A short-cut to Delphi

Indications of a vehicle track from a stone quarry to the Sanctuary of Apollo at Delphi

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Introduction

The following account deals with a programme of fieldwork in the mountains near Delphi, which was carried out in the years 2010 to 2015. The objective was to find traces of a 6 km-long roadway, which in all probability must have been laid in the years after 373 BC. The purpose of the roadway was to bring new building stones from a stone quarry today bearing the name St Elijah to the Temple of Apollo at Delphi, which lay in ruins following an earthquake in 373 BC. The fieldwork in the mountainous landscape was made possible by the hospitality extended to us by the French Archaeological School at Athens, and through the permission granted us to stay in the School's building in Delphi and the interest shown in our work by the director Dominique Mulliez and his successor Alexandre Farnoux. We would like to thank the Carlsberg Foundation for a grant which made it possible, in the spring of 2013, for us to carry out a month-long investigative survey on the mountain slopes. Permission for the work was granted by the Ephorate of Delphi and the Greek archaeological authorities, and we owe the Ephor for Delphi, Dr Athanasia Psalti, and her colleagues a debt of gratitude for their helpfulness and support in this work. The further field exploration and ensuing processing of the data were made possible by stipends from the Danish Institute at Athens, for which we are also grateful. We would like to thank Kristina Winther-Jacobsen, the Institute's director, for the commitment she has subsequently invested in this publication, and for Neil Stanford's careful translation.

Regarding the field investigation and the interpretation of the observations which we made in the area, we would like to mention the great inspiration provided by a number of professionals. These include É. Bourget, D. Skorda and E. Trouki. They have conduced to our interpretations of the observations during the fieldwork. In addition, our own experiences from walks in the mountains in the years 1963-8 together with the warden of the French School's building at Delphi, the late Christos Kaltsis, have had a crucial influence on the practical organization of the fieldwork. Finally we would like to thank Tønnes Bekker-Nielsen and Per Grau Møller at the Cartographic Documentation Centre, Institute of History at Syddansk Universitet, for always being prepared to help with map readings and determining coordinates. Rune Frederiksen served as archaeological advisor to the investigation.

The article is followed by a map with indications of GPS positions referred to in numbered order in figure captions, an appendix with a list of the GPS readings, a list of sources for figures and a bibliography.

The authors
Copenhagen, December 1, 2016

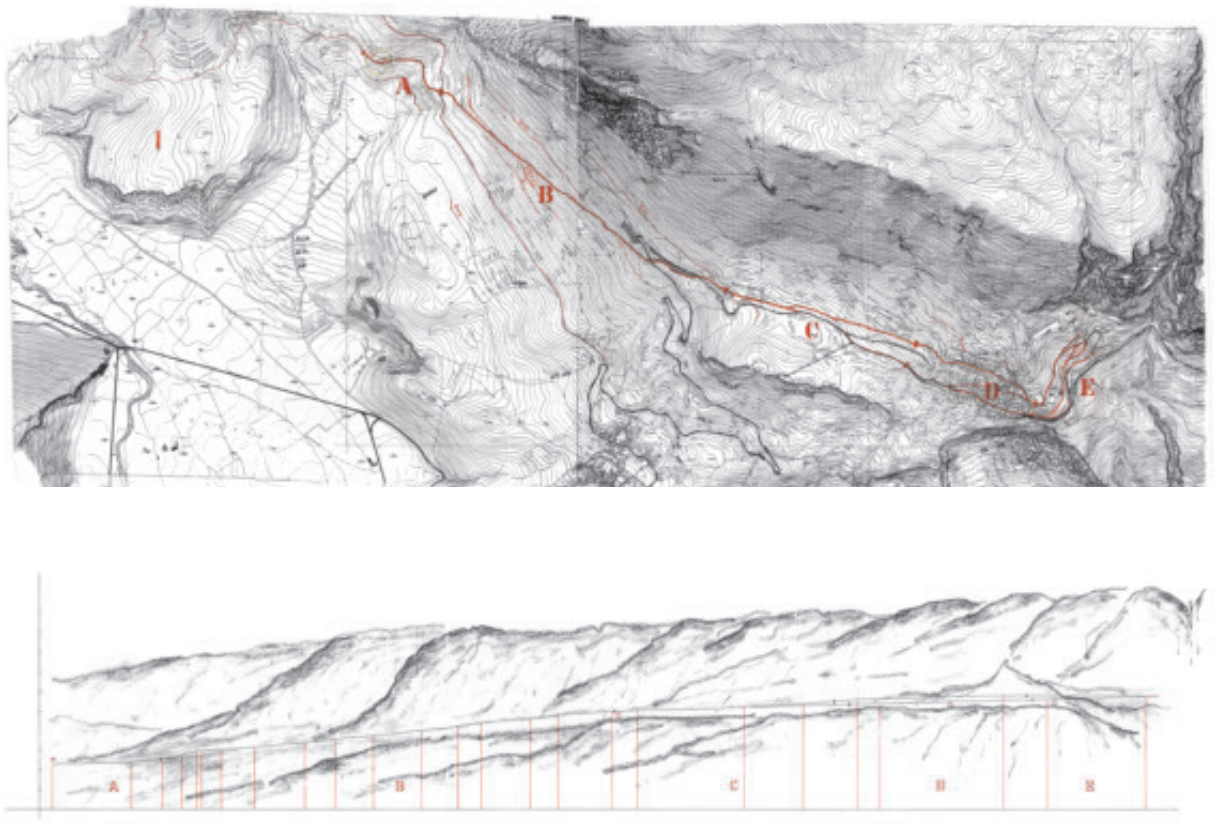


Fig. 1. *The stone quarry to the left (at A) and the sanctuary to the right (at E) are shown on this map from the 1960s. Visible between the two markings is a remarkably straight footpath. Our sketch below the map shows this path in elevation, divided into five sections from the stone quarry to the sanctuary (A–E). Also shown on the sketch of the mountainside is the percentage of increase for every 200 m towards Delphi. The sketched elevation below the map was drawn by GAU.*

How the fieldwork was structured[1]

The detailed examination of a vehicle track in the mountain slopes between a stone quarry from antiquity and the Sanctuary of Apollo at Delphi took its point of departure in the analysis of topographic maps on a scale of 1:5000, and the observations published by D. Skorda in 1991.[2] A corridor around the path drawn between the stone quarry and the modern road, which is an extension of the one to Delphi, was chosen as the area for the fieldwork.[3]

In the fieldwork the distance from the stone quarry to the sanctuary was divided up into five sections along the marked path for 6 km, as shown on the map. The sections represent the changing character of the landscape in the area. The survey on the mountain thus followed a topo-

1 An outline of the projected investigation was presented in a lecture at the annual meeting of the Danish Institute on April 11, 2011 at the Acropolis Museum by Gregers Algreen-Ussing, entitled "A Short Cut to Delphi".

2 Skorda 1991. We should like to thank Ms Skorda for permission to refer to her work and for the inspiring conversations we had concerning the Stone Quarry Road.

3 In the period 1963-8 this path was still passable for the Danish architecture students who surveyed/measured the sanctuary for the French School of Archaeology at Athens with a view to the publication of an atlas of the sanctuary (*Atlas*). On walks along this path we saw areas of hewing, the significance of which, at the time, was unknown to us. It was the warden of the French School, Christos Kaltsis, who was familiar with the path who gave it the name Kaltsis' Path. Today the path is impassable and has practically disappeared.

graphically accessible corridor between Amphissa and Delphi, starting from the stone quarry, which is situated 300 m lower in the landscape than the temple.

The description of the fieldwork follows the sequence step by step up to the sanctuary:

Section A includes the beginning of a vehicle track, which is to be found by the stone quarry named St. Elijah. A subsequent steep upward gradient takes the road out from the mountain towards the southeast.

Section B includes a long stretch on the southeast slope of Mount Parnassus, which leads to a small, modern church at Hosios Loukas, lying on a promontory halfway between the quarry and the temple.

Section C covers an extensive, flat, cultivated area. In relation to B it forms a mountain level at a higher altitude, which terminates at the modern town of Delphi.

Section D is marked by steep slopes in the landscape in and around the town of Delphi, wedged between the high cliffs of the Parnassus and the depths of the Pleistos Valley.

Section E is marked by a north–south oriented ridge with the so-called Bastions of Philomelos. East of this lies the sanctuary, where we suppose the vehicle track from the St Elijah quarry terminates.

The description of each section of the landscape from A to E begins with an account of the local character of each area. Within each section the local areas have been assigned a sequential number up towards the sanctuary. The most important part is described and shown through rough measurements of elevation placed over the plan on a scale of 1:150, or through photographs which may support the hypothesis of the vehicle track situation on the spot. Indications of construction work are designated as trace while specific indications of transport activity are indicated according to their actual function in the transportation work. Upward or downward gradients are given in percentages, against the background of the general consensus that c. 10% is the maximum upward gradient which a wagon with a heavy load can be hauled by a span of oxen. Directions of the compass are shown, for example, as 112° SE. They include simple compass readings on the spot and readings on a map, where GPS indications of altitude are also checked against indications of altitude on accessible maps. Unless stated otherwise, all maps and drawings are oriented with north upwards. Measurements and drawings were all undertaken on the spot with simple tools at the scale of 1:50. Approximate measurements, the positions of which are determined with GPS, are shown in an insert.

1. Sections and arrangements of stones' contours are drawn with bold strokes.
2. Traces of ancient shaping by hewing with a sledge-hammer, chisel or wedge markings etc. are drawn in with thin strokes. The surface of the earth where it has been reinforced with pebbles is indicated by dots.
3. Delimitations of rocks and individual partial cleanings are drawn with stippled strokes. The making of scale drawings and photographs was undertaken by G. Algreen-Ussing (GAU), unless stated otherwise.
4. Hansen & Algreen-Ussing 1975 is referred to as "Atlas" throughout. Amandry & Hansen 2010, is referred to throughout as "A&H 2010".

An Inscription: Kat[estrepse]

It was an unusual event that took place in and around ancient Delphi in 373 BC, and this event is the point of departure for the following account. The great Temple of Apollo, constructed in part with the aid of the exiled Athenian aristocratic family of the Alkmaionidai (Hdt. 5.62), had since 505 BC been known as the most important building in the centre of the ancient world, but it was no longer looking its best. The mountainside on which the sanctuary rested, made up of fallen stone, gravel, clay and earth from the Phaedriades cliffs, had slid down. It seems conceivable that this happened in the damp autumn. Weeks of pouring rain interrupted by one violent cloudburst after another undercut the slope of the mountain, on which the numerous treasuries, monuments and terrace walls were resting on their foundations. This had catastrophic consequences for the temple, which was the third largest of its kind in the Greek world.

The enormous columns, the architrave and the cella wall enclosing the sacred space had, in the night's violent storm, developed cracks and became distorted; the first visitors in the early morning witnessed the formation of deep cracks in the poros stone of which the old temple had been constructed. The assumption of a landslide is based on a fragment of a preserved inscription which tells us that "the Temple of Apollo had been destroyed

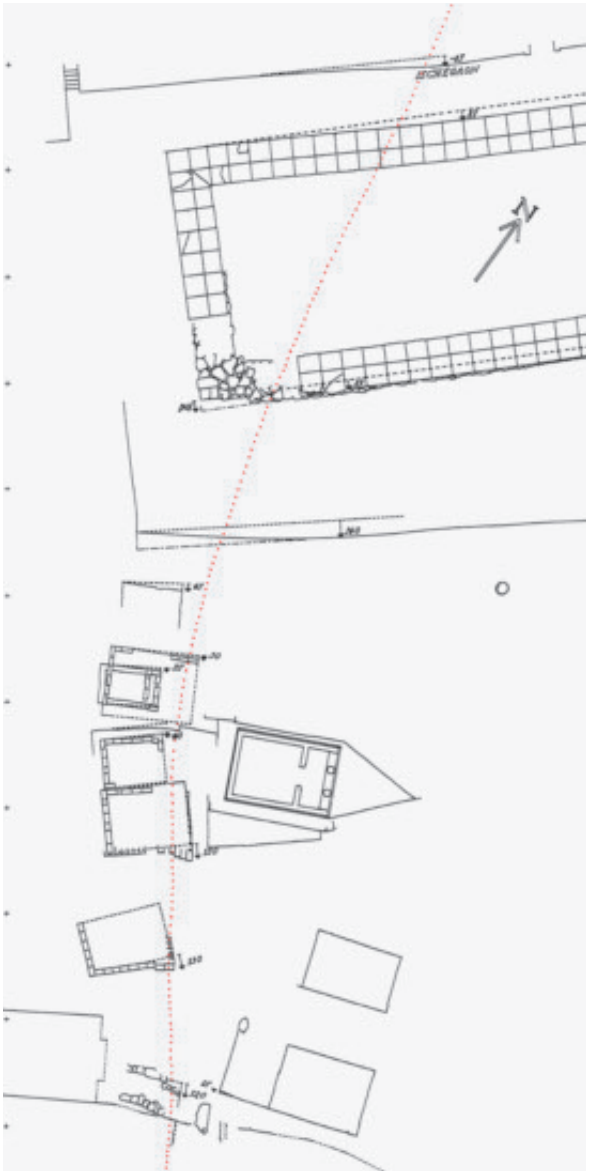


Fig. 2. *The landslide of 373 BC, drawn with red dots down the western section of the excavations in the sanctuary.*

kat[*estrepse*]" in the year 373 BC, where an earthquake is known to have happened.[4] Only the first three letters of the word given as the cause of the destruction are preserved, and we believe it should be restored as *katestrepse*, that is to say "landslide". Excavations in our own era have given us a detailed insight into what seems to have happened. Within the temenos wall of the sanctuary, ruins have been found of a number of Archaic treasure chambers, all of which were clearly deformed by a landslide. This follows a line running down through the sanctuary from north to south. It is possible to observe the direction of the landslide from monument to monument, and even the temple terrace and the building's underlying foundations exhibit a clear effect in the line where the displacement occurred.

The assembled picture shows a movement in the terrain which cuts through the entire sanctuary. Buildings that lay across this displacement, like the temple, were destroyed or severely deformed. The monuments and buildings that lay outside the displacement, such as the column base of the Sphinx and the Athenian and Siphnian Treasuries, avoided destruction completely. This is clear from their intact foundations, which are still visible today.

Perhaps this displacement in the mountain slope happened in a matter of a few minutes and moved no more than half a metre. But it was of an immense power, and it may have happened with an ominous slowness meaning nobody could hear it in the temple. To recognize the metaphysical cracking of this divine edifice, which had been visited by innumerable pilgrims from near and far, seeking advice about their future, must have felt like the power of fate. Despite the many visible fractures and distortions, the colossal body of the temple's building doubtless still stood on its twisted foundations with its time-honoured patina and the numerous embellishments and symbols which, through time, had been added to its walls and chambers. It must have been a shocking recognition when it gradually occurred to the skilled building contractors that a repair of the old temple was out of the question.

The dreadful decision to tear the old temple down to make room for a new one was unavoidable. The entire old temple had to be demolished in order to reach the distorted foundations.

The resurrection of the temple was therefore undertaken with the serious consideration that a new, stronger foundation for the building above had to be created; there was probably also the proviso that it must still be possible to hold temple worship during the rebuilding so that pilgrims, many of whom had made a lengthy journey, would not return home bearing the news that the sanctuary was

4 Only *kat-* is preserved, but it is likely that the text originally read *katestrepse*, aorist of *katastrefo*; see A&H 2010, 145 and *CID* 2, 55, 4. For the earthquake see Diod. Sic. 15.48.

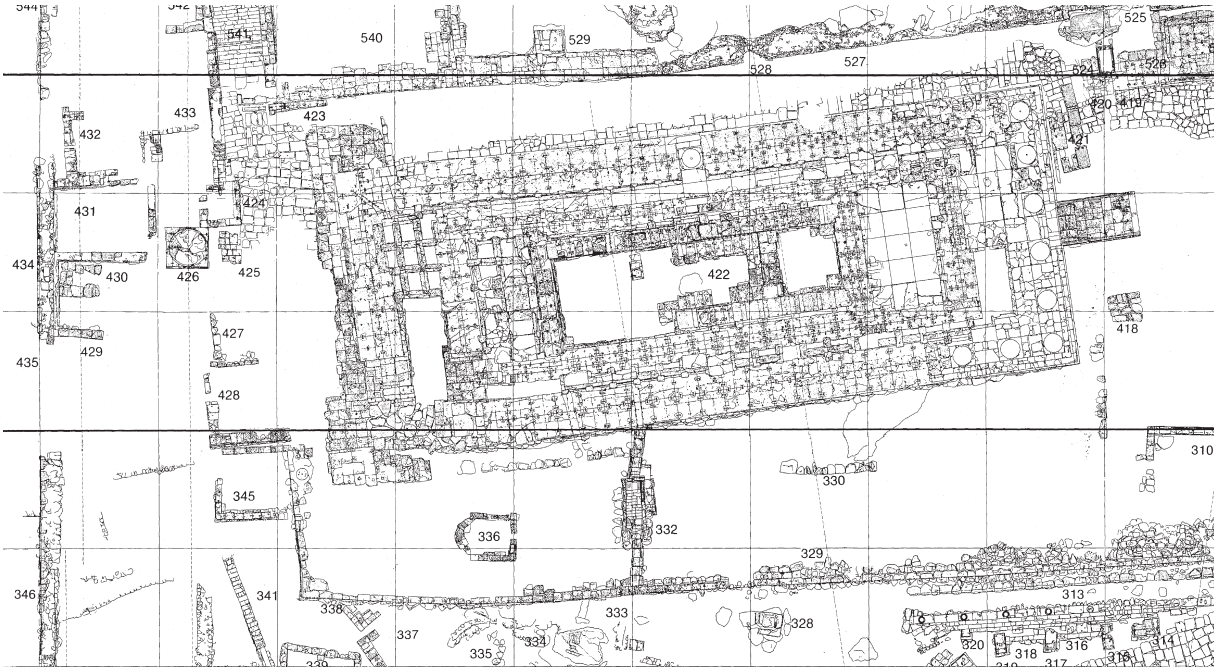


Fig. 3. *The foundations of the new temple as they appear today; between the 3 concentric frames of the foundations a binding stone framework has been inserted.*

closed. The erection of a "waiting room" up against the Ischegaon wall (Atlas 527) suggests there was such an arrangement, providing shelter for waiting pilgrims during the rebuilding.[5]

The sequence of the building of a new temple is apparent from the inscriptions which, fragment by fragment, offer an insight into the agreements, contracts and building materials which were the basis of the reconstruction of this massively important monument. It is moreover apparent from the exceptional construction of the temple foundations, which are visible today. These two sources give posterity knowledge of how, in the aftermath of the landslide, it was realized that the foundations for a monument of this size, in this location, had to be constructed according to principles which were different from those which had been used hitherto. This led to alterations in building technology in the new foundations, compared to the ones which had supported the temple that had been destroyed.

First, it was necessary to find a new, stronger kind of stone for the foundations for the columns and cella walls than the poros stone which had previously been used. Secondly, more robust joints had to be made between these new foundation stones with the aid of cramps and mandrels so that, as an assembled structure for the peristyle, cella wall and the inner colonnade, it could withstand the unstable earth pressure. Based on the actual experience this had to be taken very seriously, and it remained a concern for all construction on the sanctuary's sloping terrain. These building technological circumstances were explored in detail and described by Erik Hansen in 2010 (Fig. 3).[6]

The following account should be seen as a supplement to this examination of the temple's rebuilding. It includes the construction work in the landscape around the Sanctuary, as this was a precondition for the re-erection of the temple.

5 This information derives from an inscription from 355 BC, where the contractor Krémon of Argos was awarded 30 drachmas to erect a lean-to up against the Ischegaon; Poulsen 1924, 43, n. 5. But this may have happened as late as 335/34 BC: the Third Holy War in the years 356-46 would have made such activities unlikely; Bousquet 1989, 120-1.

6 A&H 2010.

A New Stone Quarry

Section A. Area A1. GPS 1.

In the period predating the catastrophe of 373 BC, the simplest constructions in the Sanctuary of Apollo were built with local limestone extracted from the nearby mountainsides. This type of stone, called "Parnassus stone", contains various kinds of limestone, which feature in many foundations, terrace walls and the surface of roads on the site. Prominent examples of the use of Parnassus stone before 373 include the terraces around the Siphnian Treasury (Atlas 123) and the large polygonal wall (Atlas 329) which forms the temple terrace. Parts of the wall enclosing the sanctuary are also made of "Parnassus stone". If we ignore the fact that many of these stones are loose blocks of rock from the mountain slopes which have been adapted to serve their purpose in these constructions, we know of two stone quarries from which "Parnassus stone" has been extracted. One of them lies directly above the stadium, the other, called Logari, a few kilometres east of the Sanctuary of Apollo and above the Marmaria Sanctuary. Both are at a distance and in locations which made the journey to the building site where the stone was used both short and easy to manage.

In addition to these particular quarries there are also marks of wedges in practically all the rock faces surrounding the sanctuary. The many traces of extraction in the rocks demonstrate that stone was removed from the mountain's visible structure, where the quality was sufficiently high to meet the standards stipulated for construction. The two quarries in question were probably brought into existence by the quarrying of an accessible cliff, which gradually showed itself to contain stone of a usable quality at considerable depth. No solid, homogenous limestone has been found in these quarries which would meet the requirements for the new foundations of the Temple of Apollo; besides, the two quarries could not provide the necessary quantities.

Fig. 4. *View from the St Elijah stone quarry on the southern slopes of Mount Parnassus. Delphi is situated far to the left of the picture, 300 metres higher up. In the background is the port of Kirrha, situated on the Bay of Corinth; to the left in the picture, the Pleistos Valley.*

The actual buildings, that is to say, first and foremost the temple and the treasuries from the time before the catastrophe, were most frequently built of porous poros stone, which was brought from the quarries in the Peloponnese and subsequently transported up to the sanctuary from the port of Kirrha. In none of these monumental structures or buildings do we find the homogenous blue-grey type of stone observable in the new temple foundations.

Against this background we have to assume that in response to the desire to construct stronger foundations for the resurrection of the temple, a new stone quarry was opened soon after 373 BC which could meet the new demands. We may assume that the search for this suitable stone was one of the very first activities into which those concerned put their efforts, as supply of the stone for the new foundations was a completely necessary precondition for the subsequent re-erection of the temple's enormous superstructure. We can only guess how the search for a stone of better quality in the mountains around Delphi was actually organized.

The hard blue-grey limestone that was selected for the building of the new temple is to be found 6 km west of the sanctuary and 300 m below the level of the temple itself.[7] The relatively long distance between this stone quarry and the new temple raises some interesting questions. How did the eventual selection fall on the special deposits in the distant mountains? Next, how did they accomplish the complicated task of bringing the stones, each weighing several tonnes, up the mountainsides to the temple building site.

Fig. 5. *View from the upper level of the St Elijah stone quarry, looking west, with the plateau and the Taratsa Ravine in the background to the left.*

7 The stone quarry is described in modern times in 1865, and named St Elijah by the Frenchman P. Foucart, with reference to the monastery which is situated above the quarry. Later, in 1914, the quarry is more extensively described by É. Bourguet and in 1981 by P. Amandry. Rough measurements were taken by Erik Hansen (cf. Fig. 6).

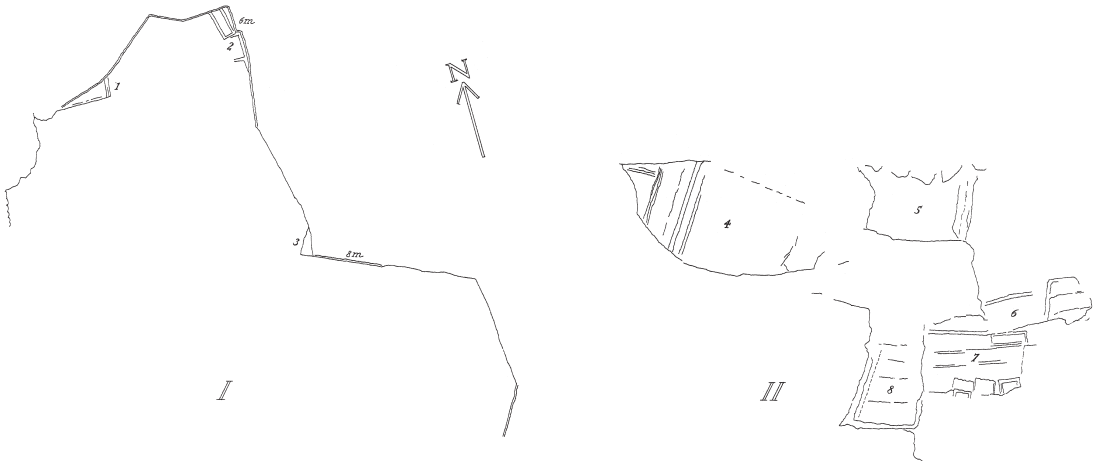


Fig. 6. *Sketch of two quarrying areas in the St Elijah quarry by Erik Hansen.*

Even in the form best suited to its use, the contractor had to evaluate whether the outcrop was of a sufficient magnitude, and how far it was situated from the building site. This evaluation must have included the character of the transport route and whether it was possible to construct a means of transport which could take the resources to the site. These matters were all essential to the opening of a quarry, not the least in the mountainous area surrounding Delphi.

In this context one crucial consideration has to be: how large must the haulage capacity be to bring the desired quantities of stone to the building site when the loads have to be pulled by oxen or mules? The increase and decrease in the upward gradients of the vehicle track impose limits on the size of the stones which could be hauled through the mountain. Thus the maximum size of the extracted stones imposes limits on the tectonic possibilities in the building work's construction and architecture.

Area A1

Section A deals with a stretch of road which may have been the point of departure for the transportation of the building stones we see in the ruins of the temple. It is situated in the mountains running down towards the south below the Prophet Elijah Monastery, where the new stone quarry was opened. This expanse of the mountain brings together a number of streams to form a larger watercourse with a corridor towards the south, which runs out on the lowland between the conurbations of Itea and Kirrha. This unpaved road, below the stone quarry which runs along

Fig. 7. *A road beneath the quarry, heading east towards Delphi.*

Fig. 8. *Area A1. Areas of rock worn until shiny and stone pavements, looking east on the road below the St Elijah quarry. GPS 1. On both sides of the lane are numerous loose stones with marks of wedges and chisels.*

the side of it across the area, today gives access to a number of recently planted olive groves, which encircle stone spoil from the quarry. It is probably the road Bourguet described in 1914,[8] when he could see ancient roadway fragments in the make-up of the track. These fragments were not discovered in our fieldwork in this area, but it is probably the same track as the one shown in Figs 8 and 9.

The present track leads from the stone quarry at Level 242[9] up to the later modern road east, where it terminates at Level 280. The length of the track in Section A is roughly 600 m.

Even though the stone in the surface of the track just beneath the quarry is completely worn smooth in many places, one cannot attach any significance to this observation as far as the precise location of the transportation of stone is concerned. The situation of the area has, without doubt, been dissected by the course of the road used as the connection between Amphissa and Delphi right up into modern times, leaving traces of heavy traffic. The later olive plantations may have altered the road's geographical position since Bourguet saw it. But regardless of where the ancient road was situated in the mountains, the steep gradient on the last part towards Delphi would have been hard to avoid, as is apparent from the following photograph, which shows the view looking southeast from the top of the quarry. At the end of the road's gradient it turns to the left in the picture, to the east and into the mountainside on which Delphi is sited (Fig. 9).

8 Bourguet 1914, 335, 339, fig. 121. É. Bourguet was the first person in modern times to have seen and described a brief stretch of a road below the St Elias quarry with ancient structures.

9 Levels above sea level are provided in this way throughout the text.

Fig. 9. *View over Section A from the middle quarry, looking south-east, where one can see the new olive plantations in rows. The track from the stone quarry in the middle of the picture rises up and cuts across the modern road and the Mornos Canal above. Here it turns to the east into the Pleistos Valley, where Section B begins.*

Delphi's upland and mountainsides were undoubtedly well-trodden even then, not just by herdsmen and peasants with their small, terraced fields, but also by people knowledgeable about building, who, as a result of the extensive building activity generation after generation, had used the sanctuary and its immediate surroundings as a stone quarry.[10] We can therefore presuppose that the search for a new quality of stone started from the many known paths and the course of the road which led to the unusual siting of the sanctuary on the steep mountainside (Fig. 10).

There is thus a connection from the east to the sanctuary, which passed the aforementioned quarry at Logari. Another is the connecting road from the west, which runs from Amphissa through an expanse of mountain between the Prophet Elijah Monastery and the promontory Taratsa

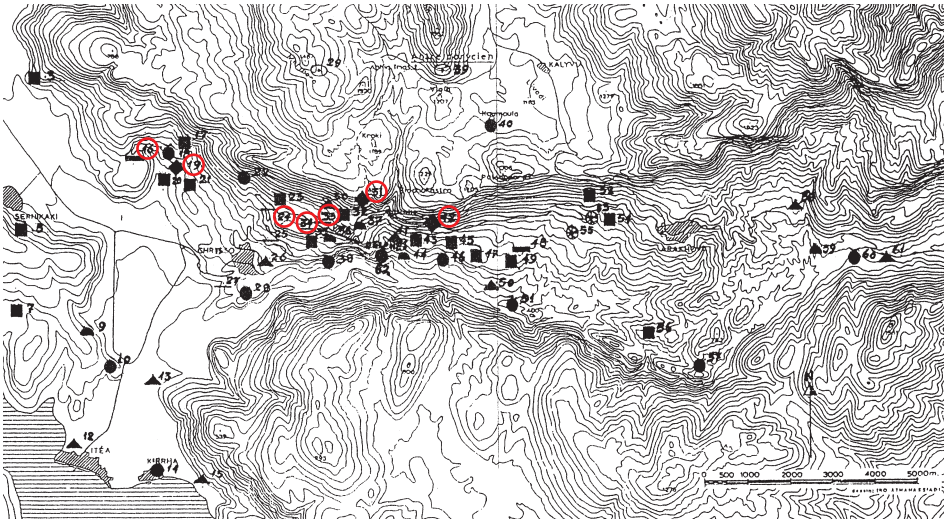


Fig. 10. *Ancient constructions in the region of Delphi. Quarries: no. 19; St. Elias: no. 31; Stadion: no. 42; Mellissi. Stretches of road: no. 16; Taratsa: no. 24; Gerospilies: no. 33; Xenia: no. 34; Elinia.*

10 Skorda 1991.

Fig. 11. *Map from 1852, which, in addition to a track between Amphissa (Salona) and Delphi, shows the stretch between the quarry and Delphi, indicated by red arrows. It also shows remains of towers and other ruins from antiquity indicated by "Tour H."; "R.H."; "Block. H".*

to the sanctuary. The last-named connecting road is to be found in a corridor in the mountains, which, seen from Amphissa, gradually rises up to Delphi on the southern mountain slopes above the plateau of the Pleistos Valley. Like so many courses of roads in the landscape, this arterial road follows the topographic conditions which display easy accessibility, and therefore has existed as a connecting road ever since the settlements of Amphissa and Delphi were founded. We have knowledge of the course of this road in the mountain from references by modern-day explorers, and it partly reappears in one of the first scientific mappings of the region, dating from 1852.[11]

It was possibly the traffic in this course of the road which led to knowledge of the locality of the St Elijah stone, in that the deposit lies in the same mountain corridor as the road. The architect of the temple and the people who knew the mountain probably began looking for new building material along the existing access road to Delphi. From these tracks their focus was directed at the outcrops of stone lying above the tracks, meaning the loading and unloading between the quarry and the transport route could be effected in a simple way, initially by using rollers in short bursts and then by wheeled wagons through the mountainsides. This latter form of transport is a point to which we will return (Fig. 11).

A project the size of the Temple of Apollo required the quarrying of 3500 m^3 of raw building stone. The visible hollows in the mountainside where the St Elijah stone was removed do not look at all impressive, however. The vertical traces in the quarry rise 30 m from an even level which has a total area of 2000 m^2. They divide up into 3 separate areas of quarrying along the existing road within a length of 200 m, each of which, with its traces of cutting and the use of wedges, appears as if they had only been left by the stone-cutters a week ago (Fig 12).

A view down the mountain from the quarrying areas gives an idea of the enormous piles of rock, gravel and earth that would have to have been removed to be able to get near a homogeneous, usable stone material. These heaps also contain the traces of the stonecutters' laborious liberation and initial shaping of the undressed building stones, each of which could weigh up to 9 tonnes. The eastern quarrying location seems to have been abandoned on account of the large fissures at this

11 Carte de la Gréce 1:200 000, 1852.

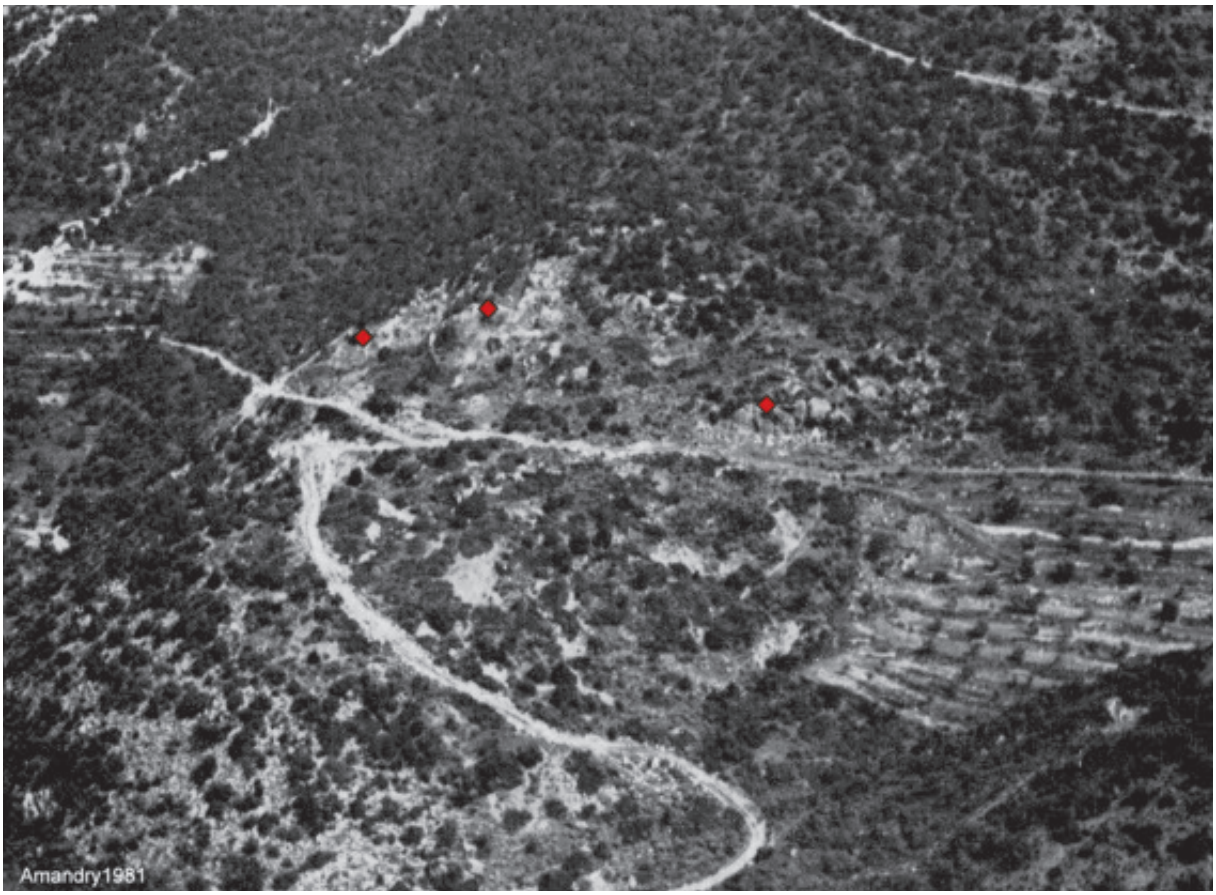


Fig. 12. *Aerial photograph of the St Elijah quarry, facing north; The three areas of quarrying are highlighted in red.*

point in the mountain. But one can clearly follow the carved outline of the individual building stones in two other areas of quarrying, after they came loose from the cliff. As is apparent from the aerial photograph, the three areas of quarrying lie directly above the existing road, while the grey nuances of the stone spoil form a heap of stones of slightly over half a square kilometre in area down the mountain slope.

If one estimates a waste of two thirds in connection with the quarrying of usable stone, one can calculate that in total, slightly over 10,000 m^3 of stone material has been extracted from the mountainside. Quarrying of the new building stone for the Temple of Apollo was doubtlessly carefully coordinated with the actual construction process itself up at the sanctuary. But the work in the mountain, as well as the building process, was interrupted, judging by inscriptions, for ten years from 356 to 346 BC, when the Third Sacred War was being fought.

Opening of the quarry is one of the first major tasks in the overall process. But the extensive construction work to provide a usable roadway also demanded meticulous planning. After an extensive survey, many working days were required to build the roadway through the mountains. This roadway had to be complete along its entire length before the first stone blocks could arrive at the building site to be incorporated in the foundations which were supposed to carry the temple's superstructure.

The stone quarry delivered more than 2,100 building slabs, which together had a total volume of 3,500 m^3. This means that the transportation from the St Elijah quarry to the sanctuary moved slightly more than 9,500 tonnes of building stones.[12] Working from an average load of 5

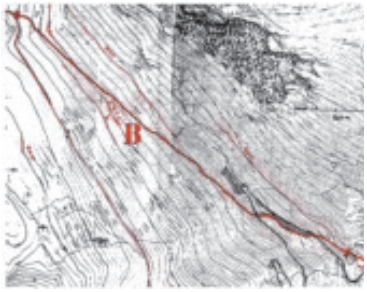
12 A&H 2010, 457, in that we have in mind a specific gravity of 2.7 for this homogeneous limestone.

tonnes per trip, each moving one or more building stones, the whole task would have taken 1,900 transport trips during the years of the construction of the foundations. As we shall subsequently discuss, one must assume that these specific transport trips were all carefully coordinated with the stages of building in the sanctuary. The inscriptions concerning contracts and contractors seem to confirm the supposition that there was some kind of meticulously devised timetable for the coordination of activities between the quarry and the building, e.g. stone blocks for euthynteria, for orthostats or for floor tiles and their foundations, so that a bulky piling-up or time-wasting lack of materials could be avoided.

In this context we can try to calculate how long, on average, it would take to transport a full load of stone from the St Elijah quarry up to the building site. We could start from the 156 stones for the outermost frame of the euthynteria: these were the first building stones brought up to the site. The average weight of each of these stones is 5.5 tonnes, in that we have added 20% to the weight of the "ready" stones which we can see today lined up in a row in their original position in the foundations. The 20% corresponds to a protective layer around the stone during transportation of 3 cm which was later removed. If we work from a wagon which weighs around 1.5 tonnes, the total weight of a typical transport of these building stones would be around 7 tonnes. As draught power we should envisage 6 to 8 oxen, which together could pull this weight on a rough track surfaced with roadstones.[13] With an average upward gradient of 6% in the corridor, one should reckon on a maximum draught speed of 1 km per hour. For the euthynteria stones the most we could hope for would be 7 to 10 traction hours to bring a block from the stone quarry to the workplace at the sanctuary. So we are envisaging one day per transport, when there should also be time for breaks in which oxen and drovers can rest and satisfy their hunger and thirst.

Next we have to estimate how many trips from the quarry could be accomplished in one day. This involves considerations of how many undressed building stones can be produced per day, and how many of the arriving stones for the building site can be shaped on the site, together with how many euthynteria stones it is possible to set in their final place per day. Whereas one can increase the number of trips without these getting in the way of each other, the situation is different in the work processes connected to the quarrying of the building stones, the dressing of them on the building site and their eventual putting in place in the temple. It is this last process in the new temple foundations which determined the rhythm of work in the St Elijah quarry. This is something of which we will acquire knowledge when we approach the building site at the temple. First, however, we will examine more closely the tracks of the stone transport on the steep mountainside, which can confirm that an actual path was made for hauling from the quarry to the sanctuary.

A Short Cut to Delphi



Section B. Area B 1-8
GPS 2, 3, 4

Should one become lost among the numerous tracks, which, like a fine pattern, have been trodden into the mountainside by sheep and goats, one will eventually notice a branching system of parallel paths which intersect with transverse ones. In this system there are no main streets and secondary roads, but recognizable thoroughfares which offer plenty of choices to anyone trying to find their way up the mountainside. These thoroughfares are characterized by their humble presence which does not reveal itself untill one actually walks on them. In this anonymous landscape one suddenly catches sight of a monumental row of stones which stretches out over the mountain's slope, across the rising geological formations which are oriented down towards the ravine and the val-

13 Landels 1978, 173-7; Korres 1993, 104.

Fig. 13. *Stone rows which in some places are made higher with an extra course; the flat façade in this terrace wall is given an even front with coarse adaptation, executed with a sledgehammer and large pointed chisel.*

ley. The large stones are lined up, side by side, in the form determined by nature. The stones are, roughly speaking, of equal size, in many cases weighing several tonnes. It is these dramatic stone rows which suggest a grandiose work of construction that engaged and combined with the principal features of the landscape. Merely the weight of a single stone, each of which was probably manhandled down from a chance place in the mountainside to a prearranged location in a stone row, demanded not only a well-organized collaboration between skilled building workers, but also tools which were capable of managing the moving of such heavy boulders on the steep slope. The linear positioning of the stones seems to demand as a precondition a directed organization of work, the intention of which could hardly be the construction of terrace walls for the small plots of land which the slopes make possible. Neither are the older donkey paths, which can still be found in the region, flanked by stones of this size and weight (Fig. 13).

On closer inspection it turns out that the colossal stones in these terrace walls often bear traces of a coarse hewing on one side and, in some cases, wedge marks attesting to their cleavages. In the places in this stone row where the pressure from falling rocks has tipped the large

Fig. 14. *Example of the stacking of large boulders, which may have formed the foundation for the lane.*

stones over down into the valley, we can now and then see a hewn bearing surface which has been left behind in the rock. Below the terrace wall a horizontal surface is often to be observed, which may have been a roadway. The side facing the valley has almost always slipped down, however, in some places leaving the remains of very large unhewn boulders piled up in rows which supported a lane (Fig. 14).

The varying directions for the stone rows discovered show that they lie on slightly ascending levels in the mountainside, with a southeasterly orientation in the range between 112° to 125° SE. The direction can be determined more precisely in places where this direction crosses the mountain's geological structure, which at intervals shows itself in small raised ridges descending towards the Pleistos Valley. The orientation of this natural feature is around 225° SW, meaning the erected stone rows must repeatedly cross the sections of rock of the mountainside. Where this crossing occurs, the ridge has been cut away to make room for the even stretch of the road. This feature can often be observed even in modern road-building when there is a need to cut through the rises in a landscape. The vertical side in this cutting-out shows, as stated, a more precise orientation of the stone arrangements. In those places where a horizontal surface has been cut into the rock, the cutting points towards the construction of a sequence which confirms that this may have been the location of road construction, the purpose of which was to establish a track. Here the question arises as to what kind of transport such an extensive road construction was intended for. We can rule out farmers having constructed these enormous retaining walls for plots of land or access to these. The same can be said of the course of the roads we call footpaths or bridle paths for pilgrims visiting the sanctuary, which to a greater extent followed the shape of the mountainside

Fig. 15. *The mountainside in Section B, looking west towards the stone quarry.*

in winding routes and bends, the purpose of which was the reduction of travelling time. With this proviso, the large stone rows may point towards three possible kinds of traffic. The first is transport of the large quantities of poros stone and building materials for the construction of the temple of the Alkamaeonidai in the 6th century from the port of Kirrha, which must have left traces on the mountain and of which the observable stone rows may be a part. Another possibility is that the roadworks may have been carried out in connection with the ceremonial processions around the temple in the years 380-79.[14] A third possibility is the extensive transport work in the years after 373, when the destroyed temple from the 7th century was re-erected in the sanctuary with new foundation stones. Finally, it is an obvious interpretation that we are dealing with a roadway which has successively served all three purposes. The problematic obstacle of the mountainside created a need for a passable corridor for the efficient expediting of heavy transportation. Reuse of an earlier sequence in the landscape was of course enormously practical. Such an earlier corridor had to be maintained and extended according to the various demands of the different aims. Herein lies a story of development, which is often characteristic of the siting of roads and tracks in general, and which in the present case suggests a surprisingly extensive programme of building work, 6 km in length across steep mountain slopes, which the present fieldwork has attempted to document (Fig. 15).

In the steep transition from the area of the mountain in which the stone quarry lies, to the relatively level south-facing mountainside which stretches towards the sanctuary in the east, the overall orientation of Kaltsi's Path alternates between 112° and 125° SE. This short cut to the sanctuary begins at Level 280 and ends at Level 484 with a total length of 2100 m. This means an average gradient of about 7%. The path in this section is pretty straight, turning after the first 1.5 km from a direction of 125° SE to a principal direction of 112° SE with local deviations. The first short stretch in the landscape has been drastically altered in modern times by new roads and by the so-called Mornos Canal. The last stretch of 500 m in this section lies close to the main road to the modern city of Delphi and cuts across it several times.

14 Forbes 1934, 104; cf. Pritchett 1980, 147.

Fig. 16. *Faint traces of a track running over a section of rock at a bearing of 114° SE in Level 362, with hewn areas. From the beginning of the vehicle track below the quarrying area itself and to the first indication B1 is roughly 1,550 m, where it has risen 120 m, giving an overall rise of 8%.*

Fig. 17. *Detail of Fig. 16, with transverse cutting.*

Area B1
Cutting into the Mountainside

The first indications of a programme of building work are to be found around Level 362. They are in the mountainside towards the Pleistos Valley, roughly 80 m above the Mornos Canal and 850 m from the place where Kaltsi's Path cuts the modern roads at Level 280-300. It is just possible to make out one or two terraces running east–west on the slope, which rises gradually.

On one of these rising levels one finds hewn areas in the rock. In one place there is also a transverse cutting which can be seen in Figs 16 and 17. GPS 2 (Fig. 16).

The transverse area of hewing may have been used as a bearing surface for a stone which was supposed to protect a roadway against sliding stones, gravel and earth from the mountainside above, which have indeed now slid. The cutting may, however, also be a gully to catch water for the thirsty oxen and their drivers after the steep journey up from the lower reaches of the mountain. A more thorough cleaning could provide the basis for a better understanding of this hewing in the middle of the mountainside's harsh landscape (Fig. 17).

Fig. 18. *Area B2a looking towards the mountainside. This cliff with hewn areas continues its course upwards behind the tree on the right, where Area B2b is situated.*

Area B2
Cuttings in the cliff with water-hole and line with arrangements of stones. GPS 3.

In the dense maquis of the mountainside a massive cliff emerges with clear signs of two hewn areas, which have arrangements of stones on their upper side. They lie about 150 m closer to the sanctuary than B1, at around Level 383. This means a average gradient of about 14% (Fig. 18).

Area B2a
Horizontal surface with water hole.

In the drawing of B2a (Fig. 19) one sees the vertical downward cutting of the rock of c. 1.4 m², and in a corresponding flat surface below at 5.1 m². Both surfaces have been dressed with a sledgehammer and a coarse pointed chisel. In the horizontal surface a natural irregular hole has been widened out. It measures 42 x 32 cm, with a depth of 28 cm. Across this surface are faint parallel lines along the mountain in the direction 123° SE. They are probably markings produced by successive cutting away of the rock, or in a subsequent levelling. On the slanting upper part of the rock are spread cuts from a point chisel which were probably intended to channel water down to the small water basin. People who frequent the mountain claim it is often full of water.[15] Below the horizontal level in the rock lie a number of large stones, which may have come from a foundation for the aforementioned levelled

15 For example, Lambros Altiparmakis, formerly employed by the museum, who drew our attention to the place and the water hole.

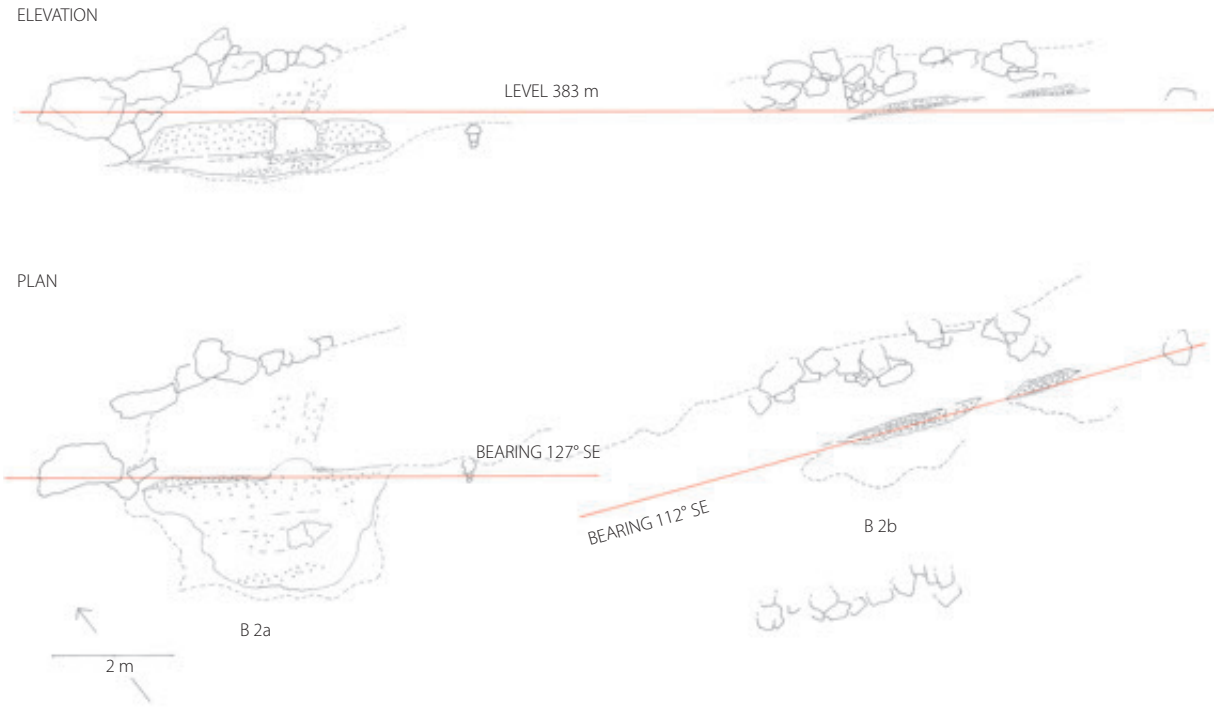


Fig. 19. *Areas B2a and B2b, elevation and plan of the hewing of a larger area of rock with a protecting arrangement of stones laid on top. Scale 1:150. The horizontal red line in the elevation shows Level 383. In the plan the red line shows the compass direction 127° SE in 2a and 112° SE in 2b. The sketch shows the bisected area. The course displays a presumed turning of the road.*

Figs 20. *Area B2a seen from above. The faint stripes in the surface may derive from successive cutting of the cliff. The hewing was carried out with a sledgehammer and coarse pointed chisel.*

area that has slid down. This relatively large surface may, if occasion arose, have served as either a halt or a "lay-by".[16] At the very top a protective arrangement of stones has been laid on top of nine large stones. They are all so heavy that it would take a team of workers with the aid of some kind of equipment to bring them down from the mountainside into their places (Figs. 18 and 19).

Area B2b
Hacked-out line in the rock.

Eight metres east of Area B2a a 4 m-long linear cut has been made in the rock with a sledgehammer and coarse chisel. It has a gradient of 15% and begins 40 cm higher than the surface in 2a. The overall length of the two areas is 16 m and exhibits an upward gradient of 8%. The cutting

16 Bourguet 1914, 338.

Fig. 21. *Area B2b looking west, with Area B2a behind the trees; large stones of irregular shape are laid above the straight cutting.*

Fig. 22. *Area B2b seen from the valley side; the beginning of the linear cutting which rises to the right is visible in the background, while traces of the foundation for the lane is visible in the foreground.*

in 2b is in the direction 112° SE, so 11-15° towards the north in relation to the orientation in Area 2a. The intention of this may have been to find secure purchase for the upper side of a roadway in the steep slope (Fig. 21).

Areas 2a and 2b represent the only place where we can determine that there was a significant turn in what we regard as a vehicle track for the heavy building stones from the St Elijah quarry. The relatively large flat area in Area 2a may be a "lay-by" or "passing place", but could also be interpreted as a horizontal underlying layer which makes a turning possible in the transportation of the heavy building stones. We will return to this below (Fig. 18-19).

É. Bourguet's Road

Area B3

The straight stretch up over the mountainside from Area B2b to the modern main road's first 180° swing from Delphi towards the lowland is about 400 m. If one follows the orientation in the clusters of heavy stone which show themselves, now and then, in the vicinity of Kaltsis' Path on this stretch, the elevation rises from Level 383 to Level 431. This means an upward gradient of roughly 12%. In this ascent towards Delphi the mountainside rises more

Fig. 23. *Big clusters of colossal boulders below the place where the modern road from Delphi to Itea takes a 180° turn for the first time; they may be foundations for the roadway and seem to be in situ, at an orientation of 125° SE.*

steeply. The area seems to be dissected by many faint intercutting paths which can be sensed in the levels of the mountain. They may be connected with the many surviving arrangements of stones which are to be found further down towards the valley and which may have links with the many different connecting tracks that must have been used from the port at Kirrha up to the sanctuary and in the subsequent cultivation of the mountainside. These tracks for animals, however rare, have stones of the size we find in the aforementioned stone clusters around Kaltsis' Path (Fig. 23).

Area B3
Double track with "sidewalk". GPS 4.

To our surprise we discovered an area with a double track. This means two parallel hollowed-out cavities in the rock at a distance of 145 cm apart. These are without doubt ruts for a wheeled wagon, since the surface of the rock in between rules out the use of a stone sledge on rollers. Visible in the rock between the two wheel-ruts is a strip of superficial cutting with a point chisel which has the same orientation as the roadway. We interpret this as a preliminary orientation mark for the course of the roadway in the mountain, which would have been marked out by persons who knew the mountains well in advance of the subsequent construction work (cf. Fig. 50). The area is dominated by massive projections which slope precipitously. They often leave narrow passages for the roadway in the steep mountainside. At this point the building workers have therefore hacked out an even stretch in the slope of 60 cm along the roadway, as a kind of sidewalk, to create an overall passage for wagon, oxen and drivers of about 3 m (Fig. 24).[17]

If we assume that the breadth of road necessary for a team of two oxen is about 160 cm,[18] the pavement at this point can compensate for the sloping rock surface close to the southern wheel-rut toward the valley. If this was the case it would not be possible for either oxen or drivers to find a foothold there. At the same time the sidewalk provides the option of hauling at an angle to the mountainside. The crooked pull would prevent the wagon from sliding off down into the valley.

The hauling at an angle can also be explained with the narrow parallel hewn areas in the line where the lower wheel-rut towards the south has its direction. These parallel hewings, which get displaced to a lower and lower level, indicate that the sloping rock created problems for the construction of a wheel-rut that could keep the wagon at a reasonable angle. The hewn areas in the rock create a rake of about 10° for the wagon, which must be the limit for carrying out the stone transportation. For this the wheel's axle's clearance comes over the rock surface, between the wheel-ruts. The surface is of such an irregular character, despite having been worked, that here we must be dealing with transport on a wagon which had a wheel

17 A corresponding "sidewalk" can be found on the upper side of the Koile Road up to the Acropolis in Athens (personal observation G. Algreen-Ussing, Sept. 2015).

18 We are assuming a breadth of 5 English feet for a span of two oxen. Burford 1960, 13.

Fig. 24. *Two parallel wheel-ruts cut into the rock in Area B3, seen from above looking south; the track is cut into the cliff-side with a "sidewalk".*

Fig. 25. *Elevation and plan of Area B3 with two sections; scale 1:150.*

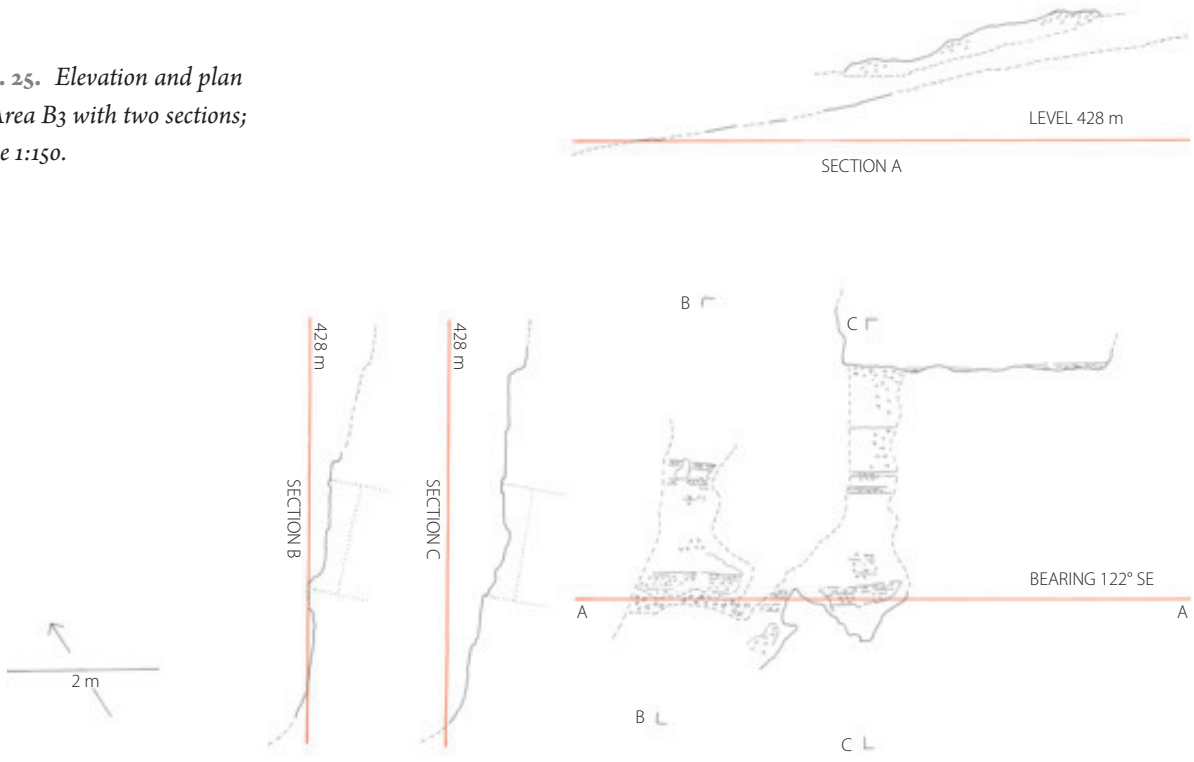


Fig. 26. *Left wheel-rut seen towards Delphi; above is the edge of the sidewalk.*

Fig. 27. *The right wheel-rut seen across the roadway; it appears to have been recut several times.*

diameter of 80 cm minimum. If there is evidence of wagon transport here, we conclude that they must have used the entire length of the vehicle track. This is our justification for only talking about a wagon with wheels and rejecting the idea of a stone sledge pulled on wooden rollers. The term "wheel-rut" is something to which we will return (Fig. 25).

The wheel-ruts lie at around Level 428 with a direction around 126° SE, in that they turn slightly inwards toward the mountain. They appear to have a steep gradient on this short section, which can be measured to around 17%. Even the cutting of the double track was done with a point chisel and the rock surface between the wheel-ruts has been worked. The distance between them is, from centre to centre, 145 cm, with a depth of from 5 to 12 cm with flat bottom and a breadth up to 25 cm,[19] which is clearest in the upper wheel-rut, looking north.

About 20 m towards Delphi several transverse "steps" have been laid across the direction of the wagon track in B3, which suggests the passage later was used as a donkey path. These steps lie on the fallen stone and piles of earth. Their "stepwise" positioning may in part have been intended to provide some respite to the donkeys, instead of keeping them moving constantly on a continually sloping, ascending or descending surface; this stepping was also a way of diminishing the erosion effect of a running watercourse, which can be very damaging to a sloping roadway bedded on earth (Figs. 26 and 27).

D. Skorda's short cut

Areas B4 to B8. GPS 5-10.

Area B4

The transition from Area B3 to Area B4 happens through a steep slope in the mountainside. It is precisely at this point on the slope that the modern road has been con-

19 For a comprehensive survey of gauges see Pritchett 1980, 195 in which he concludes that the standard width of ancient Greek wheel tracks is 140 cm, with a few deviations. But the rock-cut ruts over the Isthmus (Diolkos) show an axle breadth of 150-60 cm, according to Raepset 1993 possibly because of special wagons. We are grateful to Tønnes Bekker-Nielsen for this important reference.

Fig. 28. *Area 4a looking east, where the tracks in Areas B4 – B8 are on a line.GPS 5.*

structed across the roadway we are examining. It is difficult, therefore, to see how the vehicle track can be followed from Area B3 over to Area B4 above the modern road, where we find lengthy stone rows, hewed points in the rock and numerous wheel-ruts, lying in an extension of each other.[20] Their general orientation in the roadway changes to 112° SE. The distance from the tracks in Area B3 to those in Area B4 is about 100 m, with a rise of 11 m. This works out as 12% in a straight line (Fig. 28).

The overall length of the Areas B4-B8 is 550 m. The rise for the first 300 m, which cut their way up into the slope of the mountainside, is barely 10%. The final 250 m, which make up the area from B7 to B8, consist of an even plateau which is terminated by a new slope across the orientation of the vehicle track, the uphill gradient of which is roughly 20%. This slope is partly concealed by modern building debris, which makes it difficult to determine its profile. Standing at the top of the slope is the new, small Church of Hosios Loukas, which forms the transition to Section C.

Arrangements of stones and massive hewings in areas of the rock link Areas B4a and B4b. They protect the roadway against sliding stones, pebbles and earth and bear witness to an impressive building work which would have demanded a lot of man-hours (cf. Fig. 29). In many places bearing surfaces have been cut for the stones, each weighing several tonnes, in the solid rock of the mountain. In other places the rows of stones have been found in the eroded falls of rock. In some cases the wedge-marks show that the stones were split. Often the façade facing the road has been worked with a sledge hammer and point chisel, so that here the violent natural shapes of the stone rows form a curiously uniform sequence facing the roadway, which follows this formation. In some places the great stones lie interlocked with each other in several courses, having thus formed a

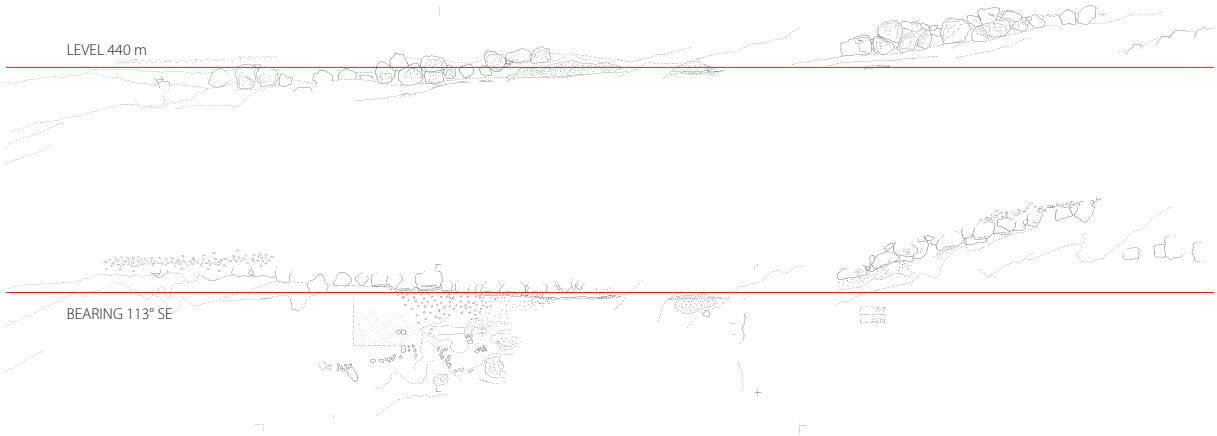


Fig. 29. *Elevation and plan of Areas B4a and B4b, both of which bear traces of a track channel for the wheels.*

20 Cf. Skorda 1991, no. 24, Gerospilies (route).

Fig. 30. *The orientation of the stone configurations around 113° SE continues through Areas B 5, 6, 7 and 8 – in all a stretch of roughly 550 m.*

Fig. 31. *Area B4a; hacked out wheel-ruts in a direction of 113° SE at Level 440, GPS 5.*

more durable bulwark against the mountain's movements and rockslides since, according to our reckoning, they were set into the mountain shortly after the catastrophe of 373 BC. This was followed by the building of the roadway itself, of the foundations of which we have pitifully few remains, since these slid down the mountainside.

Area B4a

The fact that we can talk about a deliberately laid vehicle track for transportation in this area is because we can already see the initial evidence of such transport within the first 25 m in Area 4a. There is a single wheel–rut cut down into the upper part which may once have been the course of a wagon across the rock surface at this point (Figs. 30 and 31).

Even though no excavations were undertaken during the fieldwork, and only a few instances of superficial cleaning were carried out, the base for the roadway between the two rock surfaces, which it passes, looks as though it is merely stamped earth, reinforced with pebbles. One can see on the rough measurements of Area B4a that the cleaned field with small pebbles right up to where the roadway is led into the hacked-out tracks in the rock surface. The field is shown with dots. At the same time it is possible to see that the rut in the rock is cut in the form of a fan, which may be a way of steering a wagon wheel into a delimited field in the surface of the rock.[21]

The running surface is flat-bottomed, with a width of about 25 cm and soft edges up to the surrounding rock surface. Visible in many places along the edge are cuts made by a point chisel. The nearest surrounding rock is shaped with a point chisel, forming a flat, ascending surface. The naturally occurring depressions in this surface seem to be filled with pebbles. In the eastern termination of this indication of traffic is a v-formed channel in the surrounding under-layer of pebbles, which may be a sign that the wagon had a considerable rake at this point. It may also have been formed by another type of wagon wheel, from the use of the roadway once the transportation of stone ceased. The drawing (Fig. 32) shows another two areas which are covered by pebbles: an area above

21 On Malta one can see fan-shaped "entrances" in the so-called "cart-ruts" when they run from a surface of earth into the soft limestone, which later hardens on the surface through calcification. On Malta these tracks are produced by wear and tear, in contrast to the Greek ones which were intentionally cut. This is one of the causes of the many parallel tracks on Malta. Algreen-Ussing 1992.

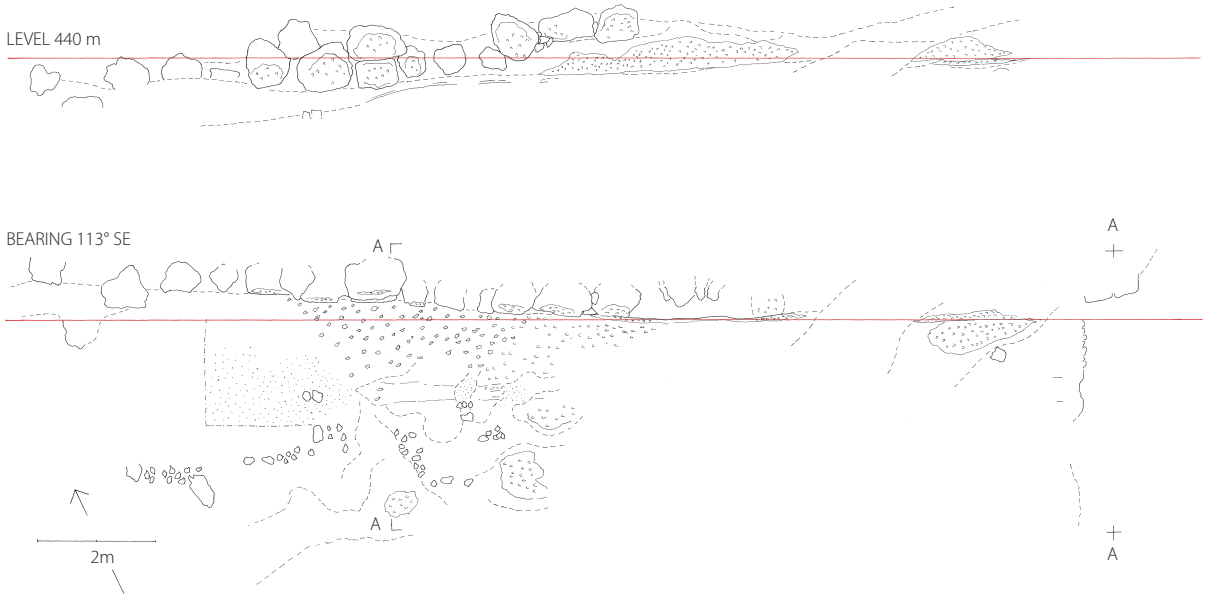


Fig. 32. *Elevation and plan of Area B4a; scale 1:150.*

the roadway's protective row of stones and an area where the layer of pebbles covers the roadway. In either case this may be a donkey track made at a later date.[22] Presumably the lowest was laid first and then the uppermost later, due to the successive filling up with stone, grit and earth from the mountain above. Both stretches of pebble layers are doubtless the vestiges of Kaltsis' donkey track.

Area 4b

16.5 m to the east there is a brief stretch of a channel for wheels, which is a continuation of that found in 4a. It has the same orientation, but it was only possible to clean a very small patch.[23]

As is apparent from the rough measurement in Fig. 29, the row of large stones above the track is laid on this cliff. Here too there are wedge marks from the splitting of larger stones, and some with the coarse marks of sledgehammer and pointed chisel. The rock itself has been worked with bearing surfaces for arrangements of stones as a base for the subsequent construction of the terrace walls.

Area B5

The first visible stone rows in Area B5a lie spread out on a gently sloping terrain with a few rock projections in the fallen grit and detritus from the modern road above. It

22 Pikoulas 1999, 250-5.

23 During our fieldwork we only had permission to clean small patches. The track lay on the mountainside in such a way that if we could have cleaned a larger area, we might possibly have found a complete section in the roadway and its ruts.

Fig. 33. *About 40 cm of uncovered wheel rut, which continues the rut in 4a, visible in Fig. 29.*

was possible to pull a stretched rope over all the arrangements of stones from a point in 4b, which showed that the scattered larger stones in Area 5a followed the same direction, around 112° SE, with a gradient of 12%. On the front of the largest stone there are hewed areas made with a sledgehammer and a point chisel. Some have wedge marks which suggest a splitting of the stones. Both above and below the stone configurations there are traces of a road surface with small loose stones, which suggests a later donkey path.

The consummate precision in the stone configuration, which combines an orientation determined according to direction with an incline determined according to functional considerations, presents an astonishing insight into the organization and practical execution of the building work. The scattered stones in B5a–b form a stretch of about 47 m overall, of which only a single trace has come to light in the roadway (Fig. 34).

Area 5b

This wheel rut bears the marks of wear and tear and erosion, with a few chisel cuts in the sides. It rises in a gentle slope at around Level 448. The total length is 270 cm, with a depression in between the two cuttings of 70 cm. The direction is 111° SE. The minimum width of the wheel-rut is 20 cm, with soft edges of 6 cm from the flat bottom. In the transverse fissure between the two areas of rock there is a filling of pebbles. The hewing shows faintly fan-shaped entrances for approaches to Delphi (Fig. 36).[24]

24 Cf. Note 22.

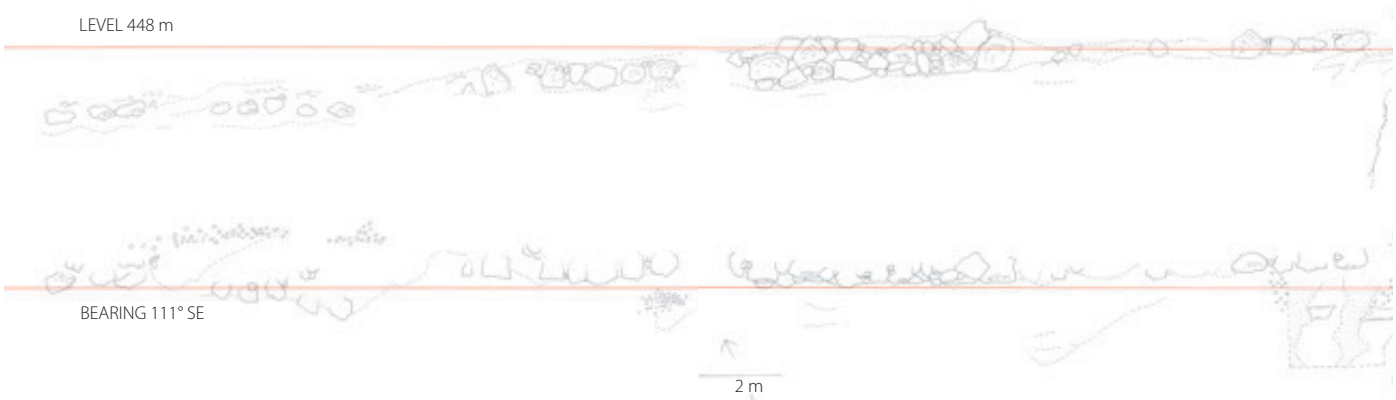


Fig. 34. *Elevation and plan of Areas 5a and 5b.*

With some cleaning around the rock surface, the earth shows itself to be reinforced with stones and pebbles. But it is hard to be sure whether this was produced by detritus from the cutting of the facades of the terrace wall above, or with the intention of reinforcing the roadway. Above the terrace wall there were remains of a road surface of small stones. Alongside the terrace of 5b, facing the valley side there is a heap of large stones on a lower level about 6 m below the track we see in Fig. 37. By and large they follow the orientation of the lane and may have been the remains of a foundation for the building up of the roadway into a larger version of the same, but it may also contain stones which have slid down from the upper arrangements (Fig. 37).

Area B6

11.2 m in the direction of Delphi from Area 5b there is more evidence of the possible track. It is a rut 120 cm long

Fig. 35. *A wheel-rut in two sections at a bearing of 111° SE at Level 448, GPS 6; the vehicle entry points towards Delphi are shaped like fans.*

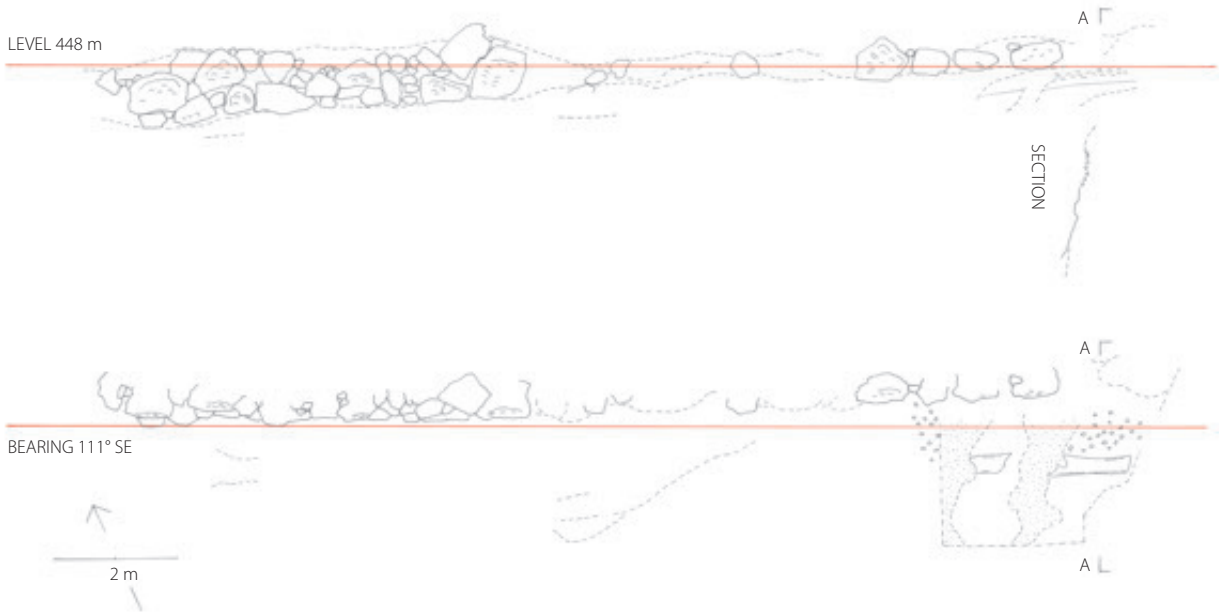


Fig. 36. *Elevation and plan of a worn rut in Area B5b; scale 1:150.*

cut down into the rock, forming an extension of 5b, but turning a little towards the east: its direction is 104° SE at Level 448. An oblong stone of 25 cm, which fits into a cavity, has been inserted into the cutting. The stone appears to have been shaped and worn on the upper side.[25] The ruler indicates the direction of the track, which is 104° SE.

This location is special because the rock close to the rut falls steeply down towards the valley. A foundation for the roadway on this side would demand extensive construction work. It is therefore possible that the roadway's upper rut lies underneath the fallen stone from the mountainside, just as was the case with B3 (Fig. 38).

At any rate the construction of the roadway might have been fairly extensive in this steep location. But it cannot be physically pointed out since the mountainside, shortly after the track found in B6 is covered with a large cone of building spoil from the construction of the modern road above. It conceals the next 40 to 50 m of the mountainside under which the roadway must have run (Fig. 40).[26]

Fig. 37. *Remains of a support wall below the track in Area B5b.*

25 In Malta too, stones are found inserted into the chalk to guide traffic, especially in places where a number of tracks intersect.

26 The cone is drawn in on the Greek military map from the 1960s.

Fig. 38. *Photo of rut B6 when looking east toward Delphi, GPS 7. The running surface is 120 cm long with a flat bottom 30 cm wide. The direction of the rut follows the ruler.*

Fig. 39. *Detail of the rut B6, with the inserted stone.*

Fig. 40. *Area B 7 looking west, where the stone-settings along the track come out of the "rubbish cone." Orientation is 112° SE at around Level 450.*

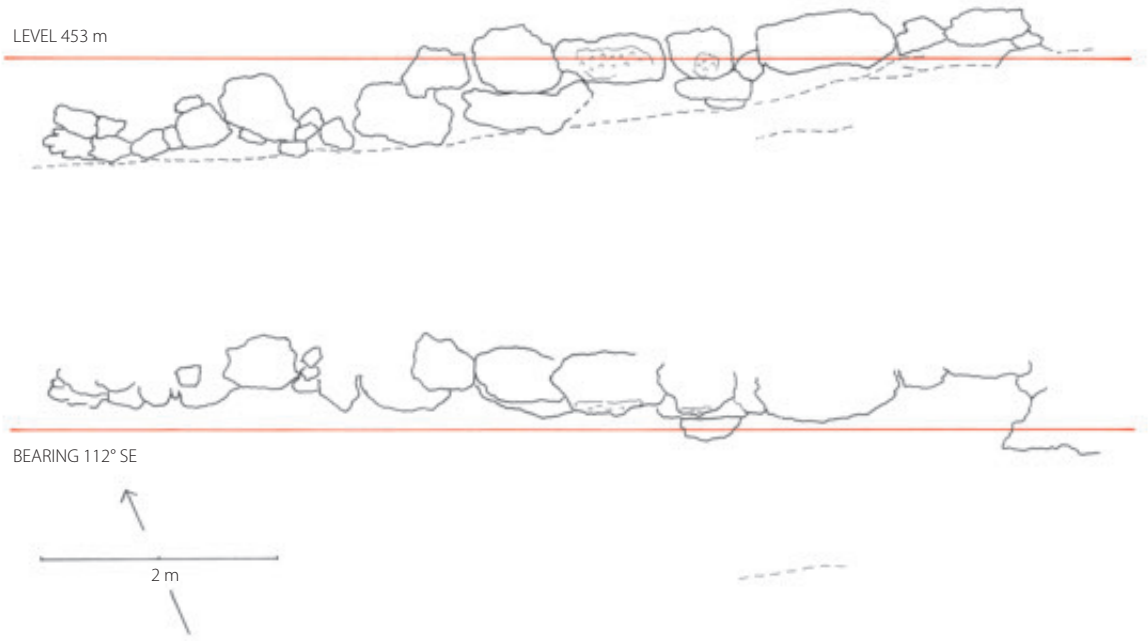


Fig. 41. *Elevation and plan of a stone row in Area B7. The lowest stones are situated directly on the rock and are loosely fitted. A number of stones have been worked with a coarse sledgehammer. GPS 8.*

Area B7

The landscape of the mountainside towards Delphi, southeast of the cones of detritus, changes to a flat surface with a very slight rake which also stretches up above the modern road. It is covered with earth which bears the marks of cultivation (Fig. 40).[27]

On the edge of this surface facing the valley lies a stone row of 16.5 m, orientated 112° SE. The distance in a straight line to the track in Area B6 is about 56 m. The stone row is a continuation of the aforementioned configurations of stones which are built up in connection with the quarry road. The row of stones gives the impression of being a foundation for a minor terracing, which could support the roadway. This assumption is based firstly on the fact that the area above approaches a horizontal surface, which does not necessitate having an extensive foundation. Secondly it is a general characteristic of the few visible foundations towards the valley that they are more irregularly built up than the upper façade towards the roadway, which has been the object of much more meticulous workmanship.

The site of the flat plateau at Gerospilies is delimited to the south by a pronounced edge facing the valley. It appears about 50 m south of Area B7. The configuration of the boulders along this edge forms a large curve, which for the first 100 m has a direction of 125° SE but then turns towards the following Area B8, orientation 106° SE (GPS 9). This sequence may possibly be parallel to the vehicle track at this point, or it may come up from the lowland and the port of Kirrha. This relatively flat, cultivated plateau in the mountainside may, in this connection, have formed an accessible entrance corridor for a number of sequences from the west and the south which run in the direction of the sanctuary from the landscapes below. They thus get around the steep rock wall by 1.5 km, which is visible on the map (Fig. 1). It separates the landscape in which Chrisso lies from the land above, in which the modern city of Delphi is situated (Fig. 42-43).

27 Above the modern road, tucked into the mountainside, there are deep wheel tracks in the roadside at Level 468, which point up towards the tower, Skorda 1991 designates them by the number 23; Gerospilies. GPS 10.

Fig. 42. *A covered outflow at the edge which goes round the flat, cultivated level at the site Gerospilies; in the background, the Pleistos Valley. GPS 9.*

Fig. 43. *The outlet, which is possibly a land-drain off the cultivated area, seen from outside the edge*

Area B8

Towards Delphi the flat area east of B7 terminates in a small ridge which rises up to above Level 500. In modern times, the small church of Hosios Loukas was built on this promontory. The promontory has the form of a 20 m-high slope with a rake of roughly 20%, which the direction of the roadway will overcome. The ascent is based on an

Fig. 44. *The 3 hollowings-out C, B, A, seen from above the promontory looking west; there are probably more of these "post-holes" buried under the detritus*

estimate, because the slope on the upper part is overlaid with discarded building materials, mainly building stones. On the lower part of the ascent the rock emerges at certain places. It was here that three four-sided cavities, roughly 20 cm deep, were found, cut with a point chisel in the solid rock; an additional one, broken on one side and situated 10 m to the south of the others, is possibly a fourth (Fig. 44).

The three square holes lie not quite on a line but follow an approximate orientation of 92° SE. The middle one, B, lies with its surface at Level 485. There are probably more instances of such holes. It is conceivable that they were used as bollards, which could secure the towing ropes with some kind of tackle on the steep slope, as is known elsewhere.[28] One reason for hauling the heavy loads up into the roadway's previous orientation – rather than dragging the loads of stone around the slope, following the course of the modern road – may be rooted in the difficulty with the relatively large turnings, which, if occasion should arise, would involve both wagon and the hitched-up oxen. To haul the wagon up the steep slope with the aid of tackle must, however, because of the rake of the wagon have necessitated the securing of the loads of stone in the timberwork of the wagon (Figs 45-48).[29]

28 Korres 1995, 103, figs 28-9.

29 If this route over the promontory was also used for transport from the port of Kirrha, from which the 4 m-long, 8 tonnes architraves in poros for the temple's superstructure had to be hauled, there seem to be good reasons for these bollard holes.

Fig. 48. *Detail of Fig. 47.*

Fig. 45. *Lowest posthole A at Level 483; it was probably rectangular and measures c.17cm on the measurable side and at the bottom less than 18 cm.*

Fig. 46. *The middle hole B at Level 485. It is very nearly intact, with sharp edges, and measures 18 x 18 x 20 x 16 cm with a depth of 20 to 24 cm. GPS 11.*

Fig. 47. *The uppermost hole C, at Level 486, situated 3.1 m above hole B; it is similarly well-preserved.*

Fig. 49. *Friedrich Nerley, Buffaloes Hauling a Block of Marble, 1831-1844.Thorvaldsens Museum, Copenhagen.*

Road and Wagon – Digression 1

Figure 49 features pairs of oxen pulling a wagon with a block of marble, on which the name Thorvaldsen is written. The scene is from a quarry in Italy and the painting shows the wagon with rigid axles, carrying a block weighing some 6 tonnes, hauled by 6 oxen. To the left is a man who is pushing the right front wheel with a long, robust pole so that the wagon is put correctly into the turning which can be seen in the rough track and which corresponds to the torque exerted by the oxen. This shift in the orientation of the wagon seems to correspond to that which occurred from Area 2a to 2b in Section B (Fig. 49).

Studying this painting enables us to form an idea of the considerations which had to be explored by those who knew the mountains well, as well as by wagon makers, when it was decided to open a stone quarry 6 km west of the sanctuary. One of the most difficult tasks was negotiating the expected rises and falls in the road used for transporting the stones. It was the task of locals familiar with the mountains to pick out the most coherent route on this particular mountain. The challenge, however, was just as much a question of the wainwrights' ability to construct a vehicle which, with its load of several tons, would be able to stand the combined hauling power of the many oxen. In this context the character of the roadway and the capacity of the wagon imposed limitations on how heavy and large the stones could be which were to be hauled up to the temple building site.

Our knowledge of Greek temple building shows that the stone sizes in the building's individual elements were all established in a mutual relationship, and this also applied to the foundation stones which went into the rebuilding of the temple at Delphi. The question was how large and heavy the stones which the architect could expect to have made available to him would be while projecting the new foundations. How would the construction work of the trackway be carried out on the mountainside so that he could answer this question, which was so crucial for the temple's architecture?

The first sketch shows the recommended course of a route on the mountain that the building work should follow. That is, markings on the mountain for a roadway which, from area to area, could be linked with rises which

Fig. 50. *Phase 1.*

Fig. 51. *Phase 2.*

were surmountable for the harnessed oxen. In individual places – e.g. in Area B3 – areas of surface shaped by hewing the rock are visible, which have indicated the direction of the tracks, but are not part of them. They can be interpreted as guiding markings put there by those familiar with the mountains for the construction workers around the course of the roadway in that spot. By means of this guidance, the building work could be commenced in several spots at the same time. The first thing was that the workers cleared a broad track and then cut away the frequently occurring minor cliffs, in the direction shown by the markings in the rock surface. Where the rake of the mountain was so large that the building workers estimated that the outer side of the roadway could not be built up sufficiently to provide purchase for oxen and drivers, they hacked out a "pavement" in the upper side of the slope, as is apparent in B3 (Fig. 50).[30]

The situation in the second sketch shown in Figure 51 is the building up of the foundation of the roadway and the construction of the protective terrace wall above the road. But before the cutting in the sketch could proceed, large rough stones for the foundation of the roadway were pushed down into place. Now and again they are laid in cut-out bearing surfaces, where it was necessary to secure their position on the steep mountainside. The same procedure was followed in the terrace wall above, which is visible in, for example, Area B4, where the side facing the roadway has been turned into an even façade (Fig. 51).

As the third stage in the construction of the roadway, ruts were cut for the wheels. The ruts have a width of between 15 and 25 cm and are flat at the bottom. Their width meant that a wagon wheel with a width of 10 cm would have been able to roll in the rut with less turning,

30 Cf. B3.

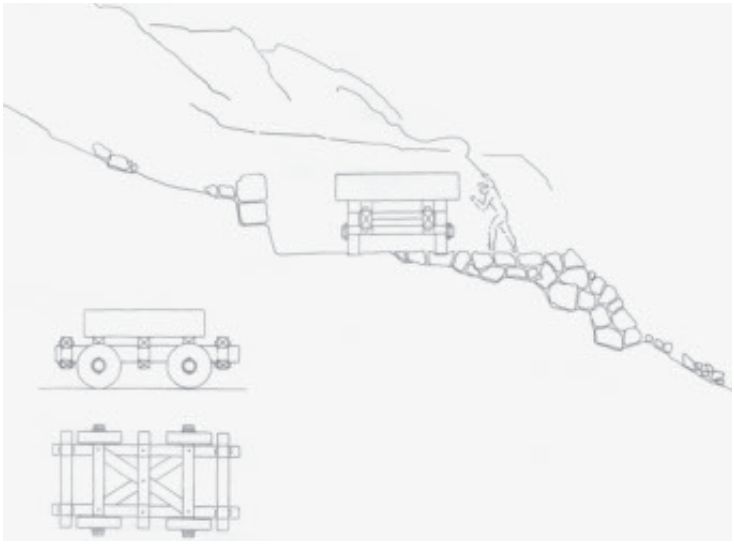


Fig. 52. *Phase 3.*

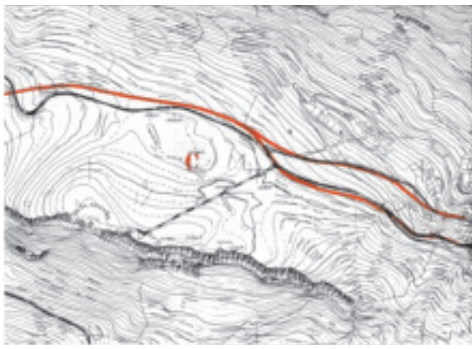
Fig. 53. *Phase 4.*

without subjecting the rectangular chassis of the wagon to excessive stress. For the same reason the hub was quite definitely not constructed too tightly around the axles, so the wheels could be turned slightly to the side on the axles. This is probably what is depicted happening to the left of the wagon in the painting shown in Figure 49. For this reason, the gauge of the wagon is difficult to determine; from centre to centre of the wheel-ruts may be measured to an average of 145 cm in the case of B3. This means free running for a wagon with traditional gauge. Taking as our point of departure the painting shown (Fig. 49), we have drawn in the sketch a wagon with rigid axles and a wheel diameter of minimum 80 cm, i.e. it fits between the wheel-ruts in Area B3.

We envisage the construction of the wagon as beams mortised and held together with dowels and robes. It would have had an overall weight of some 1.5 tonnes and was perhaps built of recycled wood from the dismantled temple roof, which was both seasoned and of good quality. The stone shown on the wagon is one of the many euthynteria stones, each weighing 5.5 tonnes (Figs. 52 and 53).

The last sketch shows the condition of the quarry road today. The piling up of stones which have slid down apparently happens right on the surface of the roadway after the terrace wall has been filled up on the upper side and has therefore forfeited its protective function – preventing stone slide. On this fill a donkey track has often been laid with a covering of small stones, until this too becomes swallowed up in the embrace of the mountain.

The Roads to Delphi



Section C, GPS 12-16

Area C1-5

Figure 54 shows the view of the town of Delphi from the west. The plots of land in this western part of Section C are divided up by numerous rows of stones, which are composed of what are called "handstones", meaning they can be carried and set into the ground by one or two people. Cultivation in the area must have happened more or less simultaneously with the growth of modern Delphi, which absorbed the plots of ground cultivated by the older village of Kastri. North of the modern road large stones are seen now and then which may derive from the transport track.

If one follows the orientation established hitherto up over the slope at the Church of Hosios Loukas, the landscape spreads out into open, easily accessible slopes, which today are cultivated in small plots of ground. About 1 km southeast of the church one can see, across this area of cultivated land, the modern conurbation of Delphi. The making of the vehicle track, but not least the transport of the heavy building stones in the extensive level expanse after the drive up from Section B, must have been a welcome relief after the day-long drive from the stone quarry to the temple. The numerous small stone rows show how the slight slopes of the plateau are divided into horizontal field boundaries across the ascent of the mountain. Traces of the transport of stone to the sanctuary are, for this reason, fewer and less noticeable than in Section B.

Area C1

The point where the church garden meets the mountain is marked by a short stretch of large stones, each weighing several tonnes. The positioning of these stones in a row requires the combined effort of many people. As the orientation of the row is roughly 104 degrees SE, and at the same time constitutes the continuation of the "bollard

Fig. 54. *View of the town of Delphi from the west.*

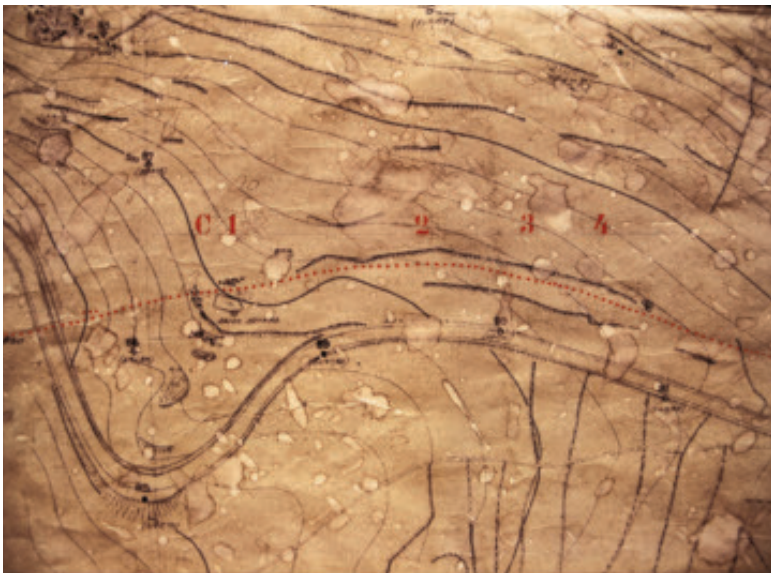


Fig. 55. *A map from 1965 of Area B8 and the western part of Section C; indications of the course of the stone quarry road are labelled C1, C2, C3 and C4*

Fig. 56. *Section C2. Bearing surface in rock.*

holes" in Area B8,[31] we regard it as part of the course of the vehicle track (Fig. 55).

The map in Figure 55 shows the area around the new Church of Hosios Loukas, where the row of large stone blocks lies in the northern part of the churchyard in Area C1. East of the church there are several stretches of stones forming corridors, where there are indications of the course of the stone quarry road, which we have labelled C2, C3 and C4.

Areas C2-4

33 m southeast of the church garden there are cut-out cavities in the sections of rock which appear between

31 A closer examination of the church area was difficult as it was fenced in and locked. At Level 510, north of the church, are the tower foundations Skorda 1991 has indicated as no. 23 on her plan as Gerospilies.

Fig. 57. *Section C3. Long wedge marks.*

Fig. 58. *Section C4. Extensive rockcuttings.*

the plots of ground, in a line 123 m long. Here there are large oblong marks of the wedges used to split the rock. On top of the rock are bearing surfaces for stone rows with an orientation of 104° SE, where the level increases slightly from 500 to 506. These refer back to the square "bollard holes" found on the slope in Area B8.

Area C2

In Figure 56 we see the promontory with cut-out bearing surfaces and large stones carefully positioned on top of these. The direction is approximately 104° SE and the level around 502. In fact the split of the rock and the shaped bearing surfaces suggest an arrangement of stones, which can be interpreted as part of the construction of the vehicle track (Fig. 56).

Lying on a brief stretch of roughly 14 m in this course are rows of erect stones which are visibly in situ. A labour-intensive building task of this character would hardly have been brought about in connection with the cultivation of the earth and the establishment of cultivation plots. We are in no doubt that here one confronts the remains of building work which served to extend the track in Section B. Above the erected stones we find again a surface of small stones which at the same time indicates that Kaltsis' Path may have followed this route (Fig. 57).

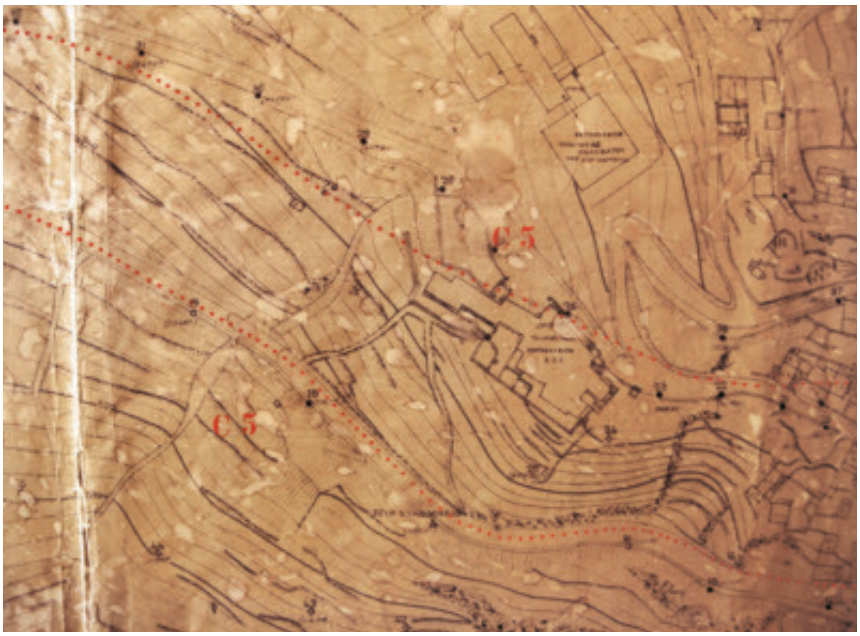


Fig. 59. *The most easterly part of the same map shown in Fig. 55, depicting an upper and lower approach to Delphi, labelled C5.*

Area C3

In Figure 57 we notice large lengthwise wedge marks in the rock and bearing surfaces. Above the cliff there are the remains of a surface covering with small stones. About 30 m to the SE from C2 is an area of rock with wedge marks and splitting of the rock which form an extension of C2. The track is situated in level 502 (Fig. 58).

Area C4

Part of the rock has been cut away in a line which continues the previous track (Fig. 58). The roadway apparently lay below the cliff (GPS 14). Roughly 14 m south there are parallel formations of stones which form a corridor in which the roadway probably had its course (cf. the map in Fig. 55).

Roughly 20 m further southeast and as a continuation of C3 is a large section of rock sticking up out of the ground, in which unusually deep wedge marks were left. The wedges probably split a part of the rock to make a passage for the roadway which clearly lay on the south side of the three aforementioned built-up tracks. In this stretch stones were later laid across the course of the roadway. The resulting flat levels are surfaced with small stones, as is the case in other places on Kaltsis' Path. Lying about 20 m south of the hewn areas and parallel with these is the modern road to Delphi.

Areas C5a and C 5b

The nearer one gets to the sanctuary from the west, the more the River Pleistos' deep, funnel-shaped valley cuts into the steep mountain slopes of the Phaedriads. The landscape's alternating levels from Section C to Section D split the modern approach roads to Delphi into a number of co-ordinated tracks at Level 524, roughly 600 m southeast of the Church of Hosios Loukas. We are assuming that the same thing happened when the contractors established the course of the heavy stone transports to the sanctuary in Delphi, even though the actual track of their course gets lost in the modern urbanization. A dividing up of these transports from the St Elijah quarry is justifiable on the intractable mountainsides among which the sanctuary is located. Where it was possible, the approach roads for the transports were laid as early as possible on levels which corresponded to the work places where the heavy building material was to be used. The ground of our supposition is that there was already a differentiation of roads in Section C with regard to the final destination where the building materials were to be used. About 550 m after the road up to the Church of Hosios Loukas, the outcrop of even larger stones north of the modern road is interpreted as a division of the transport roads into one which ascends, and a lower one which tends to follow the steep edge to the Pleistos Valley (Fig. 59).

Area C5a
The upper approach road. GPS 15.

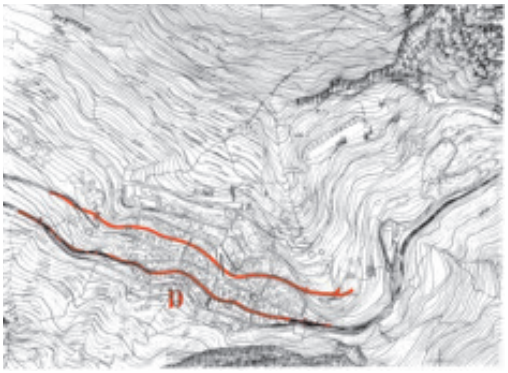
The upper stretch of the road, of about 550 m in the eastern part of Section C, rises from Level 525 to Level 568 with an upward gradient of some 8%. Earlier at this height, rows of heavy stones had been observed between the hotels Amalia and Delphi Palace,[32] which could indicate the position of the vehicle track at this level. These configurations of stones were observed by such people in Delphi as D. Skorda and L. Altiparmakis. They were later removed in connection with the building of the hotels and the rerouting of the modern road. We are assuming that these rows of stones indicated a probable position of the transportation of stones up to the temple area, which lies on Level 571, i.e. 3 m higher up the mountain.

Area C5b
The lower approach road. GPS 16.

Indications of a lower roadway are to be found in three formations of stones on Level 538 and Level 544 and in the garden area below the Delphi Palace Hotel (Fig. 60). The lowest stone rows are, generally speaking, parallel to the same orientation and form terraces which are 5 to 10 m wide and 20 m long. The formation is built up with large rough stones, as we see in Section B, with an orientation of 117° SE.[33] It is probable that the construction of these flat levels answered a need linked to the transport work, either from the stone quarry or from the port of Kirrha. The rise from the fork between C5a and C5b in the main road to the lower approach is 3% and was probably connected to a road to the Sanctuaries of Apollo and Marmaria (Fig. 60).

Fig. 60. *C 5b seen from the roadside in the lower modern road; GPS 16.*

The Town of Delphi



Section D
Area DI, II and III

The course of the vehicle track in and through the modern town of Delphi is difficult to find. Every year streets, stairs and urban development change the steep terrain into which the town is built. But when H. Convert drew the town's new plan for the area west of the sanctuary when the excavations commenced, he first undertook a meticulous field examination of the terrain in which the town was to be sited. This resulted in a mapping of the landscape in 1892, before the town was actually built. This mapping is the closest we can get to the landscape through which the various courses of the vehicle track were laid – it is improbable that this course went either over or under Convert's topographical map. Convert's map shows the field boundaries and the terracing which were built up by the population of the village of Kastri in the nearby upland, west of the large cliff which separates this upland from the village and the sanctuary it concealed under it. As a basis for his preliminary sketch for a town plan, Convert

32 Formerly the Hotel Xenia with garden plan. Architect: D. Picionis, ca. 1960.
33 Cf. Skorda 1991, no. 34, Elinia.

Fig. 61. *Part of Convert's map of 1892.*

used meticulous level indications of the elevations and a concluding summary in the level lines of the map. At the same time he drew in a number of details, which partly show the heaps of large blocks of stone in the western part of the area, which suggest defensive works, the course of smaller stone formations which demarcate numerous small plots of ground and finally the watercourses which form a confluence. In addition Convert put his signature into his landscape plan, which shows a number of burial grounds and cut-out areas in the mountain ridge, forming a barrier between Sections D and E, in the latter of which the sanctuary is located (Fig. 61).

Three phenomena emerge from the map which arouse our interest in how the quarry road may have fitted into this area. Two water ditches appear to connect the western part of Section D with the eastern one. They are horizontal in outline with small inclinations towards the outflow, and run across the area following the structure of the fields. In addition, below, there is the modern road which connects our Section C with our Section E through Section D.

The uppermost water ditch is about 480 m long and has its western point of departure at Level 592. For approximately every 100 m from here the level on this ditch is 601, 602, 604, and 604, respectively, in the eastern ter-

Fig. 62. *The road to Kirrha and the Gulf of Corinth seen from a donkey track in the vicinity of Kastri at the end of March 1836. Water-coloured drawing by M. Rørbye.*

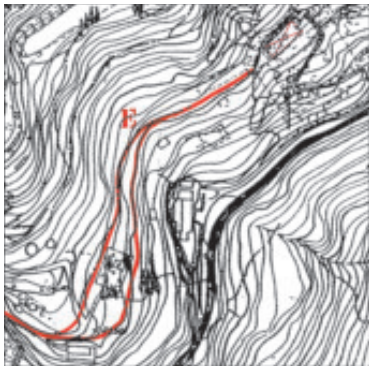
mination towards the cliff in Section E. The overall rise in this 600 m-long sequence is less than 3%. Water Ditch II runs across the fields below Ditch I. It is roughly 600 m long and has its western emergence at Level 565. For every 100 m from here the levels on this ditch are 563, 561, 560, 569, 571 and 573, respectively, in the eastern termination in the ridge in Section E. The overall ascent gradient in this sequence is less than 2%. The modern road on the edge of the valley is about 500 m long, and has its western point of departure at Level 533. For every 100 m from here, approximately, the levels on the road's upper part are 533, 542, 543, 533 respectively, and run thereafter along the edge around the fall in the cliff towards the Pleistos Valley at Level 535. The greatest rise in this sequence is less than 4%. In addition Convert shows three drains under the road towards the edge of the Pleistos Valley and a broad donkey track, which winds up from the valley to this road. On the map this path leads up to the opening in the cliff, which forms the termination of Ditch II. This route into the village of Kastri and to Marmaria is clearly linked to a number of paths from the port of Kirrha, which wound up through the steep mountainsides as pointed out by D. Skorda (Fig. 65).

The three sequences are interesting as they connect elements in areas of the landscape in Section C and E in a way that could coincide with the abandoned roadways laid for the transport of stone in Section D. The surprising horizontal location of the water ditches across the undulating terrain may be a reuse of the road constructed earlier, which led into the area of the sanctuary. Such a hypothesis is supported by the positions where they terminate in both west and east. The position of the arrangements of stones which have been observed between the aforementioned hotels around Level 565 in Section C coincides with the emergence of Ditch II. Were one to follow this ditch to its termination in the mountain ridge in the east, this termination occurs at the same point as one of the few accessible openings into the area of the sanctuary. It is also in this opening that one sees many graveyards and hewn areas from the past, suggesting a passage of considerable symbolic significance. Against this background it is our hypothesis that the main road for stone transport from St Elijah lay along this line.

The position of the mentioned western terrace around Level 540 in Section C would be suitable for a vehicle track, which twists round below the barrier formed by the cliff towards the area of the sanctuary. This sequence furnishes possibilities without major ascents, not just to the lower area of the sanctuary but also to Marmaria. The present modern road runs on the same level at an average level of 535. The termination of the uppermost ditch in Convert's landscape is connected to an opening in the barrier, formed by the cliff at Level 603, which leads in to the uppermost part of the sanctuary, where the theatre is situated. The final destination for the three passages we will look at more closely in the following section.

The Arrival of the Vehicle Track in the Sanctuary Area

Section E
Area E1 and E2



Just before the undressed building stones from the St Elijah Quarry reached the building site, where they received their final dressing and were given their final positioning, they had to travel over one of the most difficult stretches in their 6 km-long journey. This is the ridge with the Bastions of Philomenos,[34] which, west of the temple, array themselves like a protective rampart around the concave slope of the sanctuary. The area of rock forms a continuous barrier of over 700 m across the course of the vehicle track. It stretches north from the foot of Mount Parnassus' mountain massifs at Level 730 and

34 Bommelaer 1991, 217.

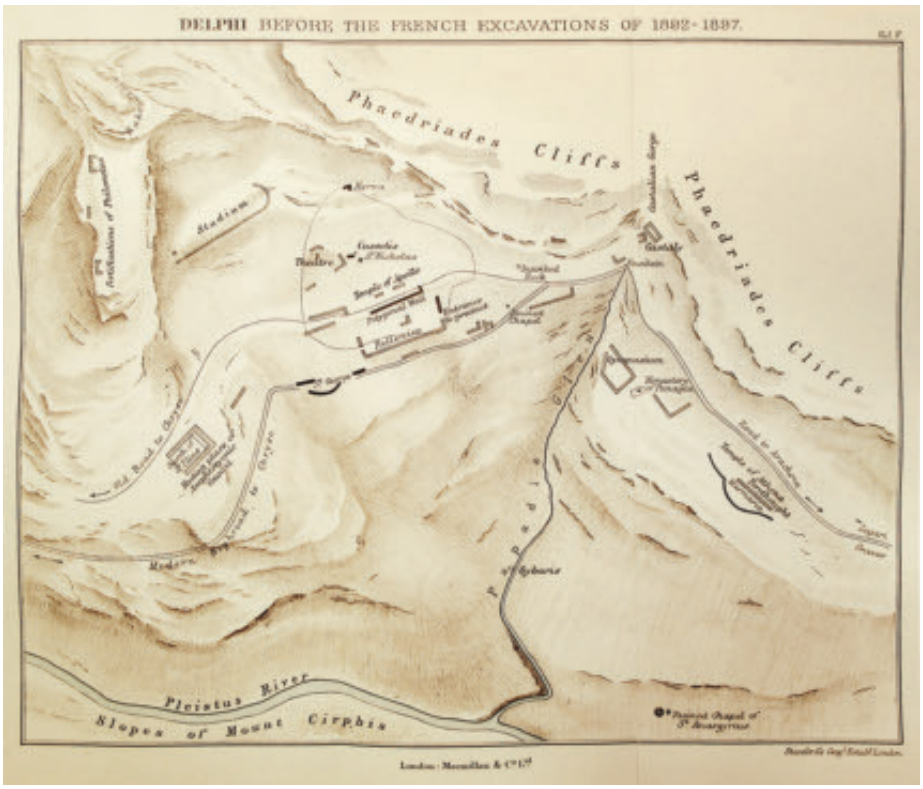


Fig. 63. *Chandler's sketch. The "old road" runs above the churchyard of St. Elijah and leads to the area around Portal C (Atlas 435), while the "modern one" runs below the churchyard and the enclosing wall around the sanctuary.*

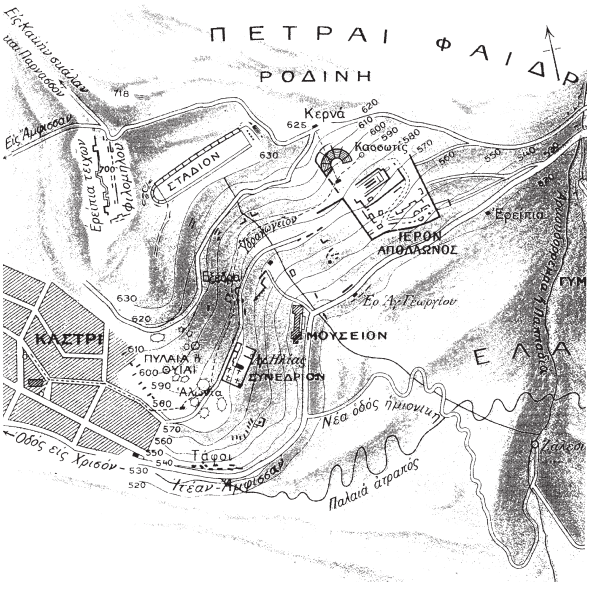


Fig. 64. *Keramópoullos 1917; part of map showing the mountain ridge, with access roads, retaining and terrace walls, as well as the Bastions of Philomelos, rock-cut tombs, small stone quarries and the location of the Synedrion.*

down to a dramatic edge at Level 520, which forms an almost vertical drop of 300 m to the deep river bed of the Pleistos Valley at Level 140. When this ridge is passed it would have been the first time in the day-long journey that the workmen, drivers and their team of oxen caught sight of the colourful monuments in the sanctuary, in the midst of which the great temple stood like a ghost of its former self.

There are few openings in the lengthy cliff which could be penetrated by the heavy transports from St Elijah. The openings have, however, been widened and re-laid in modern times so that, to the same extent as the landscape below the town of Delphi, they have left no trace of the passage of the vehicle track. In addition to Convert's mapping from a time before the excavations, which also covers the landscape around the village of Kastri, there are two informative sketch maps which can contribute to an understanding of where these approach roads were leading. One is a sketch dating from R. Chandler's visit to Delphi, which was published in 1776. It shows two roads which, at that time, led into the sanctuary. Chandler differentiates between an "*Old Road to Chryso*" and a "*Modern Highroad to Chryso*". They both have a connection to

Fig. 65. *Detail of Convert's working sheet with levels.*

the temple area,[35] where the aforementioned openings were used as gateways to the sanctuary. The old road on Chandler's sketch reappears in Covert's map as a donkey track, linking itself to the termination of Ditch II and the transition to Section E. Thereafter, Chandler's way leads into the sanctuary in the area around Portal C (Atlas 435) (Fig. 63).

The other informative sketch map of approach roads was drawn by Keramópoullos in 1917, shortly after the termination of the excavations. Here we see the thoroughfare we have posited as a main road for stone transport linked to Ditch II at Level 570. Hereafter its course has been theorized to follow the retaining and terrace walls which lead on to the area around Portal C (Atlas 435) above the St Elijah churchyard. It follows Chandler's "Old Road". On his map, Chandler calls the ruins in the churchyard the "Meeting place of the Amphictyonic Council", while Keramópoullos dubs it the "Synedrion". Also drawn on this map is a passage right up via the Stadium close to the aforementioned stone quarry (Fig. 64).

There seem, therefore, to be four passages past the mountain ridge separating Section D from Section E. First is a north passage which lies just under the marked rise in the mountain at the very top, around Level 716 above the Stadium. It connects the upper level in Section D with the concave delimitation of the sanctuary and gives access to a steep mountain path up to the fruitful landscape of Parnassus, which today is known as the Path of Pausanias. The local stone quarry above the Stadium mentioned earlier lies close to this transition. Transports of building stones from this quarry doubtless used this defile when construction work was taking place west of the sanctuary area, such as at the aforementioned bastions. But this passage did not affect stone transports for the rebuilding of the temple. Further down the mountain ridge is another passage at Level 620, which was intended for transports to the upper area of the sanctuary in a direction pointing to the theatre. This has a connection to Ditch I and was not of any significance for the temple rebuilding.

Lying below is the third passage over the mountain ridge. It is connected to Ditch II. The opening in this passage is the largest and most accessible, and it is the one described by Chandler and Keramópoullos. The passage up over the mountain ridge through this opening is, in our opinion, the most probable for the course of the vehicle track into the sanctuary. We presume, again judging by the topography, that the roadway for the stone transportation follows a turning at a level between 570-80 over towards

35 Chandler 1776, sketch map and its Superscription: *Delphi before the French Excavations of 1892-1897*, may contain later additions.

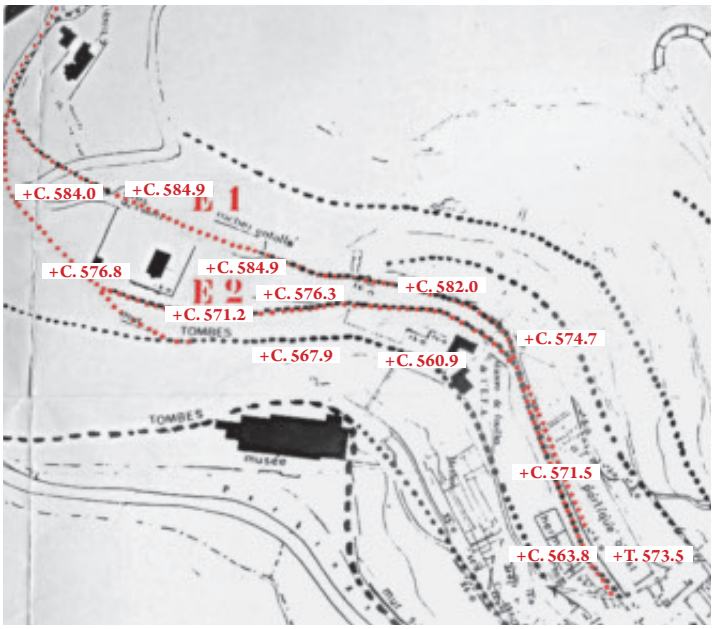


Fig. 66. *Section of Le Plan Général de Delphes, Trouki 1993. Our additions and levels are indicated in red. West is up on this map.*

the present churchyard, which is the area Keramópoullos chose as the location for the Synedrion. At this level there are occurrences of cutting and wedge marks in the areas of rock and groupings of stones both above and below the churchyard, showing an instance of a building technique which corresponds to that used for the foundations and terrace walls linked to the vehicle track in this area. The distance from the passage over the western side of the ridge via Chandler's "Old Road" to Portal C (Atlas 435) is roughly 700 m. The passage itself has a rise of 13%. Thereafter both rises and falls for the stone transports are less than 6% on the course we believe it followed.[36] We have not found actual cut tracks for the transport to the temple, nor have we had the opportunity to conduct cleanings on the places where one might expect to find such traces (Fig. 65).

Working from this basis it is probable that, following this passage over the mountain ridge, the vehicle track splits up into several divisions, two of which we will point out with E1 and E2 on Fig. 66. They are described and mapped in E. Trouki's insightful examination of the approach roads to the sanctuary.[37] The supplementary vehicle track E2 to the main road for the transportation of stone from the St Elijah quarry runs below the present churchyard, along the wall 17-O and meets the main road roughly 85 m after the foundation wall 16-O between two groups of stones at Level 573. Finally there was probably the course of a road along the edge to the Pleistos Valley, heading for the areas below the sanctuary and Marmaria (Fig. 66).

36 This hypothesis concerning the route of the transport of the stone by wagon is based on Convert's levels. In this we distance ourselves from the suppositions put forward by H. Pomtow (1889, 80-2). Here Pomtow puts forward two reasons why this stretch of road cannot be a wagon route; his observation of the 6 steps cut in the rock wall along the way and the track's ascent in and over the western cliff. Both of these are hard to point out today. As mentioned in Chapters 3 and 5, there are steps in the track for the stone transport which date from a later, different use of the sequence/route. It is difficult to tell whether this is the case in this vehicle track which we believe was laid around 366 BC. Regarding the ascent in the defile, this is hardly a crucial barrier to transport by wagon. We should like to thank Anne Jacquemin for this interesting reference.

37 Trouki 1993 (unpublished). The year before we knew of this study, most of the walls with relation to the vehicle tracks' concluding stretch were drafted and photographed during the fieldwork, with a view to a taking of measurements. It was made redundant by the thesis, which we thank J.-F. Bommelaer for having shown us. The following numbering of walls refers to E. Trouki, whom we would like to thank for permission to use her informative plans in our investigation. Cf. Fig. 66.

Where the Vehicle Track Comes to an End

The probable principal direction of the stone quarry road is the area around Portal C (Atlas 435) at the western pediment of the temple, where the entrance must have been at a level between 571 and 573 in a course between wall 7-O and wall 4-O in E. Trouki's enumeration, i.e. at the same level as the temple's future foundations.

We are in no doubt that there was a main road here for the transports and building workers, which was put in motion in connection with the rebuilding of the temple. The terrace wall, 4-O, which is more than 65 m long, forms the final, necessary termination of transport roads E1 and E2 into the Sanctuary and was begun, we believe, as the first stage in the overall plan for the rebuilding.[38] Above this road the wall forms a terrace the height of which was somewhere around Level 574. In Chandler's sketch it looks as if the old road ran over precisely this spot. It is here one would imagine the first "cutting area" to be for the shaping of the heavy building stones from the St Elijah stone quarry, before they were hauled in to the new foundation for the temple. This may at the same time support the idea of the construction of a storage area for the undressed building stones on the slope in front of wall 5-O and the cutting places located closer to the temple on the terrace on top of the wall 4-O. Above this terrace the mountain slope rises up to the place where the future portico was constructed. The termination of the vehicle track at E1 and E2 leads into this storage area and the cutting area along Wall 16-O, 6-O on to Wall 5-O, at Level 574, which is suggested by E. Trouki in Fig. 66 and the sketch in Fig. 68. The walls, as stated, bear all the marks of the same coarse hewing in the arrangement of stones, except for Wall 5-O which is built in a fine polygonal technique. Both this and the façades of the Hermeion in Wall 9-O as well as the rear Wall 7-O are built in a 5th-century manner, i.e. long before Wall 4-O was erected and the roadway we are studying was laid (Fig. 67).

As there was above the main road in Levels 573-1, there may also have been delimited plateaus below the road.

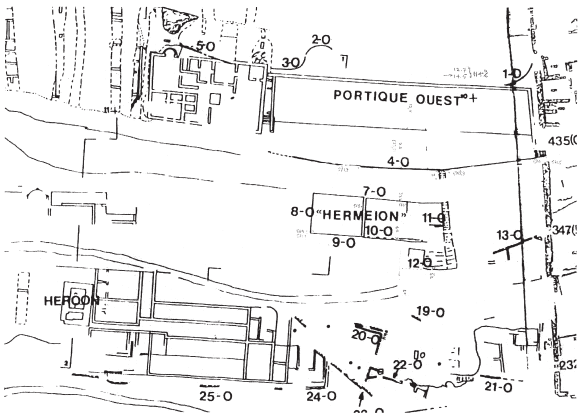


Fig. 67. *Detail drawing of the terrace area around the Hermeion. Trouki 1993, Fische no. 65.*

One example is the plateau at the Hermeion,[39] which formed a terrace at roughly Level 568, and below this again at Level 565 along the foundations of Wall 9-O and 10-O. The location of these terraces was chosen for the storage and shaping of easy-to-handle building materials, such as wood, iron and lead.

We believe that it was on these terraces, in proximity to the building process as such, that the so-called hangars and ateliers were erected. They might be above or below the main road as described in the inscriptions,[40] and thereby have formed workplaces for the preparation of the building elements which could immediately be brought into their designated places when required by the construction process.

A supplementary arrival at the sanctuary runs first along the edge to the sheer drop down to the Pleistos Valley. This divides into several branches on Trouki's layout plan. One goes up over the mountain ridge at Level 560 below the churchyard at Wall 17-O. Here follows an extensive promontory with a number of minor quarries with wedge marks and burials, which reaches into the sanctuary's concave area through an opening in the eastern edge of the rock wall. Small fillings of fissures in the rock are

38 The arrangement of stones is not homogeneous in its entire length, but constructed using a building technique which can be rediscovered in many of the foundations and terrace walls which seem to be associated with the vehicle track in this section. There is also a certain similarity to the building technique which is employed in the terraces in front of the Lesche of the Knidians (Atlas 604), and some of the tower foundations which D. Skorda has observed.

39 Trouki 1992, 106, fig. 7. Sketch and dating with reference to J. Bousquet 1988, 107.

40 A&H 2010, 454-6, no. 46 B II, 47 A II, 56 I A and 59.

observable here, using a building technique comparable to the other foundations along the vehicle track in this area. We are assuming that on this level there was a passage down the level of the Hermeion, where the transport of lighter building materials was possible. This passage is shown as a dotted line in our addition to Trouki's plan (Fig. 66). This roadway runs out on the foundations of Hermeion's lower walls 9-O, 10-O and 12-O Levels 568-4, from which, according to Trouki's observations, there may be access for steps or ramps to the terraces above via 8-O and 11-O and possibly into the Sanctuary itself along Wall 13-O on Level 564 at Portal B' (Atlas 347).

The lowest stretch follows the edge to the valley at Level 540, round below the large mountain ridge. This southern connection to the area from the west, distinguishes itself, as already mentioned, as early as Section C. Using this approach road from the west means that during the last 3 km through Sections C, D and E, the ascent gradient can be kept below 1% before reaching the southern delimitation of the sanctuary, or the limestone temple in Marmaria on the other side of the Kastalia Ravine, where it is visually apparent that stone from St Elijah has also been used.[41]

Canopies and sheds – Digression 2

The following sketches illustrate a possible site and elevation of the location of the building site in the suburb of Thyiai west of the sanctuary. Our suggestions as to their practical fitting out with storage area, cutting area, canopies and storage sheds were formed based on the information provided by the inscriptions and the arrangements of stones which are described by E. Trouki, together with an inscription from Levadia about the building process itself (Fig. 68).[42]

The sketch Fig. 68 shows the location of workplaces, canopies and sheds outside the western ring wall (Atlas 346-434-435). Workshop 46 B-I-II below the main road for the storage and working of stone and wood is about 100 m². It is in all likelihood one of the first canopies which was set up in the years 343-1 BC. It was assembled along Wall 7-O for the cutting of poros stones into sima blocks, and later for the making of the wooden construction for the temple roof. It is closed by the side wall and a front wall of a single layer of brick with an average height of 2.7 m. The structure supports one side of a pitched roof, and can be divided up into 2 lengths of roughly 13 and 21 m with a depth of 3.2 m. The quantity of raw mudbrick needed has been estimated at around 4390 stones. Below the Hermeion the canopy 59 was erected against Walls 9-0 and 10-O with a length of 25 m, according to the inscription from 336 BC.[43] It is an open-post construction which is closed by two gables in mudbrick as an open drying shed for 60 pine beams from Macedonia. About 700 mudbricks were used for walls in the gables. After the foundation stones and orthostats from St Elijah were brought in for the temple foundations from the cutting places above the main road in the years 344-33, two canopies, each 24 m long, were erected here against Wall 4-O. They stand with the north-facing openings in a post construction, and were the sculptor's workshop (47 A II and 56 1 A). They are of a height and length which permitted the setting-up and carving of 2 x 12 pediment figures.[44] The back walls on 4-O are made as double-skin walls and the four side walls in the gables are of mudbrick, totalling 14,745 individual bricks. All together this comes to 19,836 raw mudbricks for the aforementioned buildings.[45] This corresponds very accurately to the delivery of 20,000 bricks, according to Contract 56 IA (Fig. 69).[46]

41 Bommelaer, 1991, 69. In this investigation of a vehicle track from the St. Elijah quarry to the Temple of Apollo we have not examined the approach roads which may have used the floor of the Pleistos Valley and then an ascent to the sanctuaries through the olive groves below Marmaria. If we look away from the stone transports to the Temple of Apollo we notice for the whole sanctuary that transports must also have travelled to the following monuments based on the investigations described by, in particular, Bommelaer 1991 and Amandry 1981, The Theban Treasure Chamber (Atlas 124), The Kings of Argos (Atlas 113), The Rhodian Chariot (Atlas 406), The Column of the Dancer (Atlas 509) and The Thessalian Base (Atlas 511), as well as a number of smaller bases.

42 Cf. Note 53.

43 A&H 2010, 456

44 A&H 2010, 455.

45 We have used the dimensions to be found on the raw mudbricks at Delphi today: 31.3 x 31.3 x 7.8 cm.

46 A&H 2010, 455.

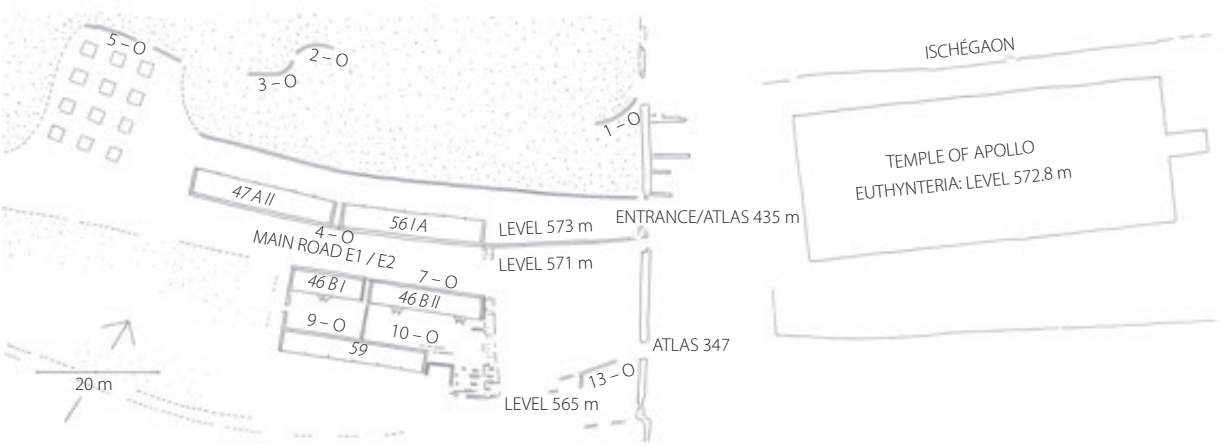


Fig. 68. *Plan showing the possible location of workplaces,canopies and sheds the western ring wall and the relation to the outline of the Temple of Apollo.*

Visible at the top is the terrace which lies over Wall 4-O. Here the stones from the quarry were given their final dressing, as described in Stages of Work I and II. Later the two north-facing ateliers were erected for work on the pediment figures. Below Wall 4-O is the main road into the sanctuary which brings to an end the road from the St Elijah quarry.

On the terrace under the main road formed by the Hermeion, sheds were set up for the storing of wood for the temple's coffered ceiling. At the bottom of the section is the drying shed for the wooden beams from Macedonia, the back of which is Wall 9-O and 10-O in Trouki's numbering.

The Rebuilding of the Temple

Shortly after the earthquake in 373 BC and its fatal consequences for the old temple, a coordinated plan of activity appears to have been devised for the many tasks entailed by such a rebirth. In all likelihood the plan was expounded in a detailed description, though all we know of this is a fragmentary inscription with references to a *syngrophos* (Doric for *syngraphos*),[47] which we today would designate as a masterplan. The plan covered the 20 years it took to recreate the great temple.

From the many stones and other traces left behind and the practical preconditions for the work, we can conclude that both outside on the mountain and inside the sanctuary a long series of projects were brought about which were closely co-ordinated according to this plan. But every participating individual could only realize his part of the project if he collaborated carefully in this common endeavour, from the stone quarry to the building site. There must have been an astonishingly well-thought-out plan for the joint project before it was set in motion.

47 See A&H 2010, 462, 464. Cf. LSJ s.v.

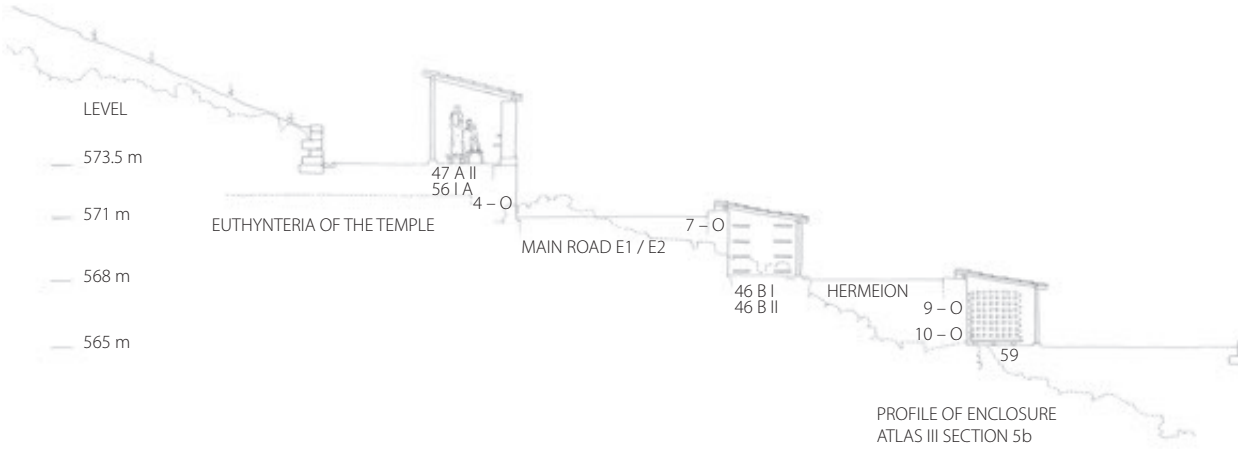


Fig. 69. *Elevation. East-facing section of canopies and sheds positioned on the terraces above and below the main road, which runs at Level 471. Behind the buildings the profile of the western ring wall is drawn in from the Atlas, section 5b.*

Turning to the temple square itself, we observe extensive demolition and the cleaning up of the damaged building elements in the temple. It was especially the construction of the foundations which attracted attention, since it was here that the key was to be found to the prevention of future movements in the building.

For this reason the demolition of the old temple was one of the first tasks commenced in 366 BC,[48] and it left the former foundations under the old temple as an open, cleared surface. This so-called hypeuthynteria, under the previous euthynteria in poros, had to be trued up and adapted to answer the new demand for a stronger enlarged euthynteria, which was now to be laid in the robust stones from the St Elijah quarry and fastened together with metal clamps (Fig. 71).

The first undressed stones for the outermost frame in the euthynteria, each weighing roughly six tonnes,[49] may have already been cut free of the quarry shortly after 366 BC and stood ready to be hauled over the mountain on the newly-laid vehicle track to the sanctuary. On their arrival at the storage yard below Wall 5-O, each individual stone, still retaining its coarse protective layer on all sides, with the requisite dimensions, was examined for cracks and its surface checked by the architect. The stones which had been approved were then, one by one, hauled up to the terrace above Wall 4-O and turned over to the stone-cutters, who initiated the first of a cycle of seven phases of work through which each building stone passed in the temple's rebuilding.[50]

1. First, what was to become the underside of the euthynteria blocks were cut to level with broad anathyroses along the edge, while the area within these is cut slightly deeper with coarser chisels.
2. The same procedure is carried out with three sides of the stone which are cut into right angles on the bottom surface. Both this and the sides' anathyroses are checked and marked with red lead and polished. After the first uniform working of each individual, approved stone from the quarry, they were considered standardized building elements waiting to be hauled in to become part of the new temple foundations.

48 A&H 2010, 467.

49 Calculated from an average size of these stones in situ with a density of 2.7 and allowing for a 20% protective layer.

50 This first and the following descriptions of seven work-flows follow the procedures which are to be found in the inscription in Bundgaard 1946, which deals with the temple ruin in Levadia. The building stones in Delphi and in Levadia seem in many tectonic respects to resemble each other.

Fig. 70. *A. Tournaire's 1902 reconstruction of the sanctuary shows where the dominating Temple of Apollo presented itself to good advantage after the rebuilding, which was completed in the year 327 BC.*

3. But before they could be fitted into the euthynteria, the fourth, unworked side of the already laid euthynteria stones in the frame had to be collectively trued up following the temple's modules. This truing up is also checked and marked with red lead and polished.
4. In addition there must have been an adaptation of the old hypeuthynteria layer which was cut to function as a bearing surface for the new rows in the euthynteria underneath, and also the bearing surfaces for the joists which bind them together.
5. One stone was laid at a time on top, where the bearing surfaces between hypeuthynteria and the new stone were finally adapted to fit each other, as well as the two side surfaces to those already laid. The joins between them were checked and marked with red lead and polished with stone powder before the final approval was given by the architect.
6. Finally, all the oil and grinding agent was washed off the joins with citric acid. Then the stone from the St Elijah quarry was at long last fitted into its permanent position and ready to be secured with cramps in situ.
7. Finally the overall surface was trued up by aligning with the laid stone and their end surfaces according to the same guidelines as before and marked red lead, grinding and truing up the curvature with the use of levelling blocks carved in dry wood from a wild olive tree.

If we assume that 12 teams of men working together two and two and in the four work teams from III to VI, we can assume that it would take a total of 18 days for each work team to lay a stone in the outermost frame of the euthynteria. Taking a point of departure in the creation of this frame for the foundation, which consists of 156 euthynteria stones, the quarry on St Elijah mountain would have to deliver at least one of these very heavy stones every third day to enable each of the six teams to work continually on the rebuilding, which took place in the years 366-56 BC. If this hypothesis is accurate, it would have taken 16 working months[51] to lay the foundation frame and probably the same for the euthynteria frame inside, which had to support the cella wall and its orthostats. The shift between the stage of the work in the first

51 This is a supposition which depends, to a great extent, on the winter weather. December and January can be so rainy that it the oxen could have been denied foothold. In these months there is also the danger of heavy snow, which would hinder transportation in the higher mountains.

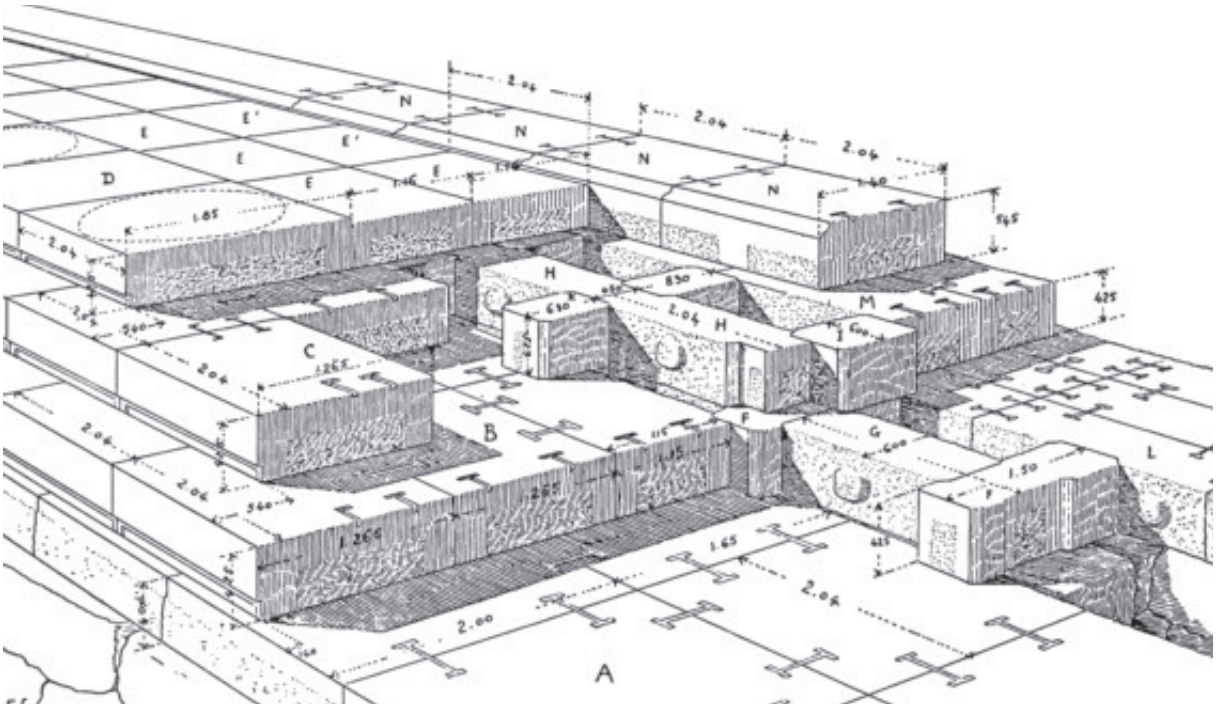
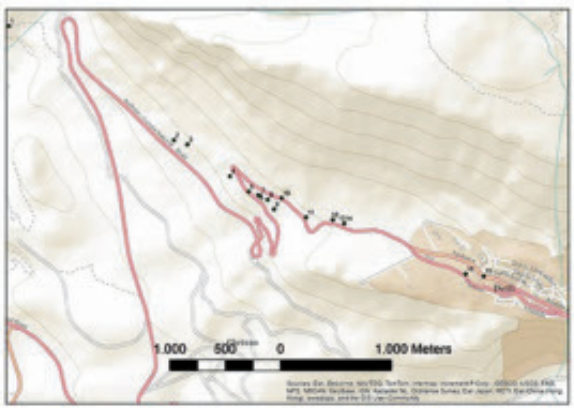


Fig. 71. *The Temple of Apollo's foundations on the long side of euthynteria; they were built in their entirety with stone blocks from the St Elijah quarry.*

two and the third work phases depends, however, on the quarry being capable of delivering more stones to I and II than the rhythm of the work demands in III to VI, and thus contributing to the creation of a stockpile of standard stones which could even out the effects of any instances of delay in the quarrying or in the subsequent transport. The planned changes in the pace of the building need deliveries of St Elijah stone for the foundation, poros stone for the superstructure and shaped wood for roof and ceiling construction may also be significant for the work rhythm in the stone quarry. For instance, in the building phase in which the peristyle is erected in poros stone, it would be conceivable to have a period when storage yards and cutting areas and workshops all concentrated on this task. This would give the St Elijah quarry workers more time. Judging by the inscriptions all the columns and part of the entablature in poros stone were complete when war broke out in 356 BC. When the war of 356-46 BC was over, the inscriptions show that the first floor tiles and orthostats from St Elijah began to arrive at the building site, which signifies that work was completed on the foundation frame that lay within the peristyle. This occurred in the years after 343 BC and includes some of the heaviest loads of stone. An orthostat with its protective layer can weigh up to 8.5 tonnes. Emerging in the same period were a number of stones from the quarry which formed joists for the floor tiles and a fairly small frieze of 66 decorated stone blocks, which were set up in the cella wall in 335 BC. The joists and floor tiles, orthostats and frieze display what is at first sight complicated carving, the first on account of the way they must be made to fit constructively into the building and the last because of their decorative shape. In all, 2131 St Elijah building stones were used in the total construction, having an overall volume of 2959 m^3.[52] They constitute about half of the total volume of stone in the finished building work. This circumstance also shows the crucial significance of the discovery of the new stone in the distant expanse of mountain had for the rebuilding.

52 A&H 2010, 457, fig. 18.22.

Appendix



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38,496405	22,451705	239.4	1
38,489171	22,465106	366.3	2
38,488900	22,466191	389.1	3
38,486889	22,469646	428.4	4
38,485895	22,471161	440.03	5
38,485686	22,471941	447.6	6
38,485652	22,472068	448.2	7
38,485393	22,472722	450.4	8
38,484790	22,473210	456.0	9
38,485492	22,473845	478.9	10
38,484274	22,475822	490.6	11
38,484118	22,477992	499.5	12
38,483894	22,478908	502.4	13
38,483879	22,478893	507.9	14
38,480546	22,490244	561.1	15
38,480678	22,488750	543.9	16

Sources for Figures

GAU = G. Algreen-Ussing
A&H 2010 = Amandry & Hansen 2010
Atlas = Hansen & Algreen-Ussing 1975

Fig. 1: Greek map sheets; 5391.1/5392 .7/6301.4/6302/2/2/6301.3//6302.4 ; 1:5000; 1966. The sketched elevation below the map was drawn by G. Algreen-Ussing.
Fig. 2: A&H 2010, part of Fig. 1.8, p. 153.
Fig. 3: Survey 1965, G. Algreen-Ussing. Atlas, Plan 12.
Figs 4-5: GAU.
Fig. 6: A&H 2010, fig. 6.
Fig. 7: Bourguet 1914, 337.
Figs 8-9: GAU.
Fig. 10: Skorda 1991, Dépliant I.
Fig. 11: Carte de la Grèce 1:200,000, Paris 1852.
Fig. 12: Amandry 1981, with red additions.
Figs 13-44: GAU.
Figs 45-8: Survey conducted together with Museum staff and Yannis Skorda.
Fig. 49 Photograph by Lennart Larsen. Sincere thanks are due to Tobias Fischer-Hansen for providing this informative reference.
Figs 50-54: GAU
Fig. 55: Collotype of map on a scale of 1: 2000 / 1965; Delphes, Plan du Site 1965, Ministere. EFA no. IA 8587. The original has never been found.
Figs 56-8: GAU
Fig. 59: see fig. 55
Fig. 60: GAU.
Fig. 61: Unpublished map, H. Convert G 2/ "Village avant des fouilles et Villages modernes" Echelle 1/1000. 1892 EFA No. 254. Modified by GAU. Reproduced with permission from the French School at Athens.
Fig. 62: Statens Museum for Kunst, Copenhagen; Sketch from Kastri by M. Rørbye, 1836. INN. NR.1974-32.
Fig. 63: Chandler 1776.
Fig. 64: Kérmopoullos 1917.
Fig. 65: *Nouveau Village*, EFA: G2. Ech. 1:1000.
Fig. 66: Le Plan Général de Delphes, Trouki 1993, unpublished.
Fig. 67: Trouki 1993, Fiche no. 65.
Figs 68-9: A&H 2010,. 454-62.
Fig. 70: Tournaire 1902, pl. 9.
Fig. 71: Courby 1927, fig. 21.

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Abbreviations

Atlas
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