

THE CART TRACKS AT SAN PAWL TAT-TARGA, NAXXAR

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INTRODUCTION

It is generally agreed that the ancient cart tracks found in many localities of the Maltese Islands constitute one of the most intriguing features of the local archaeological landscape. Yet, despite many attempts to study them, no widely acceptable conclusions have been reached about their age, purpose, and how they were made¹. The root of the difficulty is that, unlike other ancient remains and artefacts, cart tracks provide only indirect evidence of human endeavour and were not intended to convey any special meaning. There can be no doubt, however, that they were the result of human labour since no known natural force can produce practically parallel winding grooves on the rock surface stretching over distances of hundreds of metres. In fact, almost all published studies of the ancient cart tracks have assumed their artificial nature and generally focused on conjectures, with little or no reference to the detailed evidence on the ground. Indeed, it is also assumed that the reader is familiar with the characteristics of cart tracks and that there is no need to describe them in any detail.

This is not surprising because a review of the literature shows that only a small number of systematic field studies have been carried out, and even then not all results have been published. Notable field work has been carried out by Zammit², Lanfranco³, and Trump⁴, but these authors have reported few measurements. On the other hand, Parker and Rubinstein published some measurements and maps of two sites in Gozo⁵ while Gracie reported a number of measurements and other interesting statistics, and also produced two maps of sites in Malta⁶. The value of the latter's work can be deduced from Evans' 1971 review which was almost entirely based on Gracie's results.

In spite of all this effort, there has been little agreement on answers to the basic questions about cart tracks. Possibly, this disagreement stems from the tendency of

¹ Evans, J.D., *The prehistoric antiquities of the Maltese Islands*, London, 1971, pp. 202-204.

² Zammit, T., Prehistoric cart-tracks in Malta, *Antiquity*, II, 18-25, 1928.

³ Lanfranco, G., The roman cart ruts of Malta, *The Sunday Times of Malta*, August 6, August 13, August 20, August 27, 1961.

⁴ Trump, D.H., *Malta: an archaeological guide*, (Second edition), Malta, 1990.

⁵ Parker, R. and Rubinstein, M., *The cart-ruts on Malta and Gozo*, Malta, 1984.

⁶ Gracie, H.S., The ancient cart-tracks of Malta, *Antiquity*, XXVIII, 110, pp. 91-98, 1954.

previous work to discuss all the available evidence in an attempt to arrive at a general theory that explains all the observations. If this analysis is correct, the time has come to change methodology and to pay more attention to detail. By focusing on the ancient tracks in one specific area, this paper attempts to illustrate which characteristics can be meaningfully described, how the tracks can be measured and whether the results correspond with selected published hypotheses.

THE NAXXAR GAP AT SAN PAWL TAT-TARGA

A notable concentration of cart tracks occurs at *T'Alla u Ommu* also known as Naxxar Gap at San Pawl tat-Targa, limits of Naxxar. This gap is one of several sections that allow a reasonable vehicular passage across the otherwise forbidding Great Fault that traverses Malta from Madliena Tower on the eastern shore to Ras ir-Raheb in the west. The cart tracks are located on a sloping scarp of lower coralline limestone with an area of approximately five hectares, bounded by the Mosta-Naxxar road in the south, the zig-zag road which descends towards Salina in the east, and the recently tarmacked road in the south that leads to the large, ever-expanding hard stone quarry, which constitutes the western boundary. The military pill-box situated half-way down the slope serves as a useful reference point⁷ since the main tracks converge in its vicinity. In the north-south direction, the scarp rises steeply over a distance of about 100 metres from about 49 metres above sea level at its lower end, to about 70 metres at the level of the pill-box. It then continues to rise over a distance of 150 metres until it reaches the level road from Naxxar to Mosta at a height of about 85 metres. In the west-east direction, the karstic terrain rises more gently from about 40 metres above sea level to about 70 metres at the pill-box, in about 250 metres.

There are some dry stone rubble walls in the area which today form the boundary of the quarry but which previously must have acted as field walls. However, it is unlikely that the sloping rocky ground on which the cart tracks are found ever had any permanent soil cover as this would have been easily washed away by the rain. Besides the cart tracks, the only archaeological remains of note in the area consist of a rectangular shaft tomb and a disused bell-shaped cistern of indeterminate age, although Trump is of the opinion that the cistern is modern since the ruts, which pass very close to it have been modified to carry water into it⁸. Parker and Rubinstein report the presence of an incomplete rectangular shaft tomb⁹ in the area, but this observation could not be confirmed by the present study.

⁷ The pill-box is at grid reference 4945E 7608N on Survey Sheet No. 4876 of the Malta Survey 1968.

⁸ Trump, p. 132.

⁹ Parker and Rubinstein, p. 17.

The San Pawl tat-Targa tracks have been the subject of measurements by Gracie¹⁰ and Lewis¹¹, and the site of experiments by a group under the direction of Evans for a BBC television programme in 1955¹². Several photographs of sections of the tracks have been published by Gracie, Parker and Rubinstein, and by Zammit, who included an aerial photograph covering most of the area¹³.

PROCEDURE

For the present study a map of the area was first sketched from Zammit's aerial photograph. This was followed by field work to confirm or amend the map as necessary, and to measure the individual tracks. Subsequently, a detailed map was prepared from the fieldwork aided by a copy of another photograph taken on November 9, 1967 from an altitude of 2000 feet (about 686 metres) as part of the aerial survey of Malta¹⁴. For the measurements, a steel tape was laid across each track and the distances of the outer lip, the centre and the inner lip of both ruts were recorded as well as the depth on the inner side and the width at the bottom (Fig. 1).

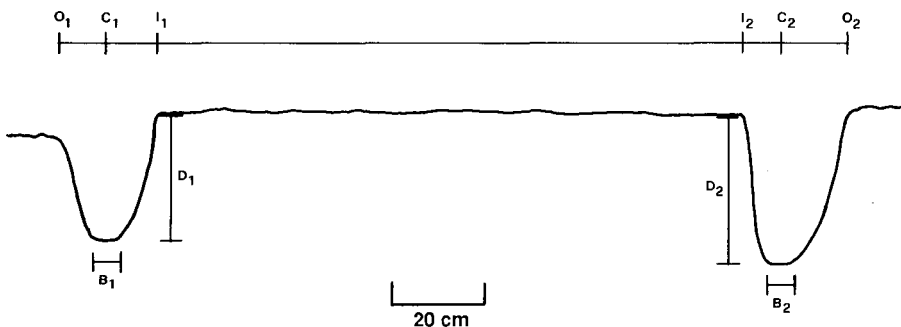


Figure 1: Profile of Track 1B to show how measurements were taken. The labels stand for the following: O marks the outer lip of each rut; C, the centre at the bottom; I, the inner lip; B marks the width at the bottom of the rut, and D, the depth. In this case the gauge of the track marked by the distance C_1 to C_2 is 144 cm.

¹⁰ Gracie, pp. 94-5.

¹¹ Lewis, H., *Ancient Malta: a study of its antiquities*, Gerrards Cross, Buckinghamshire, 1977, pp. 59-64.

¹² Evans, p. 203.

¹³ Zammit, plate IV.

¹⁴ Aerial Photograph No. 0982 taken on Run 13 by Hunting Surveys Ltd. during the aerial photographic survey of November 1967 which served as a basis for the Survey Sheets published in 1968. We are indebted to Mr Andrew Delia and the staff of the Land Surveyors Office of the Public Works Department who allowed us to examine the photographs in detail.

Notes were made of places where the tracks became double, triple or multiple, unusually steep sections, sudden deviations, and where they disappeared. The compass directions of the various tracks were also recorded.

OBSERVATIONS

The map of the area (Figure 2) shows that the tracks can be divided into three groups: starting from the north, Tracks 1, 1A, 1B and 2 form the first group; the second group consists of Tracks 3, 4, 5, 6 and 7 which run in an approximately east-west direction; Tracks 8 and 9, which both curve from northeast towards south, along with Track 10 form the third group. A brief description of the tracks follows and their measurements are given in Table 1.

The First Group

In the first group, Track 1 appears to start a few metres from the road in the north with a gauge of 140 cm measured between the centres of the ruts. It takes a southwesterly direction and runs over very rough terrain, but it is generally very well defined. After 15 metres it becomes double for a stretch of about 14 metres, where one pair of ruts has a gauge of between 140 and 143 cm while the other pair is wider with a gauge of between 144 and 147 cm (Pl. I). The track then becomes single again but at 65 metres it forks into tracks 1A and 1B which have different gauges. Track 1A, whose average gauge is 149 cm, continues for another 40 metres, then it disappears on the rocky surface at the point where other tracks cut across it. However, when the lighting is at a low angle, it is possible to see a trace of it on the other side of the junction. Thus it is conceivable that Track 1A was connected to another well defined stretch marked as 6A on the map, whose gauge is between 138 and 148 cm.

Track 1B curves sharply towards the east and then follows a long wavy path until it takes another turn to the southeast appearing to come to an end under the soil close to the pill-box (Pl. IV). Its total length, including Track 1, is over 280 metres. Along its uphill path, this track is joined first by Track 5 and then by Tracks 3 and 4. Track 1B is single almost all of the way except from one point where it is double with gauges of 138 and 143 cm, and another point where one of the ruts is triple and the other is double for a stretch of 4 metres. The depth of the ruts varies irregularly from a bare impression on the rock surface to a maximum depth of 55 cm of one of the ruts (Pl. II).

Track 2 runs parallel to Track 1 at a short distance to the northwest. It appears abruptly at the north end and rises gently for about 26 metres on rough ground which slopes 12 degrees from SE to NW across the track. It then rises sharply at an angle

of 22 degrees over a distance of about one metre and continues to rise gently thereafter for a total length of 34 metres after which it disappears without a trace. A rectangular shaft tomb measuring 210 cm by 85 cm with its long end orientated in an approximately E-W direction is found about 10 metres further southwest, almost in line with the track.

The Second Group

The aerial photograph of 1967 clearly shows that Track 3 had a tight 90 degree bend at its western end and it continued for some distance beneath the fields in a northerly direction. This part is now covered, as is the next part, which presumably runs under the tarmacked road. The photograph also shows three other short tracks in the immediate vicinity (marked 3' and 6' on the map), but also these cannot be confirmed since the rock surface is now covered with debris. Generally, Track 3 rises gently from west to east but at three points there are short, steep rises of 24, 28 and 29 degrees. At the east end, the track joins Track 1B (Pl. V) so that its total length from beneath the fields in the west to just before the pill-box must have been about 500 metres, although it can now be followed for only about 330 metres. Its gauge is variable, with an average of 139 cm and a range of 133 to 144 cm. Measurements also show that the northern rut, which is down-hill, is deeper than the southern one on average.

Track 4 appears abruptly a short distance east of the main junction of Tracks 1A, 1B, 3 and 5. The first 25 metres of this track are well-defined but shallow. It then touches Track 3 and continues separately along a very bumpy path as it runs into a series of deep pits, which must have been shallower or filled at the time when the tracks were in use, otherwise the track would have been impassable (Pl. III). The ruts at this section of the track still bear witness to the severe pitch and roll to which the vehicle must have been subjected. In spite of these obstacles, the width is fairly regular with an average gauge of 139 cm and a range of 137 to 140 cm. The total length of Track 4 is about 130 metres and it ends by joining Track 1B a short distance north of the pill-box.

Track 5 is a short, generally shallow section, with an average gauge of 148 cm, which connects Track 1B to Track 6. It should be noted however that the average width of its gauge does not tally well with the average gauge widths of the other tracks, which are 142 cm and 144 cm respectively.

The west end of Track 6 consists of multiple ruts which now appear from beneath the modern track skirting the boundary of the quarry. But the old track must have started much further west as evidenced by the 1967 aerial photograph, which shows a clear stretch of about 30 metres on the rock surface and a shorter stretch further

west (6' on the map) that have since been quarried away. Nevertheless, the 170 metre stretch that remains is remarkable for its roughness, the width of the ruts at the surface and at the bottom, and the number of branches towards the top of the slope (Pl. VI). In spite of its roughness, the gauge is fairly even with an average of 144 cm and a range of 141 to 148 cm. However, at a number of places the ruts are double, triple or even multiple, and the gauges of these sections are somewhat different. Thus, at 77 metres from the west end, a short section is double with gauges of 148 and 128 cm, while about 60 metres further on another section is triple with gauges of 145, 145 and 134 cm.

The first branch appears at about 65 metres from the west end of Track 6 and is marked 6A on the map. This track can be easily followed for the first 70 metres and beyond that traces of it are found over a further distance of 30 metres. In addition, there is a short track which branches out of Track 6A and runs parallel to it for a short distance. The average gauge of the main track is 143 cm with a range of between 138 and 148 cm.



Plate 1: Track 1 looking towards the southwest.



Plate II: Track 1B, on the right, crosses Track 3, left of centre.



Plate III: Track 4 looking towards the northeast. The rut on the right passes through a series of deep pits.

Plate IV: Track 1B, looking towards the east, about 100 metres from the Pill-Box.



Plate V: Junction of Track 1B, on the left, and Track 3.





Plate VI: Very rough terrain at the west end of Track 6.



Plate VII: Detail of Track 1B that captures evidence of the severe pitch and roll to which the vehicle using this track must have been subjected.

The next branch, marked 6B on the map, is more complex even though its total visible length is only about 50 metres. Not only is it double at places, but it has two further branches, one of which can be traced with some difficulty for about 32 metres. The average gauge of Track 6B is 145 cm with a narrow range of 142 to 147 cm.

Track 6C is a short, but distinct 5 metre stretch which also branches out of Track 6. Even over this short length, its gauge ranges from 146 cm to an abnormally wide 152 cm.

Track 7 runs nearly parallel to Track 3 for a distance of about 38 metres. Although it is not as deep as the other tracks in this group, its profile is sharp and well-defined for most of its length, and it has a very uniform gauge. Strangely, there is no evidence of a connection with any of the other tracks at either end, although this could have been present originally.

The Third Group

The first trace of Track 8 occurs just west of the modern steps that lead from the side road at the north to the bend of the modern road east of the pill-box. The steps in fact cut the track at right angles so that their U-shaped profile can be easily made out. Beyond the steps, the track continues for a short distance towards the west and then turns to the southwest. It disappears when it comes across Track 1B and the modern pipeline. However, when the lighting is at a low angle, it is possible to see a trace of the track for a short distance beyond this point. The total visible length is about 42 metres but it is fairly certain that it originally extended further at both ends. Its gauge is only 132 cm, which makes it by far the narrowest track at San Pawl tat-Targa. Otherwise, the width of its ruts and their depth are fairly similar to those of the other tracks at the site.

The east end of Track 9 touches the foundations of the modern road and also in this case, the track must have extended further east but not beyond the width of the modern road otherwise it would have been possible to trace it there. It could possibly have turned to join Track 1B which is of the same width, however this possibility cannot be conformed by observation, but older aerial photographs may shed some light on this conjecture. Its path takes a southwest direction at first and then turns gently towards the south and runs parallel to the modern pipeline, always on very rough terrain. At one point it is cut by the wide ditch which forms part of the defensive Victoria Lines and further south by the wide road which leads to Mosta. The track continues to the south for a considerable distance and it can be traced intermittently up to Tal-Wej and Ix-Xaghra ta' Santa Margerita at Mosta, for a total

distance of 1.5 kilometres (Figure 3). The continuity of the track can be confirmed from the 1967 aerial photograph and by walking along its path, even though long stretches have since disappeared under the asphalt and the new buildings. Unfortunately, its possible extensions beyond Tal-Wej and Santa Margerita cannot be checked since the area is now built.

Track 10 is a shallow 7 metre stretch on a small patch of flat rock, which however can be traced on the rough terrain for another 15 metres towards the east. Also in this case, any previous connection with the other tracks no longer exists.

DISCUSSION

With these observations and measurements at hand, it is now possible to attempt to answer the original questions as they relate to the tracks under consideration. Reference will also be made to selected hypotheses concerning their date, how they were made, and their purpose.

Age

The approximate age of the cart tracks is one of the questions that has eluded a clear answer. Of course, the basic problem is that there is no method to determine their absolute age. It is however possible to arrive at a probable date by postulating a direct association, or a lack of association with other datable features in their vicinity. In this way, their association with features caused by tectonic activity led to the supposition that they date back to the Paleolithic age¹⁵. However, this conclusion must be discarded because of lack of corroborating evidence for the presence of man in Malta at that time. Furthermore, sudden or gradual earth movements could have occurred at any time during these last seven thousand years or so since man first set foot on Malta.

Zammit has attributed the tracks to the temple builders on the basis that as these people increased in numbers, the fields in the valleys could no longer support their needs and cart tracks were formed when they started to carry any surplus soil uphill to reclaim some of the rocky land¹⁶. This attribution has lost support because of the

¹⁵ Galea, G. *Malta fl-imghoddi*, Vol. 1, Malta, 1972, pp. 56-7. The evidence includes two instances of tracks running to the edge of the cliff: one at Mtahleb, and the other at Ras il-Pellegrin. They enter the sea at St. George's Bay, Birzebbuga and apparently reappeared on the other side of the bay, as recorded by A. Leith Adams. At Qala, Gozo they are cut across by feather faults in the rock, according to C.-D. Reuther, *Tectonics of the Maltese Islands, Centro*, 1(1), pp. 1-20, 1984.

¹⁶ Zammit, pp. 23-4.

lack of a clear association with known sites of the Temple Period and the occurrence of numerous cart tracks in other localities away from the temples. Although the latter observations are correct – and Zammit was aware of them – no mention is usually made of the shallow winding track that skirts the remains of the temple at Borg l-Imramma, Gozo at a distance of about 40 metres towards the south southeast, the several pairs of tracks apparently coming from the direction of Skorba situated about 100 metres east of the temples and which continue for a long distance beyond, and the short track just off the modern paved path between Hagar Qim and Mnajdra. Gravina also mentions pairs of cart tracks on a patch of bare rock where the foundations of a new building were being laid just opposite the temples at Tarxien¹⁷.

A much stronger association has been postulated with recognised Bronze Age sites¹⁸. The basis of this association depends on the observation of ancient tracks which can still be observed leading towards the Qala promontory near San Martin, the Borg in-Nadur settlement and its defensive wall, and the recently uncovered area at Mtarfa within the precincts of the former military hospital. The latter site contains evidence of activity in later periods, and the occurrence of a shaft tomb cutting across a track in the immediate vicinity has been cited as evidence that the tracks must have fallen out of use by the time the tomb was sunk, which could have been during the Punic period. Other instances of tracks cleanly cut by shaft tombs occur at Ghar il-Kbir, where two tombs cut across a track, and at Bingemma¹⁹, all of which strengthen the case for the attribution of the tracks to an earlier age than that of the tombs, possibly the Bronze Age.

A case can also be made, however, for the Punic period by supposing that some early tracks fell out of use during that same period as adjacent tracks came into use. It was then found convenient to locate the tombs beside them, incidentally cutting across an older track in a few cases. Besides the instances of tombs cutting across the tracks already mentioned, examples of shaft tombs just a few metres away from the tracks occur at Dwejra (Malta), Tal-Wej and Santa Margerita (Mosta), Kuncizzjoni and at Mtarfa itself, while at other places, such as Bahrija, St Patricks, Ta' Zuta, Gebel Ciantar and Mtahleb, shaft tombs can be found only a short distance away from the tracks.

Finally, Lanfranco attributes the tracks to the Roman period because of their apparent association with Roman remains²⁰. Similarly, the association of some

¹⁷ Gravina, L., The mysterious cart-ruts, *Times of Malta*, November 5, 1958, p. 5 and p. 11.

¹⁸ Trump, p. 33; Evans, p. 204; Buhagiar, M., The bronze age fortified settlements of the Maltese Islands, 1991, mimeo.

¹⁹ Trump, p. 33.

²⁰ Lanfranco *op. cit.*

tracks with ancient quarries and the observation of instances of similar tracks in other countries, always in connection with quarrying have also led Bonanno to the conclusion that they were formed during the Roman period²¹ to which the quarries are attributed.

Attribution to later periods have not been made but there is no justification for this, especially as it is known that Arab writers between the 7th and the 13th Century occasionally mention carriages in connection with the transportation of large blocks of stone at Alexandria and Tripoli. It is quite possible that the tracks were formed during the Arab Period, although it would be very difficult to prove this given the scant remains of this period²².

Now, do the tracks at San Pawl tat-Targa support or refute any of these hypotheses? It seems clear that these tracks cannot be attributed to the Temple Period or to the Bronze Age since there is no evidence of any temple in the vicinity and there does not seem to be any connection with the dolmens above Wied Filep or with Misrah Ghonoq, which is adjacent to Fort Mosta, both of which are presumably Bronze Age sites²³. Neither are they connected with quarrying as it does not make sense to cart rock either up- or down-hill, since it is available in abundance at both ends. Moreover, the tracks found near ancient quarries in Malta generally have ruts with a rectangular profile, that is with practically vertical sides and a wide flat bottom, unlike the V- and U-shaped ruts at San Pawl tat-Targa. There is, however, a tenuous connection with the rectangular shaft tombs, one of which is shown on the map (Figure 2) and at least another ten exist, or rather existed, at Tal-Wej and Ix-Xaghra ta' Santa Margerita, only two of which can be seen today²⁴.

²¹ Bonanno, A., The archaeology of Gozo: from Prehistoric to Arab times. In C. Cini (ed.), *Gozo: the roots of an island*, Malta, pp. 30-31.

²² Wiet, G., The Moslem world (7th to 13th Century). In Dumas, M. (ed.), *A History of Technology and Invention, Vol. 1, The origins of technological civilization to 1450*, (transl. E.B. Hennessy), London, 1969, pp. 352-3. Interestingly, G.F. Abela was of the opinion that the ruts were caused by carts carrying stones for construction which were exported to the Barbary coast G.F. Abela, *Della descrizione di Malta Isola nel Mare Siciliano con le sue antichità, ed altre notizie*, Malta, 1647, p. 69.

²³ Besides containing a fine pair of cart tracks – now unfortunately under tons of debris and soil – the area of Misrah Ghonoq now occupied by Fort Mosta had an important megalithic wall 50 feet long. A model of this wall was made by Petit-Radel, and was among the models of cyclopean walls in the Mazarin Library at Paris. Ashby, T., Bradley, R.N., Peet, T.E. and Tagliaferro, N., *Excavations in 1908-11 in various megalithic buildings in Malta and Gozo*, Papers of the British School at Rome, IV(1), 9.

²⁴ Two rectangular shaft tombs can still be seen at Tal-Wej at grid references 4898E 7499N and 4892E 7507N. At least another eight tombs existed further to the southwest until 1984 when the area was built over.

Firmer conclusions can be reached about the relative age of some of the tracks. Thus, it is quite clear that Track 1A is brought to an abrupt end because Track 1B and Track 3 cut across it, showing that they are of a later date. Similarly Track 4, which lacks continuity at the western end appears to be an early track which was replaced by Track 3. The same can be said about Track 7 which seems to have been slightly used and then replaced by tracks 3 and 6, while its extensions at either end were eroded. Two reasons why a new track could be preferred to an earlier one are either because the old track becomes too deep, rough or bumpy, as seems to have happened in the case of Track 4, or the old vehicle is replaced by one with a different gauge.

Little can be said about the length of time taken to form the tracks as this depends on the type of vehicle and on the load that was carried, two factors which will be discussed in the next sections. However, it should be pointed out that some have claimed that the ruts were made when the climate was more humid and consequently the rock surface was more easily marked by the vehicle²⁵. This however does not indicate any specific period because there are several instances of cooler and wetter periods followed by drier periods throughout the range of time under consideration, that is the Bronze Age to the Arab Period.

How the tracks were made

The process by which the tracks were formed is another point of controversy. Basically, there is agreement that the ruts were caused by the continuous passage of a vehicle, but there are two hypotheses about the type of vehicle that was used. One holds that the vehicle had wheels similar to a modern cart, and the other that it was either a slide car consisting of two poles with a number of wooden slats across or a sledge with a much greater contact with the ground. The sledge can be ruled out because of the sharp turns some ruts make, such as the hairpin bend at l-Argentier but not the one at the Naxxar Gap, as Trump contends²⁶. The evidence in the latter case does not exclude the sledge because the sharp turn at the junction of tracks 1A, 1B and 3 is ground flat (Pl. II). Moreover, it is difficult to imagine how a sledge with runners not more than 6 cm wide can survive the severe stresses to which it is

²⁵ Gracie, p. 98; H.H. Lamb cites evidence of a fluctuating climate in the Mediterranean over the last 5000 years. Of greatest significance is perhaps the period 600-200 B.C. which was characterised by a cold climatic regime in the eastern and southern Mediterranean, resulting in an increase in fertility in Greece and making possible the Carthaginian, and later the Roman croplands in North Africa. Afterwards there was a trend towards recovery of warmth in Europe and of increasing dryness until about A.D. 400. Lamb, H.H., *Climate history and the modern world*, London and New York, 1982, pp. 148-9.

²⁶ Trump, p. 34; Gracie, p. 92.

subjected when it clears the sharp inclines at various places at Naxxar Gap both uphill and downhill. The V- or U-shaped profile of the ruts also exclude vehicles with metal rim wheels similar to modern carts since these form relatively wide shallow ruts with a rectangular profile.

Most writers assume that the vehicle had wooden wheels without metal rims. Since wood is much softer than rock and considering that wheels form ruts by a constant grinding action – a rather inefficient process – hundreds of journeys are needed before the first grooves appear and thousands more to make them as deep as they appear today. The process would have been faster had wheels with metal studs been used. However, one has to consider the materials needed, the technology of wheel-making and the use of rotating or non-rotating axles for the carts²⁷.

Others prefer the hypothesis of the slide car consisting of wooden framework with hardwood shafts, possibly with stone or metal tips to reduce wear²⁸. In this case the ruts must have been formed by the constant scraping of the runners on the rocks, a quicker way to form the first traces of grooves than the grinding of wheels. It would also have been easier to follow the same path and consequently to cause the grooves to become deeper in a short time. In an experiment conducted at Naxxar Gap in 1955 for a BBC television documentary on Maltese archaeology, Evans showed that a cart with wheels stuck firmly in the tracks while the slide car was pulled along without much difficulty²⁹. Lewis repeated the test with a slide car and obtained the same result³⁰. These demonstrations suggest that the slide car is more efficient than a wheeled vehicle to negotiate the roll, pitch and sudden bumps observed (Pl. VII). However, not enough details about both investigations are available. Moreover, since the experiments were carried out on existing tracks, it is not possible to arrive at a definitive conclusion about the type of vehicle that formed the ruts in the first place. Only a carefully controlled experiment can decide whether slide cars or

²⁷ Piggott showed that the relevant technology developed at different rates in different regions. He also noted that although wheeled transport appeared around the fourth millennium B.C. over a wide geographical area in Europe and the Near East, the ancient Egyptians and the Chinese only introduced it in the seventeenth and the twelfth century B.C. Later, a large part of the late classical, and later Islamic, world between the third and the seventh centuries A.D., abandoned wheeled transport in favour of camel for riding or as pack animals. Piggott, S., *Wagon, chariot and carriage: symbol and status in the history of transport*, London, 1992, p. 15. Also, id., *The earliest wheeled transport from the Atlantic coast to the Caspian Sea*, London, 1988, p. 17. Pisani Sartorio makes the point that vehicles were very expensive: “un carro di costruzione accurata con ruote di un solo pezzo senza cerchioni poteva costare nel IV secolo d.C. 6000 denari; con ruote assemblate, invece, 3500 denari”. Pisani Sartorio, G., *Mezzi di trasporto e traffico, Vita e costumi dei Romani antichi*, 6, Roma, 1988, p. 21.

²⁸ Gracie, p. 97; Lewis, p. 62.

²⁹ Evans, p. 203.

³⁰ Lewis, p. 63.

wheeled vehicles are capable of producing ruts with the same characteristics as those observed, especially the tracks on sloping ground and those at sharp bends.

The tracks at Naxxar Gap show that vehicles with different gauges were in use, ranging between 132 cm and 150 cm with a preference for gauges of about 142 cm. In all tracks, the gauge is variable and the extent of the variation is from 3 cm, as in Track 7, to more than 10 cm, as in Track 3. This flexibility has already been noted by Gracie, who concluded that the vehicle must have been capable of considerable distortion³¹, and by Parker and Rubenstein, who explained the variation as the result of wobbly wheels, due to worn axle-stubs or ill-fitting lynch-pins or both³². There is more uniformity in the width at the bottom of the rut which is generally about 6 cm at the narrowest, although a slightly smaller width is sometimes found³³. This measurement corresponds to the thickness of the wheel or the runner, depending on which type of vehicle was used.

Whatever type of vehicle was used, the method of traction poses another vexed question. In the case of tracks with ruts of a rectangular profile the ground between the ruts is heavily eroded indicating that hooped animals were used to pull the carts. In the case of ancient tracks, such as those at San Pawl tat-Targa, there is no such indication. On the contrary, the surface rock between the ruts and by the sides is usually much smoother than the surrounding terrain, suggesting that the rough edges were ground by the shuffling of feet. Elsewhere, very rarely there are grip lines pecked on the rock to prevent slipping. At Bingemma, about a hundred metres east of the church of Our Lady of the Letter some rough grip lines occur between the ruts, and more such lines occur by the outer side of the ruts at a particularly steep section of the tracks at Dwejra, Gozo. The latter instance is especially important because only people can walk in the narrow space between the track and the rock face on the south side into which it is cut. These additional observations support the idea that the carts were pulled by people.

Purpose

The purpose of the tracks is another mystery: some authors believe that they had a specific use, others prefer a more general purpose. As already mentioned, Zammit argued that the tracks were used to transport soil from the valleys to the plateaux at the top of the hills in order to increase the extent of arable land during the Temple Period³⁴. Parker and Rubenstein agree with the idea that the tracks were associated

³¹ Gracie, p. 94.

³² Parker and Rubenstein, p. 15.

³³ Occasionally widths of 5.5 cm and 5.0 cm were encountered.

³⁴ Zammit, p. 23.

with agricultural activity, but they suggest that rocks quarried from the surface were transported to construct terraced fields on the valley slopes during the Carthaginian domination of the islands³⁵. On the basis of the evidence of local tracks and similar ones in the Mediterranean, Bonanno believes that they were used to transport quarried stones for building in Roman times³⁶. Gracie is among those who believe that the tracks were multi-purpose, forming a simple system of communication between settlements and with the sea and natural springs³⁷.

Now, if the tracks were used to carry soil, rocks or quarried stones the cart would be heavily loaded in one direction and not loaded in the opposite direction. This asymmetry would be expected to show up when the cart encounters a sharp rise or a bumpy stretch. A loaded cart going uphill is expected to cut more into the upper part of the rise than at the bottom part, whether it is a wheeled vehicle or a slide car. A different pattern of erosion would be expected if the heavy load is carried downhill. Also, the need of soil or rocks for agricultural purposes was presumably satisfied over a relatively short period of time. Probably so short that there would not be enough time for the cart to cut so deeply into the rock or to form so many deep tracks. Furthermore, only relatively short tracks are expected from the source of the soil, rock or stone to the place where it is needed. However, if the tracks were part of a network of roads joining settlements and the sea then one would expect to find very long continuous stretches which lead to known settlements or places where evidence of settlement can be found, and to the sea³⁸.

The tracks at San Pawl tat-Targa do not exhibit any convincing evidence of directionality. It is also clear that they were not meant for the transportation of rocks, although it is not possible to exclude soil. But, there are many deep ruts which must have been formed over tens of years at least, more than necessary to carry all the soil that was needed. On the other hand, the length of the tracks and the extension of Track 9 towards Mosta are more consistent with the hypothesis that they formed a system of communication between distant localities. Additionally, it is worth recalling that Gracie and Trump point out that the San Pawl tat-Targa tracks extended towards Salina Bay, but unfortunately only the end part between Tal-Qadi and the church of St Michael at Salina can still be examined today³⁹.

³⁵ Parker and Rubinstein, p. 24-25.

³⁶ Bonanno, p. 31.

³⁷ Gracie, p. 98.

³⁸ Besides the well-known track which leads into the sea at St George's Bay, Birzebugia, there are other tracks close to the shore at Ghadira Bay, Salina Bay, St George's Bay (Paceville, behind Villa Rosa), and at Dwejra, Gozo.

³⁹ The part of the track which is not on private property has a length of about 30 metres and an average gauge of 138 cm.

CONCLUSION

This close look at the tracks of San Pawl tat-Targa reveals a network of tracks some of which merge into one another, others are separate, and one or two, although separate, could have been linked in the past. Their age is still a mystery because it is not possible to firmly associate them with other datable features. Only a tenuous connection with rectangular shaft tombs, which may date back to the Punic period can be made. Surely they were made at an age when there was scope for many journeys, some of which at least were over large distances. The profile of the ruts excludes the possibility that they were made by wheeled vehicles with metal rims. However, from the evidence of the profile alone, it is not possible to distinguish between wheeled vehicles without metal rims and slide cars. But slide cars are favoured by the experiments which were carried out by Evans and Lewis and by a consideration of the required flexibility and resilience of the vehicle to withstand the stresses of the roll, pitch and jerks of the bumpy journey on the rough rock surface. Wooden wheels without metal rims would have fallen apart under those stresses.

Perhaps the clearest result emerging from this study is that the tracks provided a connection between the fields at the mouth of Wied il-Ghasel, to which they descend, and settlements at Mosta and Naxxar. Unfortunately the connection with the port at Salina Bay is no longer evident but the remaining stretch close to the bay can be admitted as plausible evidence for this connection. The overall length of the tracks from Salina to Tal-Wej at Mosta would then be about 3.5 kilometres, although the longest ascertainable stretch today is about 1.5 kilometres long. Taking the tracks at San Pawl tat-Targa to be part of a wider road network would indicate that they were used for many purposes and not for one specific use. It would also mean that the tracks formed part of an ancient road system, perhaps one of the oldest extant road systems in the Mediterranean⁴⁰.

This study can only be considered as the beginning of an attempt to investigate in some detail the ancient tracks at specific sites. Of course, the conclusions only apply to the tracks at San Pawl tat-Targa and it would not be surprising at all if different results are obtained from similar studies of the tracks at other sites⁴¹. For these tracks, a more systematic and comprehensive approach can be adopted by taking measurements more frequently and at strictly regular intervals, carefully

⁴⁰ Singer, C., Holmyard, E.J. and Hall, A.R. (eds.), *A History of Technology Vol. I*, Oxford, 1954, p. 713. Forbes, R.J., *Studies in Ancient Technology Vol. II*, Leiden, 1955, p. 138-141.

⁴¹ Tracks with a different profile from those found at San Pawl tat-Targa, and which can be seen at various localities, may have been formed in a different way at a different age, and served a different purpose.

surveying the vicinity of the tracks for any association with datable structures, and mapping the concentrations of distinctive pottery sherds along the tracks. The latter should be done by trained archaeologists, and even then the random collection of sherds should be discouraged as this would result in the destruction of the little available evidence that can shed light on the age of the enigmatic cart tracks.

Table 1: Measurements of Tracks at San Pawl tat-Targa, Naxxar

Track Number	1+1B	1A	2	3	4	5	6	6A	6B	6C	7	8	9	10
Length (metres)	284	31	34	228	130	39	174	100	50	5	38	42	(1500)	7
Gauge														
No. of measures	16	3	4	21	16	2	11	9	7	2	3	2	5	1
Average (cm)	142	150	143	139	142	148	144	143	145	149	142	132	142	141
SD	2.5	1.0	0.8	3.5	2.5	–	2.4	3.9	1.6	–	1.0	–	1.7	–
Widest	147	151	144	144	147	151	148	148	147	152	143	134	143	–
Narrowest	138	149	142	133	138	144	141	138	142	146	141	130	139	–
Depth of rut														
No. of measures	a b	a b	a b	a b	a b	a b	a b	a b	a b	a b	a b	a b	a b	a b
Average (cm)	11 14	3 3	5 4	20 19	11 14	2 2	11 12	6 6	5 6	2 2	3 3	2 2	4 3	1 1
Deepest	18 25	16 26	7 9	19 14	18 25	21 13	15 22	15 17	8 18	19 16	14 18	20 7	29 22	2 4
	37 55	22 32	10 16	33 38	37 55	22 21	22 39	30 25	20 32	20 17	17 25	32 9	50 43	– –
Width at surface														
No. of measures	16 16	3 3	5 4	22 21	16 16	3 3	13 13	9 9	7 7	2 2	3 3	2 2	5 5	1 1
Average (cm)	21 20	23 40	15 15	19 18	21 20	31 18	29 33	25 27	21 24	26 27	16 15	17 15	30 27	8 12
Widest	35 27	27 44	19 22	28 25	35 27	34 23	41 45	30 31	31 42	28 28	18 23	21 19	53 37	– –
Narrowest	13 14	25 34	11 11	9 8	13 14	28 12	17 22	22 12	12 15	23 25	12 11	13 10	18 17	– –
Width at bottom														
No. of measures	10 13	3 1	5 4	20 19	10 13	1 2	7 10	6 6	5 6	2 1	3 3	2 2	3 1	1 1
Average (cm)	8 6	7 14	8 8	6 7	8 6	9 8	14 12	12 11	10 11	12 8	6 6	6 6	8 7	7 8
Widest	13 10	9 –	10 9	8 12	13 10	– 9	22 27	18 15	17 18	15 –	7 8	6 6	13 –	– –
Narrowest	6 5	6 –	7 6	5 5	6 5	– 7	6 6	9 7	6 4	9 –	6 5	5 6	6 –	– –

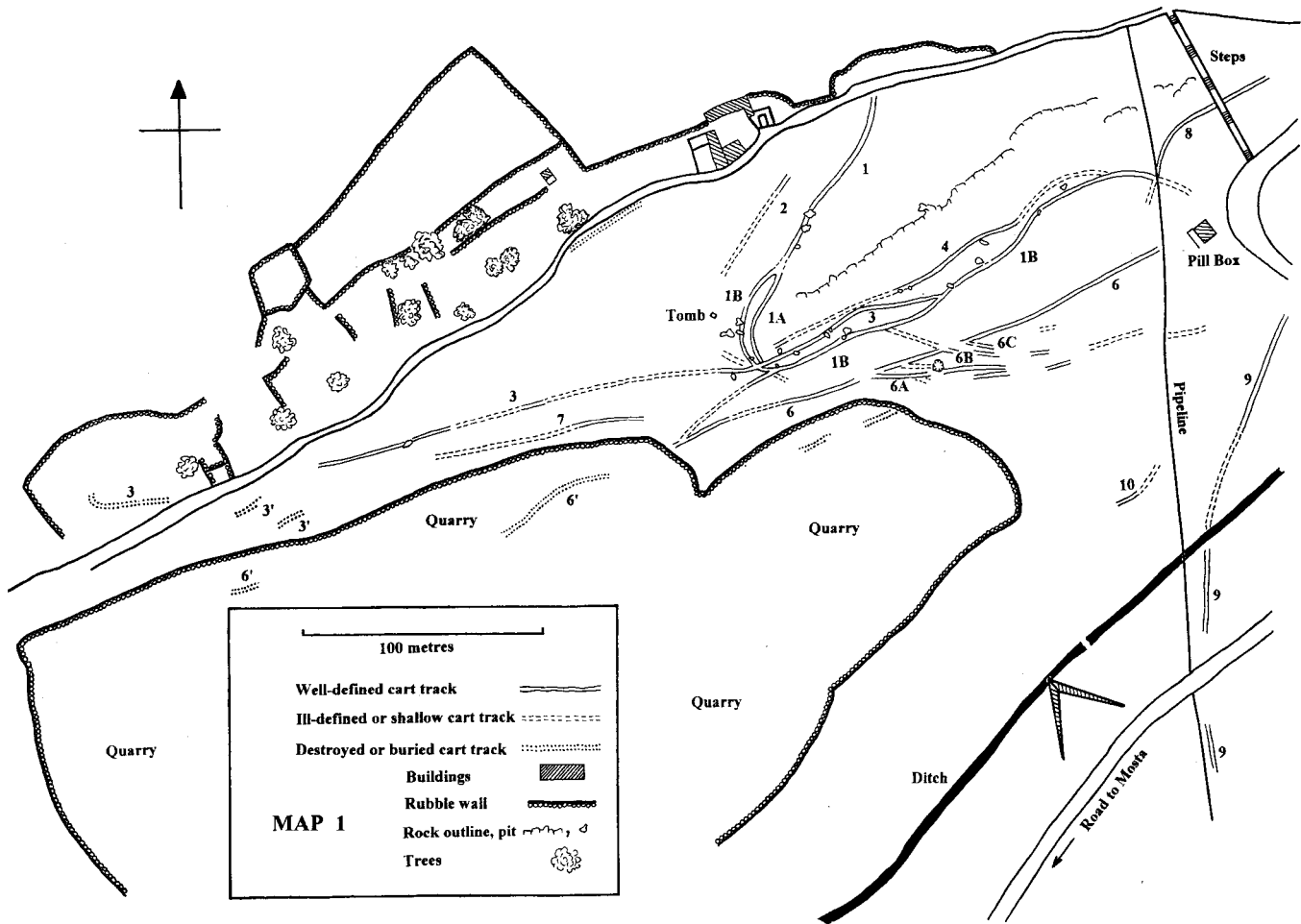


Figure 2: Map 1 charts the cart tracks at T' Alla u Ommu, limits of Naxxar.

