Giants or Geniuses?

Monumental Building at Mycenae

Barbro Santillo Frizell

In this paper I will focus on some aspects of the history of building technology, a neglected field in archaeology. The related subject is the monumental tholos tombs of Bronze Age Mycenae, and I will argue that a fuller understanding of the building procedure is necessary to interpret the monuments in their historical context. A new interpretation of their function and role in the royal propaganda is proposed.

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..the sacred towers built by the Cyclopes,
in beuty far excelling human effort..
Seneca, *Thyestes*, 406.

A HEROIC LANDSCAPE

The monumental ruins of Bronze Age Mycenae have always constituted a visible past in the landscape. Contrary to many other famous Bronze Age places, Mycenae was never completely buried over time and the memory of its glorious past lived on throughout the history of the ancient Greeks. In archaic times, at least five hundred years after the end of the Mycenaean civilization, it was described by Homer as a well-built royal stronghold. In classical times when the great Attic dramas echoed its legendary history, the old Mycenaean city walls were restored and reused. During the Graeco-Roman period, local traditions and folklore finally ascribed Mycenae's prehistory to a mythical past and attributed its monumental buildings to the cyclops, giants of Greek mythology. And here we are today – the time has come to convert these supernatural creatures into human beings.

HISTORY OF ARCHITECTURE OR HISTORY OF BUILDING ?

Compared with the scholarly interest focussed on other archaeological material of the Mycenaean civilization, relatively little attention has been paid to its most conspicuous remains, the monumental buildings. Why? One reason is probably the amount of luxury items, wealth of gold and other art objects found in the graves, which since the first discoveries in the last century have attracted enormous interest among laymen as well as scholars. But this is not the whole truth; other societies which have produced buildings on a monumental scale, for example Bronze Age Sardinia, have suffered the same fate. The reason for this surely lies in academic traditions, which in different ways have fostered and maintained artificially defined disciplines with borders often arbitrarily and randomly set. A conspicuous part of our archaeological heritage is the remains of buildings, especially in classical archaeology. In spite of this, classical archaeologists have very little, if any, professional training in dealing with architecture. They are nevertheless expected to document, evaluate and interpret the remains of buildings. The lack of insight into building technology has led to the practice of handing over these matters to architectural historians, who, however, have often no technical university degree and no practical building experience. Their university training is traditionally focussed on aesthetics and form, with a preference for monumental and grand architecture as objects of study, and perception becomes thus a major concern in their approach. Acting upon the demands of the archaeologists, the architectural historians have been busy reconstructing the original appearance of the buildings, and more effort has been put into reconstructing the decoration of facades and stylistical elements than understanding the structure of the building and the construction procedures. The historical interpretations are left to the "experts". This has led to a lack of understanding of the socio-anthropological aspect of building, that is the relation between man and his construction work. The consequence of this attitude is, in our case, a poor understanding of the function and role of monumental building at Mycenae. It can be examplified by such statements as: "The construction of the Tholos Tombs is *easily understood*, especially that belonging to the graves of the Late Mycenaean period" (Mylonas 1983:169). A list of similar statements could be made long but is of little use, since all scholars have based their observations on the publication of the British School in the 1920s (Wace 1925:283–396) which suffers from many faults and errors in the documentation, particularly in the survey and the related drawings (Santillo 1990:17–18).

Fig. 1. The "Treasury of Atreus" as seen by the English traveller Edward Dodwell in 1834. The artist's careful rendering shows the inclined edge profiles of the inner lintelblock.

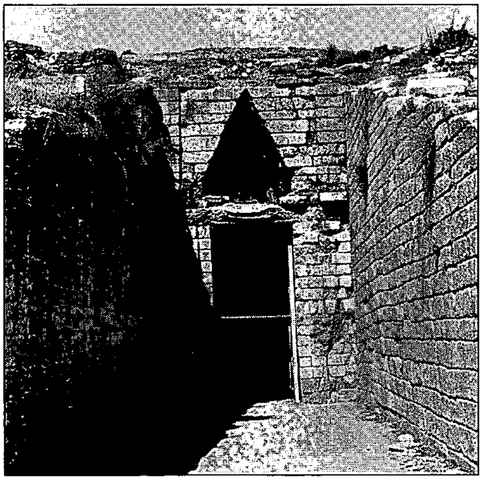

Fig. 2. The monumental facade of the Clytemnestra tomb. Photograph R. Santillo.

Contrary to what has been stated, these buildings are complex structures and to understand their construction and statical behaviour is a difficult task. A contextual study of such a complex building type requires a broad scholarly approach which combines archaeological data, the history of architecture, and the practical experience of building. Such an approach is necessary to open up possibilities to interpret these buildings in a wider geographical space and historical context.

FROM GRAVE CHAMBER TO MONUMENT

The tholos tomb as grave type was widely spread in Late Bronze Age Greece. More than a hundred tombs of varying size and refinement have been found, dating from the Early to the Late Mycenaean period. Most of them are quite modest in size and architectural refinement. After the burial the tombs were closed; the doorways and corridors were covered with earth and hidden in the landscape. The concept was an underground chamber modelled after the more frequent rock-cut chamber tomb. During a certain period, around 1400 B.C., there occured at Mycenae a monumentalisation of the grave type, contemporaneous with the erection of the monumental walls and the entrance gate at the citadel, the so-called Lion gate.

At Mycenae nine tholoi were built, more than at any other site. This shows the importance of the place but also explains why the development towards monumentalisation of this particular building type took place here, where the building tradition was firmly rooted.

Only three of the tholoi at Mycenae can rightly be called monumental: the Atreus tomb (fig. 1), the Clytemnestra tomb (fig. 2) and the Lion tomb (fig. 3). The names traditionally used even today are those given by Pausanias (i.e. what modern scholarship has tried to reconstruct from his geographical descriptions), who was told that members of the legendary royal family were deposited in the tholoi. All the tombs at Mycenae were plundered already during antiquity. We cannot attribute any grave to any particular individual, and so the tombs remain anonymous. We don't know whether the above-mentioned royal persons lived before, during or after the tombs were built.

All three tombs are built of well-dressed ashlar blocks of local limestone and conglomerate in the dry masonry technique, that is

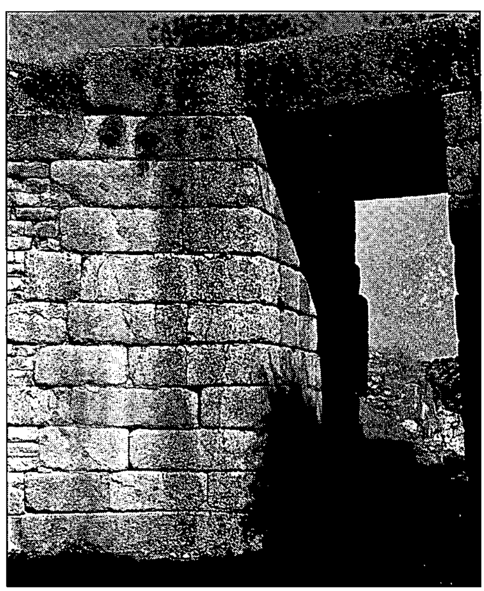

Fig. 3. The Lion tomb. The upper part of the cupola has collapsed at the level of the lintelblock. Photograph R. Santillo.

stone walls without mortar. The cupola of the Atreus tomb has a diameter of 14.60 m and is only slightly smaller in height. The Lion tomb has a slightly smaller diameter (14 m) and was probably more or less the same in height (the upper part has collapsed). The tomb of Clytemnestra is 13.40 m in diameter. These are the largest dry masonry domes built. They were lavishly decorated on the facade with stone columns and other decorative sculptured elements, and were meant to be visible - at least for some time.

TERMINOLOGY AND CONCEPTS: FALSE OR TRUE DOMES?

In the literature the Mycenaean cupola is called a false dome, a pseudocupola, or even a false vault. The agreement among scholars that the Mycenaean architects did not know the principle of the cupola and were not able to build true domes, is total. Some examples will illustrate this: "The largest vault in the ancient world constructed before the Roman Pantheon was the Treasury of Atreus at Mycenae. The dome is not a *true arch but a corbelled vault*, which is made by laying converging courses of masonry and smoothing off the angles of the stones on the inside" (Larousse 1972:263). Similar and related statements can be found in almost any book on the history of architecture and Greek Bronze Age archaeology: "The dome is *not constructed on the arcuated or vault principle*: the courses simply project one over another, uncemented until by the lessening diameter of the concentric circles, the top could be covered by a single stone, hollowed on the under side to continue the curve to a round point." (Dinsmoor 1950:30); "Each course overlaps and counterweighs the one below, on the *cantilever system*" (Lawrence 1983:80); "Above the foundation course, each ring of blocks is cantilevered to overlap the

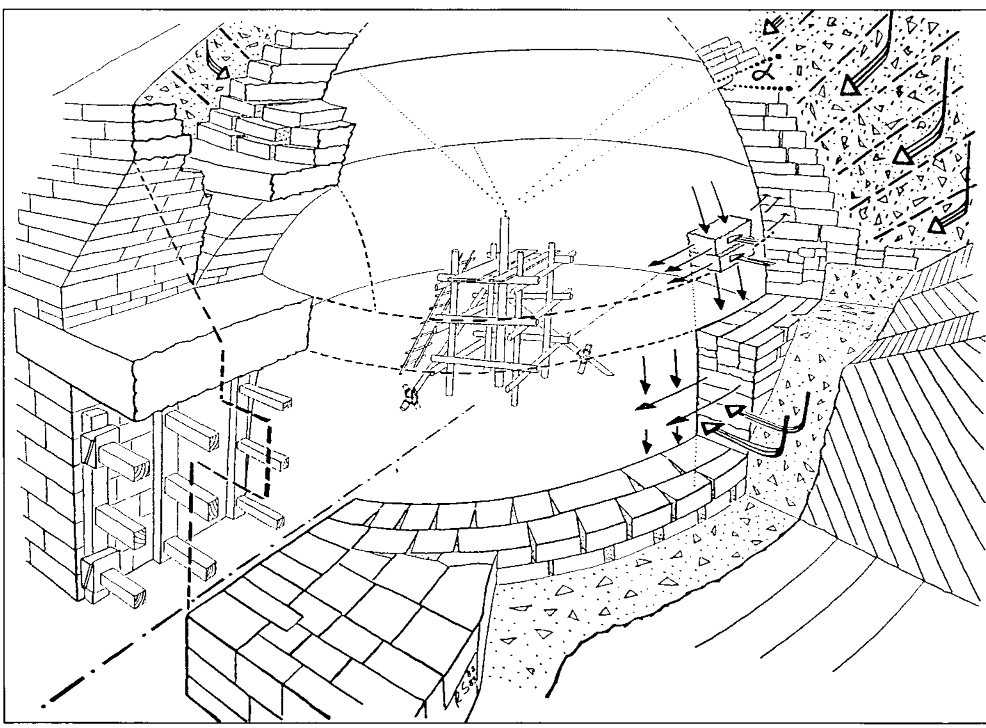

Fig. 4. Prospective drawing illustrating the characteristics of a Mycenaean tholos tomb of dry-wall masonry. The wooden struts in the stomion were not removed until the lintel blocks were positioned. Drawing R. Santillo.

one below, until finally the circular top block is set to crown the whole and give the impression of a vault, *a false impression, since the top block is nonfunctional as a keystone*" (MacKendrick 1981:74–75). The list could be made much longer, but it will only show that authors of handbooks copy one another or that they have a lack of knowledge in building technology. Specialized articles and treatises on this matter, though quite few, never question this basic assumption (Cavanagh & Laxton 1981; Pelon 1976). Turning to the field of architectural history the situation does not become clearer, and in a major work it is stated that: "The stone domes, in particular, were all *false domes*, constructed like the false arches described in the previous chapter, by *bedding each course more or less horizontally* but projecting a little inward from the one below" (Mainstone 1975:113).

In short it is evident that these authors have never asked themselves: if these domes are *false*, what are the properties of a *true* dome?

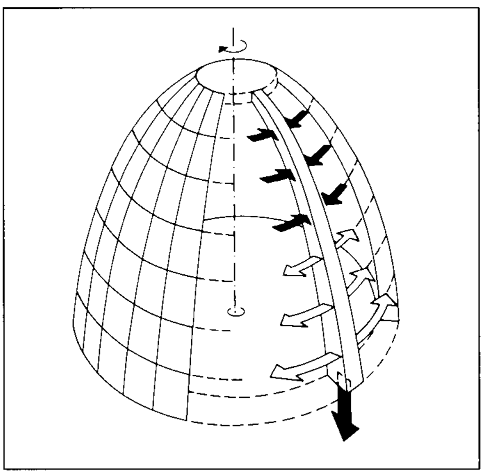

Fig. 5. Schematic drawing of an ideal cupola. The cupola is a spatial structure where the load is carried to the support, which in the Mycenaean tholos is continuous, by a twin mechanism in which the two parts are inseparable and always act together. This twin mechanism works by a compound of horizontal ideal rings, called parallels by the technicians, and by a compound of vertical ideal half rings, called meridians, which follow the main curvatures of the system. A masonry dome is built ring by ring without a bearing scaffolding.

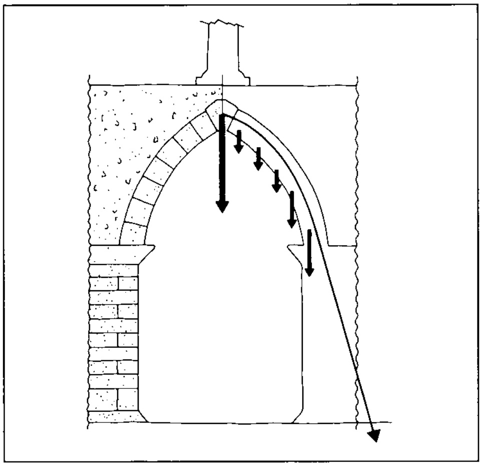

Fig. 6. An arch with a concentrated load at the top. The arch is a plane structure which carries the load to both supports through a string polygon mechanism which usually has the form of a curve, commonly called the line of pressure. The direction of the pressure line to the supports is inclined, therefore the arch is a thrusting structure. A masonry arch of ashlars must be built on a formwork which supports the structure under construction, at least until the keystone is inserted.

Perhaps the most common misconception in the field is that arch and dome have similar characteristics. The lack of constructive concepts has led to this confusion. It appears that it is the building technique that has caused so many scholars to talk about false vaults or false cupolas or even false arches. In addition, there is a general tendency to mix construction methods with static principles, in spite of the fact that they are two different concepts. Construction includes the building techniques used to put a building together. Statics includes the principles of equilibrium in buildings and their parts – its laws tell us why a building stands up and does not fall down.

It appears that it is the method of placing the stone blocks in more or less horizontal layers, that is the building technique, that has caused so many scholars to talk about false cupolas. If, however, the stones were placed with an increasing inward inclination, which is how an arch with wedge-shaped stones is constructed, the structures would have been accepted as true domes (fig. 6).

There are no arches in the cupola; it is built ring by ring and not arch by arch. There is no keystone in the cupola; instead all cupolas have an "eye" at the top. It can be capped but never locked. Therefore there is no real relationship, neither statically nor constructionally, between cupolas and arches although both often have curvilinear form (figs. 5, 6).

The fact that we are used to seeing drawings of domes always in plane section has, I believe, contributed a great deal to the misconception that there should be arches in the domes. We lack training to think in terms of space and to convey a spatial structure into a plane section and vice versa. The cupola is a spatial structure in contrast to the arch which is a plane one.

Before leaving this brief summary of concepts which have been treated more fully elsewhere (Santillo Frizell & Santillo 1984; Santillo Frizell 1986; Santillo 1987), I will briefly mention the term "corbelling" (sometimes the term "cantilever" is used as an equivalent) and the so-called principle of corbelling. The word derives from the architectural term "corbel", which is a projection jutting out from the face of a wall to support a superincumbent weight. Corbelling is a building technique and not a statical principle. This might seem purely a semantic issue, but that is not the case since scholars (Cavanagh & Laxton 1981, 1982, 1985) have tried to explain the "principle of corbelling" from a static point of view – without success – and therefore the misunderstanding is conceptual.

CONSTRUCTION OF THE THOLOS TOMB

The tholos is composed of three parts: the dromos, which is the huge corridor leading from the entrance; the stomion, which connects the corridor to the interior room; and the cupola, that is, the interior room itself (figs. 2, 4) (Santillo Frizell & Santillo 1984; Santillo 1986).

Before the actual construction a plan and a program were prepared for the building on the basis of various parameters, such as location of the site, distance from the quarry, means of transport, temporary access road to the work at various levels, past experience of the staff and workmen, nature of the filling material, economic resources in relation to the monument, and the specific requirements of the commissioner. The construction began with the setting up of a grid to prepare for the excavation and earth moving. The excavation started with the huge funnel-shaped pit where the tholos was to be constructed and, almost at the same time, with the dromos and stomion (fig. 4).

Access to various levels was prepared using part of the excavated material. The main access road, which was lateral to the stomion wall-platform at the level of the lintel, had to be built carefully. It terminated with a ramp which, at the beginning, sloped down to the tholos floor level.

The masonry was laid in successive levels, always covering the whole area of construction. After the first few courses the construction was serviced by access paths. Horizontal struts and shoring were mounted in the stomion to act on the ashlar blocks, which were bigger here and especially finely worked for this reason. The gap between the ashlar blocks was carefully filled and the trench between the circular wall and the external surface was packed with filling material. The pressure or thrust of the earth layers contributed greatly to bind the masonry so that no mutual displacement could occur during later building operations.

Up to a height that is generally at the level of the lintel, the thrust of the earth was supported by the rings of stone. Where this annular system was cut by the doorway, the larger mass of the stomion and the struts made their temporary contribution. The ramp of the main service road would by now be at the same level as the lintel and, therefore, almost horizontal. The lintel blocks were then launched and the struts in the stomion took on even more stress.

At the level of the lintel the cupola changed shape. There were now increasing difficulties. Previously, the fact that at the bottom the courses project less and the blocks are bigger allowed a larger number of courses to be laid, which facilitated the filling of the trench. The values of these parameters now changed completely. The new shape enhanced the sliding tendency of the blocks of the lower part, which needed an annular device to give an inward thrust layer by layer. In order to provide a thrust, the Mycenaeans put the filling layers in the form of a funnel, profiting from the natural slope of the terrain. If the workmen had only spread a horizontal layer of earth, let us say 25–35 cm thick, it would have contributed nothing to the inward thrust but would have benefitted only the lowest layers, because its weight increased the lower pressure and, therefore, the thrust. This increase in pressure was of course necessary for the lower part already built, but it did not help the part under construction.

The construction proceeded up to the top by layers of bonding and earth filling. Finally the last course was laid: the funnel was now very narrow, still open, and the building was standing up. To protect the funnel surface from erosion, a lid was slid down and the hole capped.

In most tholoi it is clear that the courses have an inward inclination. This inward tendency increased the inward effect of the thrust of the fill.

BUILDING AND PROPAGANDA

In the tholos tombs, the stomion gap was usually covered with two (most common) or three lintel blocks of conglomerate. The solution chosen for the stomion in the Atreus tomb was only two blocks. The inner block is a gigantic one which had been dressed according to double curves of the interior walls of the cupola (fig. 1). This block, which is almost 8 m in length and 5 m in breadth, weighs over 120 tons. Such a heavy block had never been placed or erected in Greece before, and it was never repeated again in Greek history.

How much is 120 tons really? Let us convert this abstract number into real objects! A very small car weighs about one ton. The average block of great size in the Egyptian pyramids weighs about 12 tons. Only the big obelisks exceeded it in weight and size. Their weight is between 140 and 340 tons. A great difference is that obelisks were never incorporated in any building; they were always used as free-standing elements. The biggest block in history that was incorporated in a building is the great monolithic cupola of 230 tons covering the mausoleum of Theodoric the Great at Ravenna (Santillo 1996).

The placement of the enormous block in the Atreus tomb goes beyond all practical building needs, and the reason for choosing such a solution must be sought elsewhere. It does not require too much imagination to understand that the most difficult task and delicate operation in the whole building procedure was to handle this enormous block! First it had to be extracted from the quarry and the interior profile had to be dressed; then it had to be put on a sledge and transported by some means to the building site, where it was positioned over an empty gap in the stomion walls, temporarily buttressed by a wooden frame-work.

Why did the architects at Mycenae choose such a solution? The whole building procedure is clearly an act of propaganda on behalf of the commissoner, who was probably a member of the royal family.

Building monumental tombs for propagandistic purposes was nothing new in this part of the world at that time. The common scholarly interpretation of a propaganda monument is that the ready-built and finished product fulfills the propagandistic purpose. Regarding funerary monuments, their main value, apart from the primary function to protect the corpse, should accordingly lie in a dynastic claim, to enhance the prestige of the commissioner and serve as a projection for the afterworld. Without excluding the above-mentioned symbolic aspects linked to mortuary monuments, I will argue that the greatest aspect of propaganda in erecting such a monument as the Atreus tomb lies in the building procedure.

Some examples from ethnohistory and other ancient societies will show that the technical problems and the solutions found are similar, and that the deeper cognitive value of such operations is part of a collective human sentiment. These cross-cultural analogies will complement the lack of written or pictorial sources of the Mycenaean culture and enlarge our referential framework. They show that the transport and placement of enormous blocks used as building material, was a major problem that had to be resolved and thus formed an important part of the propaganda.

THE ROYAL HORSES OF DALARNA

Our first example is not a building element but a monumental sarcophagus. It illustrates one important part of the building operation, namely the transport of very heavy blocks used as building material, an operation that had its own important propagandistic part in the enterprise.

One of the biggest stone monoliths ever transported in Sweden was the coffin made for King Charles XIV of the Bernadotte family. It was sculpted in Dalarna of the famous red porphyry in the year 1852 and placed in Riddarholmskyrkan, Stockholm, in 1856 (fig. 7). Earlier in the century the Crown had acquired the porphyry quarries and the industrial plant, with the aim of producing royal gifts for distinguished subjects and foreign envoys (Lagerqvist & Åberg 1989).

The history of this spectacular event is well recorded and the documents are kept in the royal archives. It appears that the problem

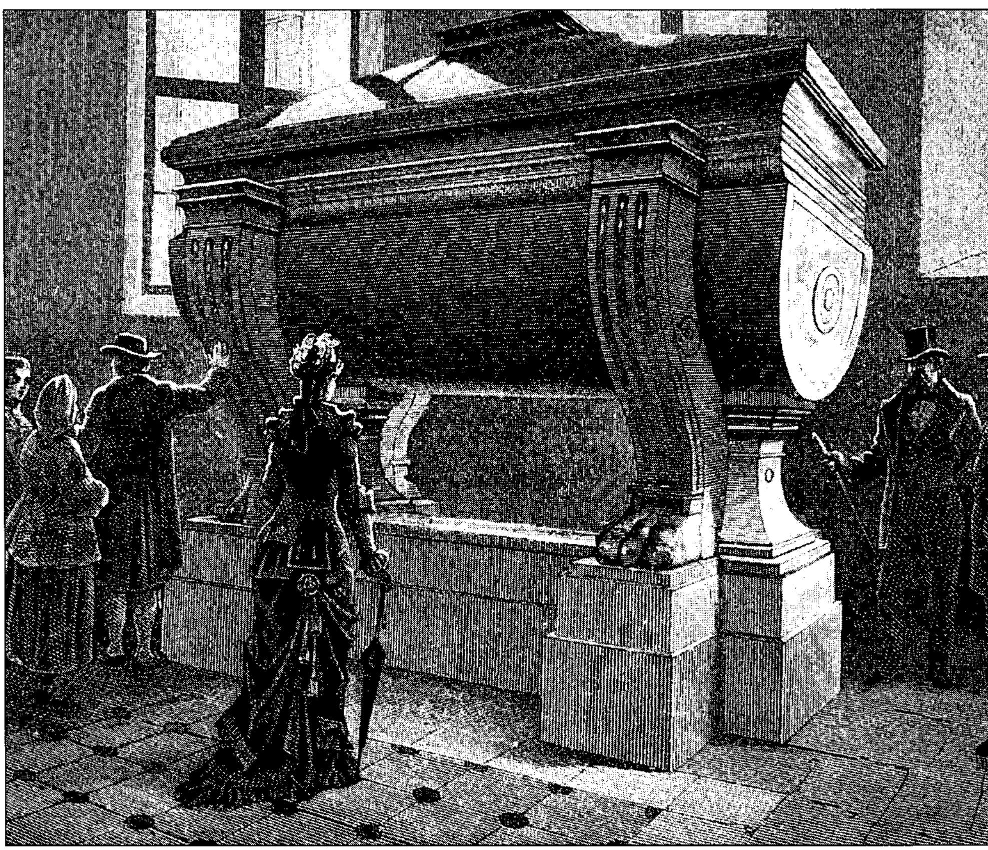

Fig. 7. The sarcophagus of Charles XIV placed in Riddarholmskyrkan in Stockholm. Lagerqvist & Åberg 1989:104.

Fig. 8. The Royal Horse, Olmats Anders Persson, one of the draggers in Dalarna, portrayed in 1916 when an ethnographical documentation of the event was done, over fifty years after the famous transport. Lagerqvist & Åberg 1989:102.

of transport was a major one, and it was not resolved until the coffin was ready. The quarries were ca. 200 km from the closest harbour town of Gävle, from where the coffin had to be shipped to Stockholm. At that time the roads were very bad and railways were almost non-existent. Several wagons were built, which turned out to be useless. The idea of a possible road transport had to be given up. Instead the suggestion was made to transport the coffin on sledges across lakes and rivers during the winter. It was the master-builder of churches, Björk Anders Jonsson, who was given the task of constructing two huge sledges modelled after the vehicles used for transport on snow and ice in this part of Sweden. The sarcophagus had to be transported in two parts: the coffin itself, which weighed eleven tons, and the lid, which weighed five tons.

It took four years after the coffin was ready before a cold enough winter arrived, when lakes and rivers were so deeply frozen that the transport could be done. The sources give a vivid picture of the enterprise, which was talked about for many years afterwards – and in fact still is! The coffin was dragged by 110 men, the lid by 70. All the men were dressed in their finest clothing with long, white, furcoats. The conception of a public event is evident.

The men who participated were called the Royal Horses – a name they proudly kept for the rest of their lives. Many of them lived to a high age (fig. 8). No contemporaneous pictures of the event exist, but the stories that were told by the people who were present and that were later transmitted from generation to generation, are as vivid as any painting!

The transport is described as a magnificent triumphal procession! The temperature was –35° Celsius. The schnapps, which was free, was stored in the coffin. On the lid sat the most famous musicians of Dalarna and played the

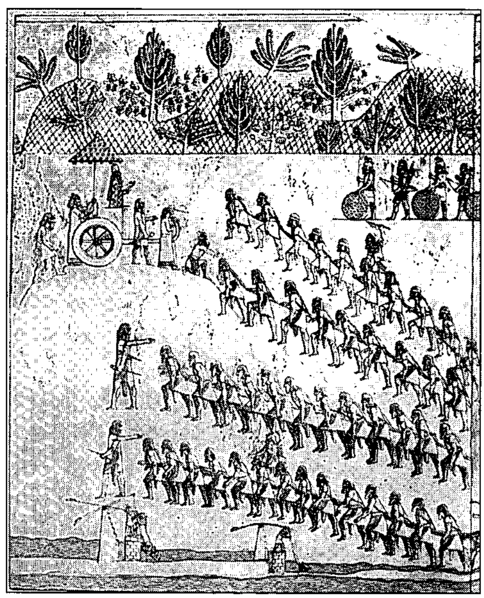

Fig. 9. From his chariot Sennacherib is supervising the operation of transporting the bull colossus from the quarry. His self-image illustrates the magnitude of the project and shows the great propagandistic value of the enterprise. The relief was placed together with several others depicting quarrying and transporting, in the court of the throne room in the south-western palace at Nineveh. Russel 1991, fig. 54.

violin. The importance of their participation is shown by the fact that the musicians were paid double the amount of the others. Several marches and working songs were composed for this particular event. Afterwards they became part of the local folklore tradition. In spite of the extremely cold weather, all the people along the road participated in the event and celebrated the men with parties and dancing, and those who could afford it offered the men food, drink and lodging.

ASSYRIAN PICTURES

The above example shows how important the participation in a transport-event of heavy masses was, and its value as a public phenomenon. The following example from the neo-Assyrian culture bring us directly to building operations which include the transport of building material and sculptural elements of excessive size. It further shows the role of the commissioner in such a propagandistic enterprise.

On the upper Tigris during the ninth-seventh centuries B.C. the rulers of the powerful neo-Assyrian empire built their capital cities and palaces. The city walls and buildings were adorned with stone reliefs and sculptures from the north, where suitable stone material was available. The ornamental tradition in the palace architecture was to flank important doorways with sfinxes, or bull colossi with human heads, sculpted from monoliths. The average weight of these sculptures is between 12 and 14 tons, but occasionally blocks of much greater size were used. I will return to that below.

The palace walls were decorated with sculpted reliefs showing battle scenes, war campaigns, religious ceremonies, etc., accompanied by inscribed texts. No other ancient civilization has left behind such a rich pictorial documentation. Later on in history the Roman emperors developed an attitude towards historical narrative and representation very similar to that of the neo-Assyrian rulers.

In the palace of the Assyrian ruler Sennacherib (704-681 B.C.) at Nineveh, excavations by Layard in the 19th century revealed a whole series of refliefs depicting the quarrying and transporting operations commissioned by the king. Some of the slabs are preserved in the British Museum, several others are now lost and only preserved through the publica-

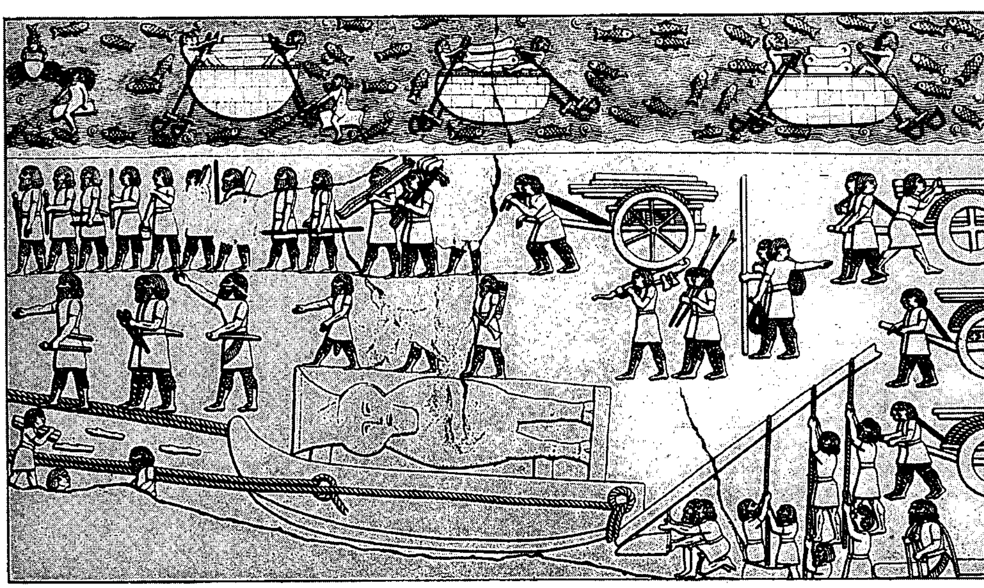

Fig. 10. From the quarry the huge monolith is brought on a sledge to the Tigris, where further transport is done by ship. Russel 1991, fig. 60.

tion of Layard's drawings (Layard 1849-53). Together with the inscriptions, they constitute a completely unique pictorial and epigraphical documentation from antiquity.

These reliefs had a prominent position, being placed on the walls of the court which led into the throne room. The doors were flanked by the same bull colossi, whose transport is described on the reliefs.

The stone for Sennacherib's palace was quarried in the Balatai, 35 kilometers upriver from Nineveh. The king himself is represented as supervising the work at the quarry as wells as the transport along the Tigris to Nineveh (fig. 9). Whether he actually was present himself or is only symbolically represented on the reliefs does not really matter: the significance lies in his self-image which shows how important he considered this enterprise in the royal propaganda.

By means of costume and captions, Sennacherib identifies the laborers in the quarry and the men hauling the bull colossi as "inhabitants of hidden mountain regions, conquest of my hand " (Russel 1991:260).

Sennacherib, more than any other ruler before him used building operations in his propaganda. He attributed the discovery of his primary source of sculptural alabaster to divine revelation (Russel 1991:115). A very conscious building program was conceived which exalted the difficulties involved in the building operations. He depicts himself supervising the work in the quarry and accompanying the colossi on their journey to Nineveh. He provided his palace with the biggest colossi of all Assyrian rulers, allegedly forty to fifty tons (Russel 1991:115). With respect to the difficulty and the technical process, there is a great difference between transporting a block of the latter size and a block of ten to twelve tons, which was the more usual weight of these sculptures. It has not been possible for me to get an overview of the weight of the various bull colossi or lion sfinxes from the different palaces. The numbers given above are taken from Russel 1991 and Trolle Larsen 1996, respectively. But since neither of these authors seems to be so concerned with the varying weight of the colossi, I must make a reservation for the exactness of the numbers given. The weight of these colossi illustrates the magnitude of this project and the great prestige it conferred to Sennacherib in relation to his predecessors. His palace building was rightly claimed as being "without rival."

The Assyrian reliefs are unique in their details. They show a group of men hanging onto a pole which is connected to the sledge (fig. 10). This operation is crucial for the transport: it gives the impetus to move the sledge forward and makes it possible for such a limited number of men to pull such a weight.

That the same mechanical device was used at Mycenae, can be deducted from the huge lintel block in the Atreus tomb (Santillo 1990). From the inside of the tomb it can be seen that the block has inclined edge profiles (figs. 1, 11, 12). The same can be seen on a block walled into the dromos walls (fig. 14). This means that the pole, that is the mover, was once moved on the block which was transported on a sledge. It should be noted that this device is not a lever, which is the usual explanation, but what with a technical term is called a "cam mechanism" (Santillo 1990). Using this device, manpower can be considerably reduced and thus make possible the transport of a block of this size. It has been calculated that this operation, in an arrangement of four rows of men (as on the Assyrian reliefs), required only a total of four hundred men (Santillo 1990).

A PUBLIC PHENOMENON

In Assyria and Egypt the main part of the transport was performed on the Tigris and Nile rivers, presumably during the flooding periods when the land transport could be minimized. Special ships were built for these transports. In Egypt the tradition of quarrying, handling, transporting and positioning huge stone blocks had started already in the Old Kingdom (ca. 2705–2155 B.C.). During the 18th Dynasty (ca. 1550–1305 B.C.) very huge obelisks were erected in the sanctuaries. The

Fig. 11. The left side inclination of the huge lintelblock in the Atreus tomb (seen from the inside of the burial chamber) which was used to move the block on the plain. Photograph R. Santillo.

pharaoes competed in erecting increasingly taller obelisks, which reflects the rivalry among the rulers.

The operations along the Nile and at the river beds surely attracted people from far and near. Craftsmen, sailors, merchants and diplomatic envoys from the Aegean and Near Eastern countries were continuously visiting Egypt, which at the time of the great obelisk raising had expanded its border of political dominance far up the Syro-Palestinian coast. The Nile was the heart of Egypt and the main route of communication.

The Roman emperors took over the tradition of the Egyptian pharaoes in competing in obelisk raising. They were probably the first people to venture a transport of such heavy stone masses on the open sea. As a symbol of the conquest of Egypt, an obelisk was brought to Rome by the first emperor, Augustus. It turned out to be an effective instrument in the imperial propaganda and was used by his followers. Today Rome still has thirteen obelisks. Special ships had to be constructed for the transport, and the Roman authors (Pliny and Ammianus) report on the immense public interest in these projects. The ship commis-

Fig. 12. The right side inclination which was used to move the lintelblock uphill. Photograph R. Santillo.

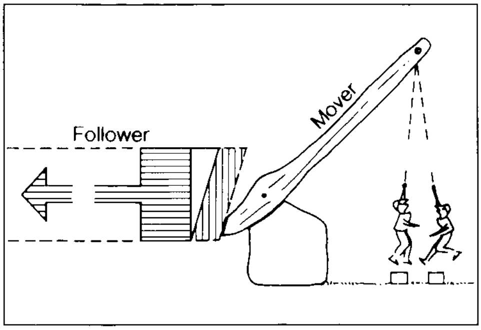

Fig. 13. Sketch illustrating the cam mechanism. When the men let go of the pole (the mover), it acts upon the block (the follower) and gives the impetus which moves the block (or sledge) forward. Elaborated by A. Grenberger from Santillo 1998, fig. 1.

Fig. 14. The block walled into the right dromos wall of the Atreus tomb. The inclined profile used for the transport and the cutting for the ropes are left in situ. Photograph R. Santillo.

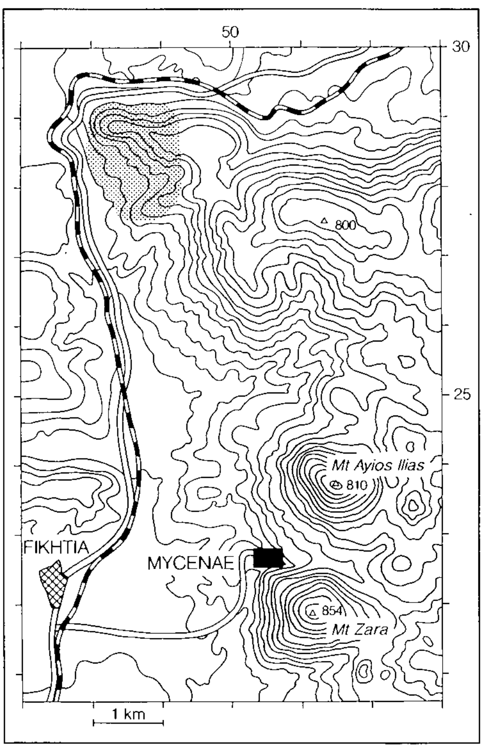

Fig. 15. The area of Mycenae and the Dervenaki gorge. The shaded area indicates where the quarry, providing conglomerate slabs, is situated. Elaborated by A. Grenberger from 1:100.000 GREECE Sheet K8 KORINTHOS.

sioned by Augustus was left and exhibited at Puteoli, the international harbour on the Gulf of Naples. It was greatly admired and eventually became a tourist attraction: "Above all, there came also the difficult task of transporting obelisks to Rome by sea. The ships used attracted much attention from sightseers. That which carried the first of two obelisks was solemnly laid up by Augustus of Revered Memory in a permanent dock at Pozzuoli to celebrate the remarkable achievement" (Pliny: 36. 14. 68–71).

A TRIUMPHAL PROCESSION

Back to Mycenae! At Mycenae the blocks were transported entirely by land. The quarry was situated some kilometers north of Mycenae, where the blocks of conglomerate are still visible in the surface (figs. 15, 16). The route is not so long but difficult, as the slopes

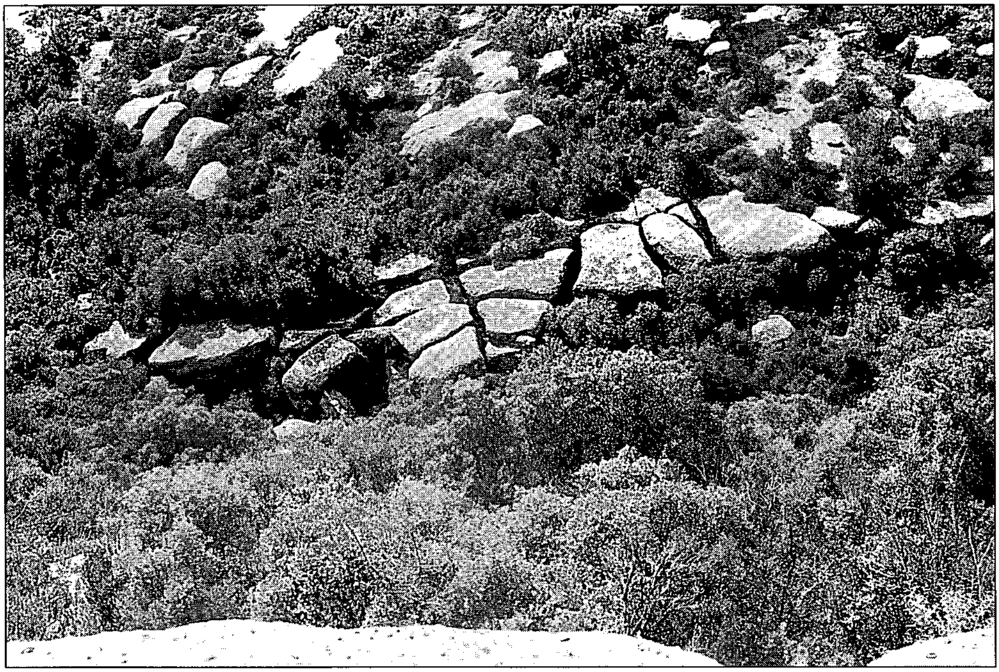

Fig. 16. The quarry. Huge blocks of conglomerate are exposed in the surface. Photograph R. Santillo.

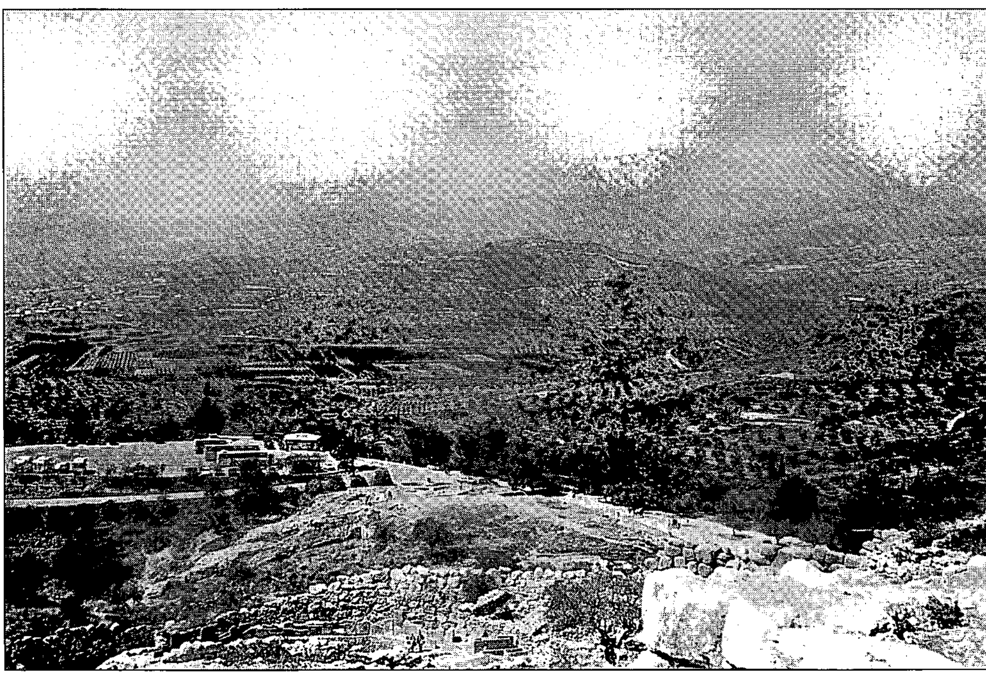

Fig. 17. The plain to the west of the citadel. The quarry is situated behind the mountain ridges to the right of the picture. On this plain the gigantic monolith (as well as the other conglomerate blocks) was transported. Photograph B.S. Frizell & R. Santillo.

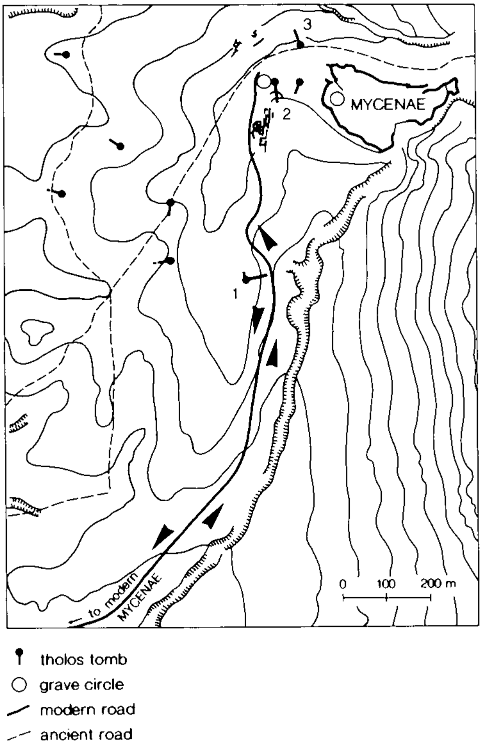

Fig. 18. The topography of the area with the tholoi. No. 1, the Atreus tomb; No. 2, the Clytemnestra tomb; No. 3, the Lion tomb. The road for the block is indicated by arrows. Elaborated by A. Grenberger from Santillo 1990, fig. 40a.

leading up to the citadel are heavily inclined. The old road passing west of the Atreus ridge was too steep to be used for this transport (fig. 18). The route used for the gigantic block of 120 tons and the other big blocks should, according to accurate calculations correspond to the modern road leading up to Mycenae (figs. 18, 19). As mentioned earlier, the huge lintel block in the Atreus tomb has inclined edge profiles on both sides. These have, however, different inclinations. The left side is more heavily inclined and was probably used on the plain. On the right side the edge is straighter, which shows that it was used for moving the block uphill (Santillo 1990).

We have to imagine a public event never seen before! The surrounding territory was densely populated. The visibility from the mountains and hilltops is particularly good around Mycenae. From the hills of Argos and the mountains behind Mycenae it was possible to see the transport of the colossus on its route on the plain and then uphill to the citadel of Mycenae (fig.17). Such an event must have attracted people from far and near.

The final and exalted moment of the triumphal procession was the positioning and raising of the huge monoliths. We have to imagine a public event and a scenario similar to the

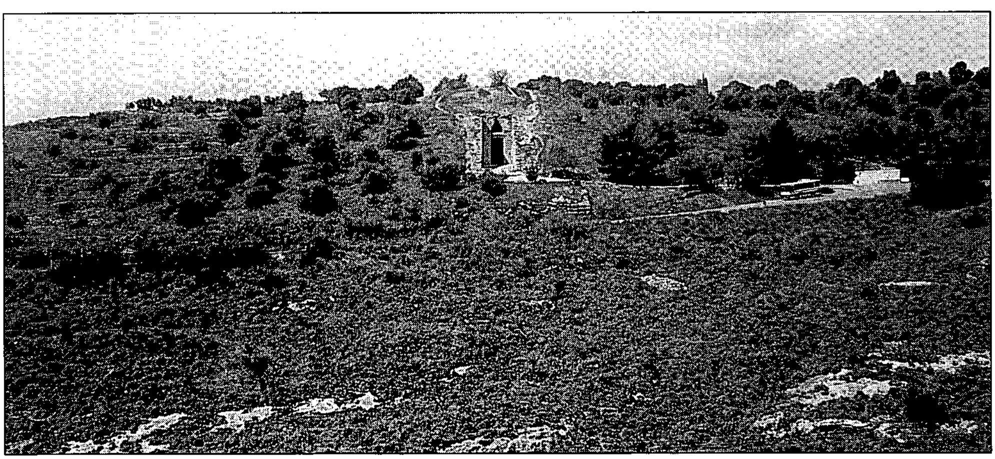

Fig. 19. Via Triumphalis. On this road which today constitutes the main road to the archaeological site of Mycenae, the huge monolith of 120 tons which covers the stomion in the Atreus tomb was transported. It was a public event of great attraction: never had a stone of such size been placed in a building before – and it was never repeated again in Greece! Photograph B.S. Frizell & R. Santillo.

operation led by Fontana in 1588, when the obelisk at the Vatican was raised (fig. 20). The event could well be accompanied by the words of the Roman author Ammianus who reports on how extremely difficult the raising of the colossus was: "...there remained only the raising, which it was thought could be accomplished only with great difficulty, perhaps not at all. But it was done in the following manner: to tall beams which were brought and raised on end (so that you would see a very grove of derricks) were fastened long and heavy ropes in the likeness of a manifold web hiding the sky with their excessive numbers. To these was attached that veritable mountain engraved over with written characters, and it was gradually drawn up on high through the empty air, and after hanging for a long time, while many thousand men tired the wheels resembling millstones..." (Amm. Marc. 17. 4. 15).

The lintel block in the Atreus tomb, which weighs ten times the coffin from Dalarna and three times Sennacherib´s greatest bull colossi, can be compared to the Egyptian obelisks, with the great difference that this block was used as an element in a building. The positioning consequently required particular operative solutions. It was never lifted into position (as is commonly assumed) but launched on the sledge (fig. 21). A crucial part of the operation was then the removal of the sledge and the lowering of the stone colossus onto the stomion wall by a gradual lowering of the scaffolding (fig. 22) (Santillo 1990).

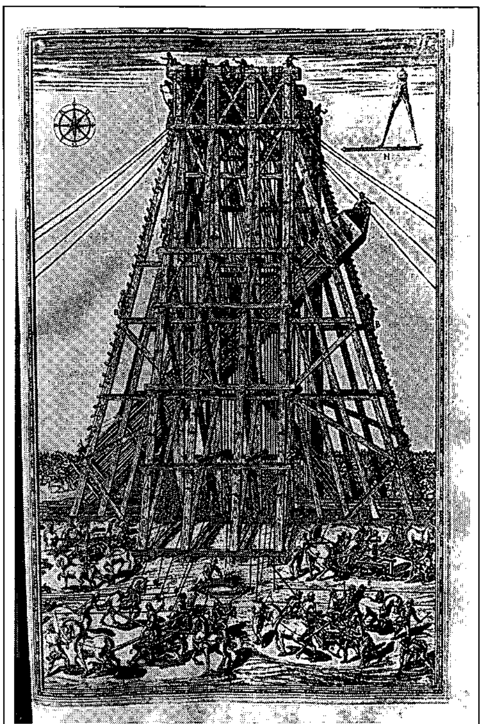

Fig. 20. The raising of the obelisk at the Vatican from the contemporaneous documentation by Domenico Fontana, Della trasportatione dell'obelisco vaticano et delle fabbriche di nostro signore Papa Sisto V, Rome 1590.

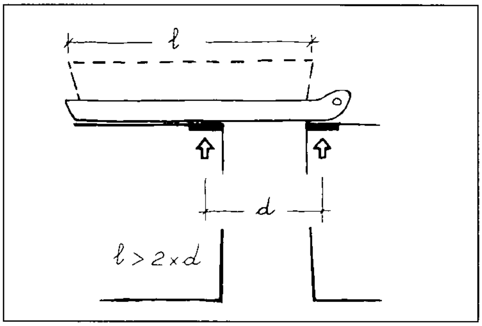

Fig. 21. The positioning of the huge lintelblock, which was launched on a sledge over the stomion gap. Santillo 1990, fig. 46.

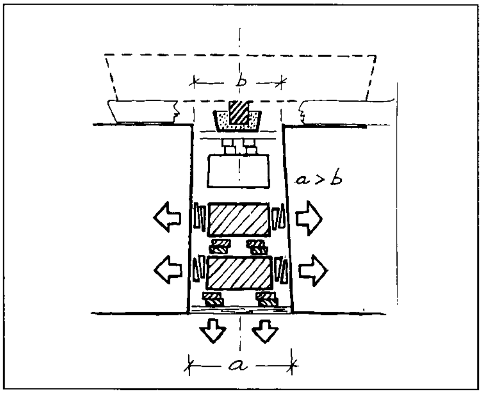

Fig. 22. Scheme of the self-blocking scaffolding in the stomion gap. The sledge was removed by means of wedges, a mechanical device still used today in Mediterranean shipyards, and gradually lowered by the means of sandboxes. Santillo 1990, fig. 48.

THE AUDIENCE

To whom was this propaganda directed? Without having knowledge of the building procedure and its various operative phases, and thus perceiving the monument only as a finished product, a locally or regionally defined audience becomes the logical interpretation. A Greek monument for a Greek audience. The reason for the size and splendour of some of the tombs at Mycenae has consequently been sought in local socio-political phenomena and been explained in terms of the changing conception of territory and regional political interests (Wright 1987:176, 183).

The way the propaganda was carried out at Mycenae and the vehicle used to express it has, however, convinced me that it was directed towards a much wider audience than is usually assumed. It went beyond Mycenae and its surrounding petty chiefdoms in the Argolid; its target was the high civilizations of the Eastern Mediterranean and the Near East.

The monumental building at Mycenae started in the fourteenth century B.C., which was a period of great expansion for the Mycenaeans in the Eastern Mediterranean. With the fall of Knossos, which occured somewhat earlier, they took over the role of the Minoans in the Eastern trade, and contacts with Egypt are well documented in the archaeological material both at Mycenae and in Egypt (Cline 1994). The reciprocity of finds indicates frequent contacts and probably direct trade between Egypt and Mycenae during the fourteenth century, which led to even more intensive contacts and trade during the following century.

Homer mentions that captive Mycenaean Greeks had to work perforce in building operations, namely in the tale of Odysseus, when he and his men became prisoners after a raid in Egypt. Many men were then killed "and others they led up to their city alive, to work for them perforce" (*Od.* 14. 270). It is easy to imagine that this reflects a Late Bronze Age setting where Aegean merchants, mercenaries and pirates regularly frequented Egypt. As said above, the handling of stone colossi had been going on in Egypt for at least a thousand years. A public phenomenon such as monumental building, which could not be hidden in a secret workshop, was particularly apt to stimulate the exchange of ideas.

The monumental tholoi buildings at Mycenae must be interpreted in an Eastern Mediterranean context. Other great builders at this time were the Hittite rulers. They built powerful citadels also using great blocks, such as those in the Lion gate flanking the entrance gates at Hattusa. The mighty Hittite empire competed politically with Egypt.

Mycenae was a small state on the fringes of the Eastern Mediterranean cosmopolitan world – but it was aggressive, expanding and competitive. That the ruling class had ambitions of political power beyond the local level and aimed at an international role is shown by their monumental building projects. These can only compete with those of the Egyptians and the Hittites. The Mycenaean Greeks were not passive receivers of cultural influence, but active participants. This is demonstrated by the way they chose to expose their propaganda. They did not simply copy or import a monument, as the Romans did, their achievement was much greater. As a work of architecture, the tholos tomb is purely Greek in origin and concept: it has no Egyptian nor Hittite counterparts. The Greeks used their own building tradition, brought it to a monumentalisation and incorporated a new component, the huge lintelblocks, to increase their efforts and prestige. In this they had created a propaganda monument on international standards. The combining of their technical skills in mechanical engineering with their scientific knowledge of geometry in a truly gigantic enterprise shows the true genius of the Mycenaean architects.

English revised by Laura Wrang.

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