banks of oars were thus constructed. The terms bireme (διήρης), trireme (τριήρης), etc. are ordinarily taken to designate vessels with superposed banks of oars. The Athenian navy of the classic period consisted chiefly of triremes. Alexander the Great[6] is said to have built vessels with ten banks of oars; Demetrios Poliorketes,[7] vessels with fifteen and sixteen banks; Ptolemy Philadelphos (285–247 B.C.), floating palaces with twenty and thirty banks, while the extreme limit was reached in the so-called forty-banked vessel (τεσσαρακοντήρης) of Ptolemy Philopator (222–204 B.C.).[8] The practical difficulties involved in supposing superposed banks of oars for the higher rated

[1] Torr, 35–36.

[2] Scholiast, on Aelian, quoted by Graser, *De veterum re navali*, § 4: κατὰ τοὺς στίχους τοὺς κατὰ τὸ ὕψος ἐπ' ἀλλήλοις.

[3] Layard, Pl. 71.

[4] Torr, Pls. 4, 5.

[5] Baumeister, III, Figs. 1678, 1685.

[6] Pliny, VII, 57, 16.

[7] Plutarch, *Demetrios*, 31.

[8] Athen., V, 37.

vessels are so great that modern writers have suggested a single line of oars arranged in groups of two, three, and so on, like the Venetian *galea a zenzile*,[1] or with oars manned by teams of two, three, four or more oarsmen, like the Venetian *galea a scaloccio*.[2] The marble prow which bears the Nike of Samothrace,[3] now in the Louvre, and a relief recently found at Lindos,[4] show projecting galleries (*παρεξειρεσίαι*), resembling encased outriggers, to protect the oarsmen. Above this on some vessels was a bulwarked passage (*πάροδος*). A similar disposition is found on mediaeval galleys. Now, if it be assumed that the prow in the Louvre represents a high-rated vessel, such as was used by Demetrios Poliorketes, the traditional theory of many superposed banks of oars receives a serious blow.

Greek harbors (*λιμένες*) may be classed in general as natural and artificial. The coast line of Greece furnished projecting ledges and retreating bays in abundance, which without artificial modification afforded shelter and safety to most classes of vessels. Sometimes it was necessary to build a breakwater or mole (*χῶμα, χηλή*) to protect vessels at anchor from the force of wind and waves. But the important cities, subject to attack from foreign vessels, were obliged to establish closed harbors (*λιμένες κλειστοί*) with narrow entrances protected by chains, with convenient quays (*ἐρυματα*), ship sheds (*νεώσοικοι*), and arsenals protected by fortification walls with towers and lighthouses. In the construction of the breakwaters the ingenuity of

[1] L. Fincati, *Le triremi*, 2d ed., Rome, 1881; Tarn, *J.H.S.*, XXV (1905), 138; Cook and Richardson, *Class. Rev.*, XIX (1905), 375.

[2] Furttenbach, Taf. 7.

[3] Baumeister, III, Fig. 1693.

[4] *A.J.A.*, XII (1908), 91.

the Greeks displayed itself at an early date. By the seventh century B.C. the Corinthians built submarine walls in which blocks of stone were so united by a gravel cement as to be practically monolithic.[1] At a later but pre-Roman period, the submarine walls at Mytilene[2] consisted of concrete made of lime slacked in oil and then mixed with sand and broken stone. No attempt was made to establish any regular form for these closed harbors. The Lechaion[3] harbor at Corinth was exceedingly irregular; that at Larymna[4] was semicircular; and that at Rhodes,[5] rectangular.

The lighthouse (φάρος) added much to the convenience of sailors. The most famous was the Pharos at Alexandria, built of white marble, in many stories, and diminishing in successive stages towards the top, where torches or fires were kept burning at night. Such lighthouses appear to have been located near harbor entrances. The quays were built, as the breakwaters, of finer upon coarser masonry. At Larymna the walls are effectively buttressed so as to resist the force of the waves. The ship sheds, of which there are many remains, consisted of stone tracks upon which the boats were hauled, probably by windlasses, from the water into boathouses on the shore. These seldom exceeded one hundred and fifty feet in length and fifteen in width, and consisted of a single story. Dry-docks where transports might be cleaned and repaired were infrequent. But it may be noticed that at Larymna the inner harbor was closed by two flood-gates, by means of which it could be converted into a dry-dock; at Se-

[1] Georgiades, 4.
[2] Koldewey, 6.
[3] Georgiades, Pl. 1.
[4] *Ibid.*, Pl. 5.
[5] Merckel, 341.

leukeia,[1] the port of Antioch, the supply of water to the inner harbor was under control by means of a tunnel. Dockyards (*ναυπήγια*) were also necessary for ship-building, and elaborate preparations were made for launching such large vessels as those belonging to Ptolemy Philadelphos and Ptolemy Philopator.[2] Arsenals (*σκευοθῆκαι*), where the oars, sails, and tackle were stored, were occasionally buildings of some architectural interest. The Arsenal at the Peiraieus,[3] built by Philon (347–330 B.C.) of Eleusis and Euthydomos of Miletos, was the most famous building of its class. It resembled a basilica, the side aisles of which contained superposed stories, or stacks, for storage.

The interests of foreign commerce made still further demands upon the architect. Storehouses, examples of which have been found at Delos,[4] and sanctuaries for the use of sailors were built near the harbor. Colonnades with shops attached were also common in seaports. At the Peiraieus[5] there were five such colonnades, which must have added considerably to the beauty of the harbor.

10. SEPULCHRAL ARCHITECTURE. — When his active life neared its end, the Greek desired an artist to make for him a suitable resting-place. Whether he was to be buried, as were the heroes of old, or cremated, as was sometimes the custom, he wished for some memorial to mark the location of his body or his ashes. This might take the form of a sculptured or painted stele (*στήλη*), and of this class of monuments there are many beautiful remains;[6]

[1] Merckel, 355–358.
[2] Athen., V.
[3] Choisy, *Études*, 1–42; Doerpfeld, *Ath. Mitt.*, VIII (1883), 147–164.
[4] Jardé, in *B.C.H.*, XXIX (1905), 21–40.
[5] Frazer, *Paus.*, II, 24.
[6] Conze, *Die attischen Grabreliefs;* P. Gardner, *Sculptured Tombs of Hellas;* *Eph. Arch.*, 1908, Pls. 1–4.

or of a statue, representing such subjects as a lion, a bull, a dog, a siren, a satyr, the deceased himself or the official chair he occupied; or of a box or sarcophagus, of which there were many interesting varieties.[1] Although such monuments belong to the field of sculpture, we frequently find in them a suggestion that the departed had entered into his eternal home. The notion of the tomb as a house was very familiar to the ancient world, especially to the Egyptians,[2] Phoenicians,[3] Persians,[4] Phrygians,[5] Lycians,[6] and Etruscans.[7] It was accepted by the Greeks, who frequently gave an architectural character to their tombs. Such monuments as belong properly to our survey may be thrown into two general classes: (1) those which are partially architectural, and (2) those which are entirely architectural in character. To the first class belong tombs which exhibit a single architectural feature, such as a raised foundation, a column, gable or façade. To the second class may be assigned tombs which represent an entire building, such as a tower, house, or temple.

The tumulus or mound (*χῶμα*) of earth, without architectural character, served in the Troad to commemorate Homeric heroes, and at Marathon to cover the remains of the Athenians who fell in battle. It was given more enduring form by a wall at the base (*κρηπίς*, *θριγκός*), as in the tumulus of Phokos in Aegina,[8] or its surface was covered with stucco, as in the conical tombs discovered in Peiraieus street at Athens,[9] or with stone, as in the

[1] Baumeister, III, *s.v.* Sarcophagus.
[2] Perrot et Chipiez, I, 129–322.
[3] *Ibid.*, III, 137–240.
[4] *Ibid.*, V, 589–638.
[5] *Ibid.*, V, 81–145.
[6] *Ibid.*, V, 361–384.
[7] Martha, 176–220.
[8] Paus., II, 29, 9.
[9] Brueckner, in *Jhb.*, VI (1891), 198.

tomb of Tantalos near Smyrna.[1] This type of sepulchral monument culminated in gigantic structures such as the Mausoleia of Augustus and of Hadrian at Rome. The pyramid was occasionally substituted for the tumulus, as at Kenchreai[2] between Argos and Tegea.

Columns (*κίονες*), as sepulchral monuments, occur either alone or as pedestals bearing some sculptured memorial.[3] Their shafts and capitals show considerable variety in style.[4] Pilasters supporting a gable also frequently occur as a framework in sculptured Athenian stelae. Four pillars supporting a roof, forming a baldachino or tabernacle, is said by Pausanias[5] to have been the normal type of tomb at Sikyon, and his statement is confirmed by Sikyonian coins.[6] Rock-cut tombs sometimes displayed an entire building, as in the tombs at Kyrene.

More completely architectural were the various types of chamber and house tombs. Even the tumuli sometimes covered a hidden room, which served as the home of the departed. These chamber tombs,[7] in plan either circular, or elliptical,[8] or rectangular, reflected the type of houses in use amongst the living. During the Mycenaean period they often resembled Phoenician tombs, in being preceded by a narrow passage (*δρόμος*). Occasionally, as in the Tholos of Atreus at Mycenae, and in one of the tombs at Knossos, the entrance received elaborate architectural decoration, and led through a contracted passage (*στόμιον*) to the sepulchral chamber. In general they

[1] Perrot et Chipiez, V, 48, 49. [2] Reber, 186. [3] P. Gardner, 110.
[4] Borrmann, *Jhb.*, III (1888), 269–285. [6] Frazer, *Paus.*, III, 46.
[5] Paus., II, 7, 2. [7] Gropengiesser, 35.
[8] Halbherr, *A.J.A.*, V (1901), 291; Pfuhl, *Ath. Mitt.*, XXVIII (1903), 245.

were family tombs, having sometimes a single chamber, sometimes several connecting rooms. The ceilings, as in Phrygian and Etruscan tombs, received special attention. In the rotundas (θόλοι) we find pointed domes constructed in converging horizontal courses, giving to the interior of the building the shape of a beehive.[1] The exterior of the

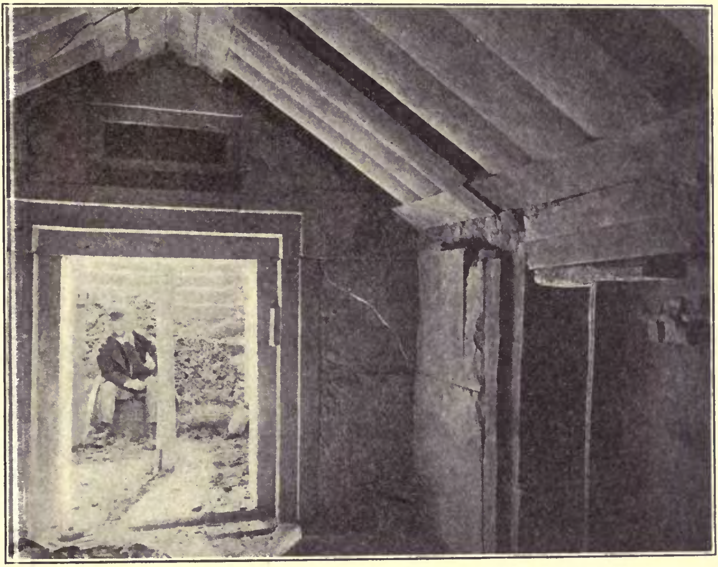


FIG. 390. — Interior of Tomb at Tamossos.

sepulchral chamber was covered with earth, and even the entrance passage at times blocked up. This prevented the vaults from falling in and protected the tomb from intrusion. The tombs with rectangular chambers had horizontal, or peaked, ceilings, and, if rock cut, reflected

[1] Tsountas-Manatt, 115–158.

the usual methods of roof construction. In the classic and later period in Athens sumptuary laws [1] prevented the construction of expensive tombs; hence we look elsewhere for examples. An interesting example from the classic period is found at Tamossos in Cyprus (Fig. 390). In the Hellenistic period chamber tombs, usually rock cut and fashioned under Greek influence, are found in Asia Minor, Africa, Italy, and elsewhere. At Pydna in Macedonia,[2] a tumulus covers a fully constructed house. A vaulted dromos leads to this subterranean house, which consisted, like the megaron at Tiryns, of a large room preceded by two vestibules. All the rooms were covered with stone barrel vaults. The doorway to the sepulchral chamber was surmounted by a Doric frieze and gable (Fig. 391).

In some localities house tombs were constructed above the soil. At Labranda [3] there is a free-standing tomb, which follows the type of a Greek house in having a courtyard, vestibule, and principal chamber, above which, beneath the roof, is a second story. In Lycia,[4] where art was moulded in great measure under Greek influence, there are many tombs which imitate types of half-timbered houses. Some have horizontal, others arched roofs.

Tombs resembling temples form a final stage in this development. To this class belongs the so-called Nereid Monument of Xanthos,[5] which reproduces the form of an Ionic peristyle temple set upon a high plinth. The temple form was sometimes repeated also in sarcophagi, a fine example of which is the Sarcophagus of the Mourners

[1] Becker-Göll, III, 145. [2] Heuzey, *Mont Olympe*, Pl. 2.

[3] Reinach-Lebas, *Arch. As. Min.*, II, Pl. 9.

[4] Perrot et Chipiez, V, 361–384; Benndorf und Niemann, Taf. 19, 26, 37, 43. [5] Overbeck, II, 191.

Fig. 391. — Doorway of a Tomb at Pydna.

found at Sidon.[1] A more complicated type was produced by superposing a pyramidal roof upon the Greek temple type. Such was the Lion Tomb at Knidos[2] and the still

[1] Hamdy Bey-Reinach, 238–271, Pls. 4–11; Collignon, II, Figs. 212, 213.
[2] Newton, I, Pl. 63.

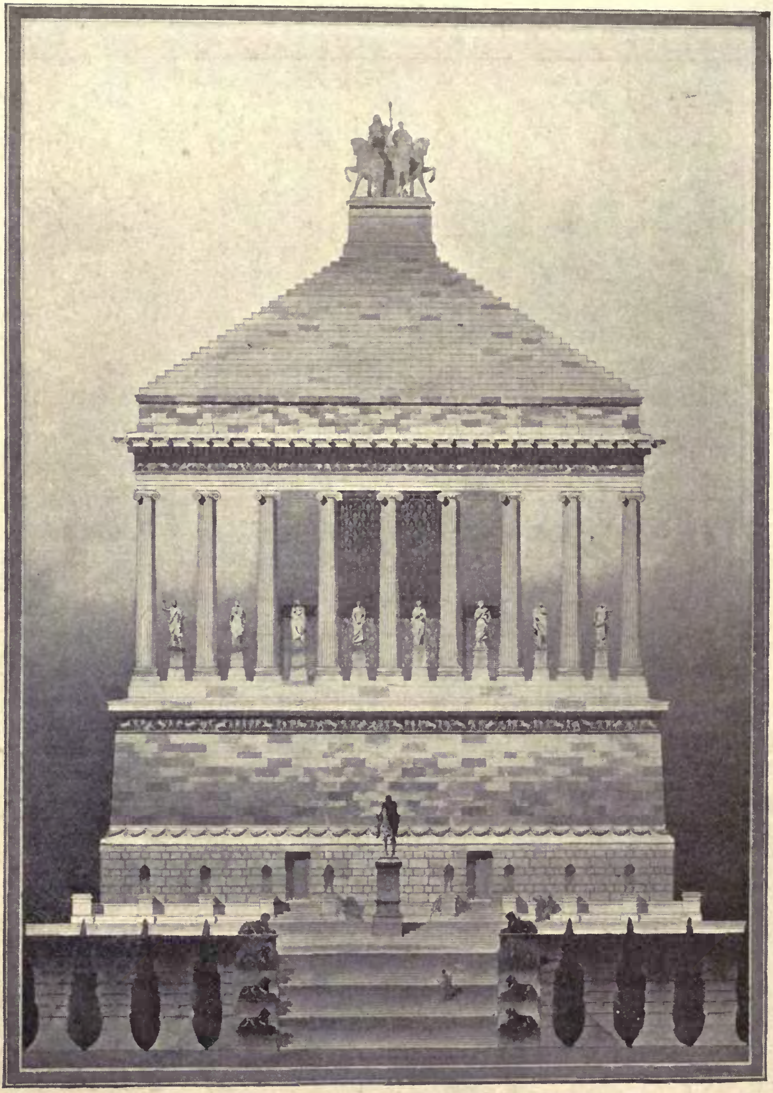


FIG. 392. — Restoration of Mausoleion at Halikarnassos.

more imposing Mausoleion at Halikarnassos[1] (Fig. 392). The latter building, famous for its sculptured decoration, was finely conceived and proportioned, and properly reckoned as one of the Seven Wonders of the World.

[1] Newton, I, Pl. 18; *Br. Mus. Cat. of Gk. Sc.*, II, 76–77; Dinsmoor, *A.J.A.*, XII (1908), 1–29, 141–171.

LIST OF ABBREVIATIONS

1. PERIODICALS

Abh. Berl. Akad. = *Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin.* Berlin, 1815–

A.J.A. = *The American Journal of Archaeology. The Journal of the Archaeological Institute of America.* Baltimore, Princeton, New York, 1885–

Ant. Denk. = *Antike Denkmäler.* Herausgegeben vom Kaiserlich Deutschen Archaeologischen Institut. 2 vols. published. Berlin, 1891–

Arch. Anz. = *Archaeologischer Anzeiger.* Beiblatt zum Jahrbuch des Archaeologischen Instituts. Berlin, 1889–

Arch. Rec. = *The Architectural Record.* New York, 1891–

A.S.A. = *Papers of the American School of Classical Studies at Athens.* 1885–

Ath. Mitt. = *Mitteilungen des Deutschen Archaeologischen Instituts in Athen.* Athens, 1876–

A.Z. = *Archaeologische Zeitung.* Berlin, 1843–1885.

B.S.A. = *The Annual of the British School at Athens.* London, 1895–

Burl. Mag. = *The Burlington Magazine.* London, 1903–

Cl. Rev. = *The Classical Review.* London, 1887–

Eph. Arch. = Ἐφημερὶς ἀρχαιολογική. Athens, 1837–

G.B.A. = *Gazette des Beaux Arts.* Paris, 1858–

Harv. Stud. = *Harvard Studies in Classical Philology.* Cambridge, 1890–

Jh. Oesterr. Arch. = *Jahreshefte des Oesterreichischen Archaeologischen Instituts.* Wien, 1898–

Jhb. = *Jahrbuch des Kaiserlich Deutschen Archaeologischen Instituts.* Berlin, 1887–

Jhb. Oesterr. Kunsth. Samml. = *Jahrbuch der Kunsthistorischen Sammlungen des allerhöchsten Kaiserhauses.* Wien, 1883–

J.H.S. = *The Journal of Hellenic Studies.* London, 1880–

J.R.I. Br. Architects = *Journal of the Royal Institute of British Architects.* London, 1893–

Mon. Ant. = *Monumenti Antichi, pubblicati per cura della Reale Accademia dei Lincei.* Milan, 1890–

Mon. Ined. = *Monumenti inediti pubblicati dall' Instituto di Correspondenza Archeologica.* 10 vols. Rome, 1829–1878.

Neue Jahrb. = *Neue Jahrbücher für das klassische Altertums, Geschichte, und deutsche Literatur und für Pädagogik.* Leipzig, 1898–

Rec. Past = *Records of the Past.* Washington, 1901–

Rev. Arch. = *Revue archéologique.* Paris, 1844–

Röm. Mitt. = *Mitteilungen des Kaiserlich Deutschen Archaeologischen Instituts. Roemische Abtheilung.* Rome, 1886–

Z. f. Bauw. = *Zeitschrift für Bauwesen.* Berlin, 1851–

2. BOOKS

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