HANNIBAL’S INVASION ROUTE: AN AGE-OLD QUESTION
REVISITED WITHIN A GEOARCHAEOLOGICAL AND
PALAEOBOTANICAL CONTEXT*

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The point of Hannibal’s departure from New Carthage in Iberia, in 218 BC, and his subsequent
march along the Mediterranean coast to the Pyrénées and on to the Rhône Basin, has been
reconstructed by ancient historians with considerable accuracy. The latter 400-km phase
through the Alps, however, has been the subject of some controversy as to whether the Punic
Army followed a southern versus a northern invasion route, or some intermediate variant.
What is certain from the ancient texts is that Hannibal was trapped by Gallic tribes in a large
defile—a gorge large enough to hold the entire army—along the approach to the high col of
passage on to the Po River Plains of northern Italia. The entrapment involved an enfilade
attack planned by an unknown Gallic commander, a military operation that nearly decimated
the Punic Army. Previous arguments as to the location of the defile have hinged on inconclu-
sive topographic, geological and geomorphic assessments. New data from palaeobotanical
reconstruction of the northern approach route show the Gorges de la Bourne and the Gorge
du Bréda, astride the Isère River, to have been forest covered during the invasion, which would

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have made the Gallic assault impossible. The existing evidence argues for a southern route, the approach through the narrow defile of the Combe de Queyras, with passage over the Col de la Traversette, as argued by Sir Gavin de Beer nearly a half century ago. Narrowing the approach route focuses on sites worth geoarchaeological exploration.

KEYWORDS: HANNIBALIC INVASION, 218 BC, METHODS, GEOARCHAEOLOGY, PALAEOBOTANY, UPPER TREELINE

INTRODUCTION

The actual route followed by the Punic Army into Italia in 218 BC has been the subject of considerable controversy for millennia (Larauza 1826; Dodge 1891; de Montholon 1905; Brown 1963; Guillaume 1967; Hart 1967; de Beer 1969; Connolly 1978, 1981; Cottrell 1992; Renaud 1996; Lazenby 1998; Bagnall 1999; Lancel 1999; Appian, trans. White 2002; Mahaney 2008, 2010; Mahaney et al. 2010), a mystery clouded over by the generic descriptions provided in the ancient literature by Hannibal’s two chief chroniclers: Livy and Polybius (Livy, trans. de Sélin-court 1972; Polybius, trans. Scott-Kilvert 1979).

Three main invasion routes (Fig. 1 (a)) have been proposed by numerous authorities (Wilkinson 1911; Walbank 1956, 1990; Proctor 1971; Seibert 1993; Healy 1994; Mahaney 2004, 2008; Mahaney et al. 2008a,b) after Hannibal left his re-supply position at the ‘Island’ on the Rhône River. The northern route (Fig. 1 (a)) follows the Rhône to its confluence with the Isère River, along the Isère to the Arc River and thence to the Col du Mont Cenis or Col du Clapier. A second possibility is a middle route from near the present-day city of Grenoble, past the Pelvoux Massif to rejoin the Durance and march over the Col du Mont Genève. A third possibility is the southern route along the Rhône to the Drôme and its junction with Le Bez River leading to the Gorges des Gaz, over the Col de Grîmone towards the city of Gap and the Durance Basin, and thence through the Combe de Queyras to the Col de la Traversette and the upper Po River country.

Both Livy and Polybius document that the Gauls planned two attacks against the Punic Army. The first was a blocking manoeuvre in which the Gauls held the high ground, presumably a col, where Hannibal would have had to deploy and engage them to effect passage. If Hannibal took the northern or middle routes, this engagement must have occurred near present-day Grenoble; if along the Drôme-Le Bez catchments, near either Col de Grîmone or Col de Cabre. Of these two cols, the Col de Grîmone is preferred, as the topography closely resembles what Polybius (III, 50) described, where Hannibal deployed his army in the lower valley, giving the impression that he was camping for the night. After his scouts reported that the enemy had departed the col at night, retiring to a nearby town, Hannibal formed a special column and led a night action, taking the col unopposed. When the Gauls reappeared the following morning, he surprised them and routed their columns. The nearby town has been referred to by many sources either as Gap, Grenoble (which did not exist in any size in Hannibal’s time), Mons Seleucus or Les Lusettes. If this action took place at the Col de Grîmone, the nearby town within walking distance would have to be at or near Les Lusettes (Mahaney 2008).

More importantly, perhaps, and following this night action somewhere on the approach route to the high col, Hannibal was attacked by Gauls who were intent on pillaging his baggage train and/or halting the invasion altogether. The exact location of this attack depends on the existence of a prominent defile with steep cliffs, from which the Gauls could roll or fling rocks, producing a considerable rock avalanche, a veritable ‘missile’ barrage. Polybius (III, 53) is clear that the defile in question is a ‘gorge’, an entrenched valley of considerable size, one capable of containing the entire army, and located somewhere near the final col leading into the Po River country.
Figure 1  (a) A satellite image of southern France and the Western Alps, showing the three possible routes that Hannibal may have followed in 218 BC (from Mahaney 2008). Of the possible approach routes, only three exhibit steep defiles: Combe de Queyras [1], Gorges de la Bourne [2] and Gorge du Bréda [3]. (b) The geology of the internal and external arcs of the French and Italian Alps (from Mahaney 2008; Mahaney and Tricart 2008).
The disposition of the Punic Army was such that the cavalry led, followed by the baggage train with heavy infantry, under Hannibal’s command, making up the rear echelon. His heavy infantry covered the first assault and repulsed the Gauls. However, an engagement quickly followed, developing into an enfilade attack along the Punic flanks with devastating effect (see Mahaney and Tricart 2008). Whatever planning went into the Gallic offensive, the effect was severe enough to cause considerable casualties, with perhaps as many as 10 000 soldiers, principally mercenaries, dying in one 24-hour period. Hannibal was forced to spend the night with only half his force near a ‘certain bare rock which offered some protection’ (Polybius, III, 53; Mahaney 2008), indicating substantial rock outcrops that might provide cover for Hannibal and his staff/bodyguard. Following the onslaught, Polybius states that ‘Hannibal was able to rejoin the cavalry and baggage animals and advance towards the top of the pass’, which indicates the col was within a reasonably short distance (i.e., ~30 km).

To assess and reconstruct the approach route, it is necessary to analyse the topography and the geology/geomorphology of the proposed approach routes. The defile needs to have the geometry to contain the entire Punic Army, which consisted of some ~35 000–40 000 men and 10 000–15 000 animals at this point. Moreover, the valley-side slopes need to be steep enough to roll/drop boulders on to the soldiers making their way along the valley bottom; hence, the slopes need to be free of timber and within an easy trek of the high col.

Thus, the only significant defiles that exist on the southern, middle and northern routes are analysed.

**REGIONAL GEOLOGY/TOPOGRAPHY**

The regional geology (Fig. 1 (b)) shows a series of overlapping thrust sheets oriented from north-east to south-west, through which valleys have been cut over Tertiary and Quaternary time, first by water flowing down the regional slope and later by meltwater from a succession of glacial advances during the ice ages (Billard and Orombelli 1986; Bini and Zuccoli 2004; Ehlers and Gibbard 2007). The bedrock geology upon which drainage lines have been imprinted is the culmination of several episodes of plate tectonics, resulting in first the opening and then the closure of a small oceanic domain called the Alpine Tethys. The ridge and trough structures that make up the Alps today mainly derive from this vanished ocean and its European margin. It is through these valleys, ringed with high ridges, that Hannibal marched his army into Italia in 218 BC.

The Alps straddle the plate boundary between Europe and Africa—or, more precisely, a northern African promontory, called Adria. Along this boundary, the first predominant plate divergence engendered continental rifting (Early–Middle Jurassic) followed by ocean spreading (Late Jurassic – Cretaceous). A kinematics reversal induced subduction of the ocean (Late Cretaceous – Eocene) and then a continental collision that is still active today (e.g., Tricart 1984). Large-scale overriding of the Adriatic palaeo-passive margin on to the European one was early described by Argand (1911), who gave the Alps their structural celebrity. The Western Alpine arc (Fig. 1 (b)) developed along a 300-km length, with a width ranging between 150 and 200 km. Globally, the resulting relief displays a marked asymmetry, the inner, eastern slope being much steeper than the outer, western one, a point reiterated by historians who have studied the routes (Lazenby 1998; Bagnall 1999). This orogen asymmetry is directly inherited from the structural asymmetry of the subduction to collision wedge, resulting from repeated outward-directed tectonic transport. Viewed on the map, curvature resulted from unequal shortening of the European palaeomargin at the western tip of the Adria promontory, acting as an indenter during the Oligocene paroxysm of the collision.
Outside the arc, in the external (or Helvetic–Dauphinois) zone, the main mountainous relief forms are contorted (flexed) between NE–SW in the north and NW–SE in the south. They underline the main fold–thrust structures developed in the Palaeozoic crystalline basement (e.g., the Mont-Blanc, Belledonne or Argentera massifs) or in the Mesozoic ante-rift to post-rift sedimentary cover (e.g., the Chartreuse or Vercors massifs, the latter being one of the gorge systems where Hannibal is thought to have been ambushed by the Gauls; see Lazenby 1998). Between these two massive ensembles, a major tectonic uncoupling is identified by Triassic evaporites or in the thick overlying Liassic marls of Mesozoic age. In this external arc, gentle Cainozoic shortening is identified by inverted Mesozoic rift-related fault blocks, the trend of which also underlines the curved geometry of the outer mountain belt. Transverse valleys may correspond to syn- or post-folding transcurrent faults, but also to much older faults interpreted as transfer faults in the palaeorift structure.

In the south-west, original east–west elongated relief features such as Dévoluy and Diois correspond to a train of regional-scale east–west folds. These are not strictly Alpine folds developed in Late Cretaceous to Eocene times, but are directly related with Provence–Pyrénées tectonics, when the Iberia microplate collided with Europe.

This contrasts with the core of the Western Alpine arc, which displays a thick pile of metamorphic nappes; in other words, allochthonous rock sheets moved on a horizontal surface. These nappes derive from both an uplift shoulder and the contiguous deepest part of the rifted structure when referring to the Early to Middle Jurassic palaeogeography, and derive from the middle/distal part of the passive margin, and from the oceanic realm, when referring to the following period. The original stack of nappes with its recumbent folds bearing flat-lying foliations was mainly emplaced in an accretionary wedge, as the ocean and its stretched margin was subducted. During the subsequent collision, several severe shortening phases resulted in post-nappe folds and thrusts. The latest ones are directed towards the core of the arc (the so-called backfolds and backthrusts) and underlie the curved geometry of the inner mountain belt. From the Late Cainozoic onwards (the Miocene?—see the discussion in Tricart et al. 2006), this complex polystage structure corresponds to the most thickened part of the Alpine crust, which underwent gravitational collapse. It resulted in extensional and transtensional faulting, parallel and transverse to the mountain belt; that is, roughly tangential and radial to the arc. This late Alpine fault net, which remains partly active, is directly responsible for the location of the main valleys, the approach routes that Hannibal followed to reach the high col or passage into Italia. It explains why relief appears more distorted in the internal arc than in the external arc.

Hannibal would not have been interested in the geology as much as the topography, but when the attack came in the approach defile, he certainly must have been acutely aware of the ease with which Gallic sappers removed large boulders from the upper cliffs, hurling them with great precision on to his columns of troops. While many outcrops contain schist, which in tabular form is not easily moved, the Gallic attackers proved adept at picking subround boulders as ‘missiles’ from among the mixed lithologies left behind by Late Pleistocene glaciers.

The middle route (Fig. 1 (a)) proposed by Connolly (1981), along the Drac River to the Romanche River, comprises drainages lacking shear vertical cliffs. All steep slopes lie within the upper limit of forest species in Hannibal’s time, as indicated by palynological reconstructions.

Comparing the rubble volume in the northern gorges with the southern Combe de Queyras, the latter arguably contains the far greater mass of rock debris, some piles probably a vestige of the 2200-year-old assault. More importantly, the great piles of rock rubble all along the Combe de
Queyras (Mahaney 2008; Mahaney and Tricart 2008) provide fertile ground for geophysical exploration with ground-penetrating radar (GPR), and metal detecting and/or magnetometer equipment. Several geophysical methods are available that can be used to probe the shallow subsurface of the rubble piles, hearths and stone wall systems outlined herein and in Mahaney (2008), but these tests should be undertaken by someone with a license to carry out exploratory archaeology. These methods include GPR, metal detectors and magnetometers.

Ground-penetrating radar, as with metal detectors and magnetometer surveys, offers non-destructive geophysical techniques for imaging the subsurface of key sites associated with the invasion. The pathways into Italia from the Combe de Queyras, the hearths in the upper Guil River, and the two-tier rockfall and the regrouping area in the Upper Po Basin are choice localities to image with GPR. The GPR instrument images a cross-section of a site and provides a profile of underground features including buried objects, bedrock and deposits of various compositions. The method relies on transmitted pulses of ultra-high-frequency radio waves (microwavelength electromagnetic energy) into the ground through an antenna (transducer), the transmitted energy reflected from underground structures or objects being received and stored in a digital control module. As the radiowave signal passes through the ground, it contacts strata with changing moisture contents and, hence, electrical conductivities and dielectric constants. Only part of the radar waves reflect off the object; the rest pass to the next interface, strata or object. Reflected signals return to the antenna and pass into the digital control module, which measures the two-way travel time in nanoseconds and amplifies signals in the process. The output signal voltages are plotted as a profile showing different colour bands for each change in strata or interface that produced the reflected wave.

The system is ideal for imaging deep structures, and for most applications here the depth required is less than 1.0 m in most instances—or in the regrouping area, where debris flow material covers important sites, the depth is expanded to 2.0 m, well within the range of the instrument. For most shallow imaging, high-frequency radar is suitable and uses antennae in the 300–1500 MHz range (Conyers 2005).

Along with GPR, researchers might consider conducting a survey of key sites using a metal detector, as outlined in several technical manuals (i.e., Ostdiek and Bord 2008). A metal detection survey might reveal a wealth of buried metal objects, including knives, spear points, swords, belt buckles, shovels, pry bars, picks, equestrian materials, coins and so on, all of inestimable value in reconstructing the military culture of ancient Carthage. An outline of the method may be obtained by consulting ASTM (American Society for Testing and Materials) manual D7046-04 (ASTM 2004), which summarizes the equipment, methods employed in the field and interpretation necessary for the assessment of subsurface materials. Both ferrous (iron and steel) and non-ferrous (aluminium and copper) metals are detected by inducing eddy currents in conductive objects. Metal detectors use either frequency domain (continuous frequency or wave) or time domain (pulsed) systems.

A vast range of metal detectors is commonly available, although the Fisher M-Scope 1212-X is widely used. In contrast, if a magnetometer is used, it will detect only ferrous materials. A widely used instrument is the Schonstedt Model GA-52Cx (see Schonstedt 2001).

**PALAEOBOTANICAL RECONSTRUCTION**

If Hannibal advanced along the Isère River to the Arc River (Fig. 2 (a)), he would not have encountered a gorge with steep cliffs and he could have marched either side of the river without
fear of a major Gallic ambush. If, on the other hand, he deviated from the Isère into the Gorges de la Bourne, astride the Vercors Massif near Grenoble, and later through the defile between La Rochette and Pontcharra (the Gorge du Bréda, immediately to the east of the Isère Valley; Fig. 2 (b)), he would have rejoined the Isère River near its confluence with the Arc. To do this he would have had to pass through short defiles with steep forested cliffs on either side (see Lazenby 1998). Despite the presence of large talus cones on either side of streams in the Gorges de la Bourne and the La Rochette – Pontcharra defile, a kind of buffer zone that would absorb the impact of hurled or dropped boulders, it is important to establish whether forest laced the valley sides during the advance. If forested, the attack as described by Polybius and Livy, would have been impossible on the northern approach routes.
The forest-limit position 2200 years ago (218 BC), and eventually the treeline, are critical components to establish if one were to argue that the decline or advance of forest into the alpine tundra influenced the ease with which the Gauls were able to dislodge boulders on to the Punic soldiers in the lower valley. Climatic reconstructions (Neumann 1992; von Grafenstein et al. 1998; Davis et al. 2003; Ortu et al. 2006, 2008) of the temperature/precipitation pattern for the Alps during the Neoglaciar (200 BC) suggest that the climate was similar to that of the mid-20th century, without the advanced global warming under way in the first decade of the 21st century (Mahaney 2008).

The Combe de Queyras (Figs 3 (a) and 3 (b)), the only major defile along the southern route, has almost vertical cliffs along the 21-km stretch of the Guil River, which nullifies the importance of timberline fluctuations, large or small. However, timber fluctuations in the Gorges de la Bourne and the Gorge du Bréda, major tributaries of the Isère River, are of some importance in assessing the suitability of the defile for the attack outlined in the ancient literature.

The palaeobotanical records based on macroremains of woody plants (Fig. 4), the most precise treed vegetation proxy (Birks and Birks 2000), show that at the time of Hannibal’s invasion, the upper treeline was at 2260 m a.s.l., at least. Isolated evidence indicates that trees, mainly cembra pine (Pinus cembra) and European larch (Larix decidua), grew at elevations as high as 2670 m (Ali et al. 2005) until the Middle Ages (AD 700–900). All sites contain continuous records of tree remains until AD 100, when trees disappeared from the Lac Cristol (2254 m), and then Lac du Lait (2196 m) experienced an abrupt drop in the abundance of tree remains at AD 900 (Fig. 4). The Lac du Thyl, which was forested until 2000 BC at least (Genries et al. 2009b), shows little tree remains over the past 2000 years, with their total disappearance from sediment at c. 400 BP (AD 1550). The other lakes (L. Loup, L. Perso) have kept trees on their lakeshores until nowadays, but the total tree abundance has certainly been very low compared to what occurred between 6000 and 1000 BC (c. 8000–2950 yr BP) (not shown; see details in Blaquez et al. 2010). The upper treeline in this region obviously moved down to reach the modern treeline between AD 500 and 1500, but the tree abundance was already low between 1000 and 0 BC compared to the middle Holocene, ~5000–1000 BC (c. 7000–3000 yr BP) (Nakagawa et al. 2000; Genries et al. 2009a), suggesting that forest clearing had already begun at most sites.

The generalized stratigraphy for the Gorges de la Bourne, shown in Figure 5, depicts the lithostratigraphy extending from the early Neoglaciar (3000 BC; 5000 yr BP) with coarse sedimentation (presumably a deteriorating climate in the Subboreal transitioning to the Subatlantic Chronozone at ~800 BC (2800 yr BP). Prior to the Subatlantic, a period of weaker sedimentation is followed by renewed frost riving and coarse sedimentation, culminating in more extensive frost riving near the top of the section; that is, during the Little Ice Age.

The generalized pollen data in Figure 5 show variations in arboreal and non-arboreal pollen that together reflect cultural-induced forest clearing prior to 800 BC (2800 yr BP), followed by a rise in arboreal pollen (i.e., the Hallstatt epoch). Hence, the elevated forest limit may have lasted for two to three centuries following the ingress of fir, which might relate to Neoglaciar cooling. After 800 BC (2800 yr BP), slight alternations in hazelnut and boxtree species indicate a quasi-stable forest limit with only minor variations in elevation. It is clear that the present forest limit more or less approximates the forest limit that Hannibal would have encountered had he ventured into Italia along the northern route advocated by Lazenby (1998).

If the forest limit has not significantly fluctuated since Hannibal’s time (Genries et al. 2009b), the snowline has remained relatively constant with the exception of the Little Ice Age (AD 1500–1800; 450–150 yr BP). Previous mention of a drop in the average snowline by Connolly (1978) to the order of 1000 m in Hannibal’s time is a great over-exaggeration. Today, the

Figure 3  (a) The entrance to the Combe de Queyras from the lower Guil River (from Mahaney et al. 2008b). (b) The upper gorge near La Maison du Roi (from Mahaney 2008).
snowline fluctuates between 1800 m a.s.l. in winter to ~2900 m a.s.l. in summer, with variations of ±300 m depending on aspect (for a discussion of microclimate on permafrost distribution in the Western Alps, see Mahaney et al. 2007). The average fall snowline position (October–November) would be 2600 m a.s.l. ±200 m today, similar to Hannibal’s time. For satellite analysis of snowline positions, see Droz and Wunderle (2002). The forest-limit elevation would be within the plus-or-minus margins or around 2500 m a.s.l. on the French side, and about 1800 m a.s.l. on the Italian flank of the Alps, the contrasting elevations reflecting aspect, nearness to maritime sources and prevailing wind. In part, the modern lower treeline elevation on the Italian side is due to human activity (transhumance, charcoal production).

**DISCUSSION**

The environmental evidence for the second attack described by Polybius argues against the Gorges des Gaz in the Dauphiné Alps. Not only is the gorge heavily wooded up close to the Col

de Grîmone, but it is not of a size compatible to hold the entire Punic Army as one massive arm. The gorge is also nearly 200 km from the high col of either the Mont Genève or the Traversette, neither of which lie within easy marching distance as described by Polybius. While the Gorge de Gaz – Col de Grîmone fits the description of the first attack described by Polybius, it is hardly convincing as the venue for the second attack.

The Combe de Queyras, picked as the most likely candidate for the second attack by de Beer (1967, 1969) and Prevas (1998), is favoured here, if only due to its geometry, geological setting and closeness to the high col. The Combe de Queyras is 21 km long, <100–300 m wide in most places, and is consistently flanked with steep, almost vertical cliffs, which afford ample material to be used as ‘missiles’. The volume of the defile is of a size that could hold the entire Punic Army, with the elephant cavalry corps up front, followed by the baggage train buttressed with mercenaries and the heavy infantry as the rear guard. Both in situ carbonate and siliceous bedrock could be made ready to drop into the valley, and boulders of varying dimensions left behind by ice during the last glaciation could also be used as ‘missile’ material. More than this, the distance to the high col is of the order of 25–30 km, approximately a two-day march.

The Gorges de la Bourne, a tributary to the Isère River, narrows in places to a point where a crossing to the upper Isère is possible. The gorge itself is quite steep, as pointed out by Lazenby (1998), but with large accumulations of talus on the valley sides. To argue for this as the site of the first attack, one needs to question why Hannibal would deviate from the Isère River through a defile that would take him into the Vercors, extremely rugged terrain offering no tactical advantage. If Hannibal did take the northern route, surely his cavalry would have informed him that the Isère River offered the fast route to the high passes. In addition, to consider the Gorge du Bréda as the venue for the second attack (cf., the alternative to the Combe de Queyras), one needs to consider that the wide talus deposits act as a buffer zone between boulder-launch sites and the main valley where the soldiers would be deployed. Any ‘missiles’ fired off the ridge crest would come to rest on the talus piles, resulting in little, if any, damage to the army below. The forest
cover today, at the narrowest cross-valley profile of the gorge (see Plate III in Lazenby 1998), stretches up the valley sides and talus cones to near the top of the gorge. If this is the site of the second ambush, one would have to explain how the Gauls managed to hurl/slide boulders through the forest on to the valley bottom. Moreover, one needs to explain why Hannibal would deviate from the wide valley of the Arc River (Fig. 2 (a)) to enter the Gorge du Brèda, an alternative route that would not save any time.

Contrasting the two areas—Combe de Queyras versus the Gorges de la Bourne—the site depicted by Polybius as the location of the vaunted ambush that nearly decimated Hannibal’s forces would have to be along the southern route on the Guil River, below the Col de la Traversette, as first suggested by Sir Gavin de Beer (1969).

CONCLUSIONS

Of the two approach route possibilities, the Combe de Queyras provides a near-perfect match for the venue for the second attack. Its sheer cliffs, ample supply of easily detached bedrock, loose regolith on the high ramparts astride the Guil River and closeness to the high col combine to make it the most likely candidate of the two proposed sites. The enormous accumulation of rock rubble adjacent to the Guil River, some of which has been affected by engineering and flood control engineering works, is probably a residual mass dating to the actual attack some 2200 years ago. Weathered scars visible on the high walls of the gorge in many places have similar light tonal contrast with adjacent heavily altered, oxide-rich rock outcrops, along the flanks of the gorge. While it might be impossible to find an artefact record in the rock rubble using metal detectors, it may be worth the effort to attempt geoarchaeological exploration of the rubble sheets using GPR. Certainly any new finds of weapons or accoutrements employed by the Punic Army would shed considerable light on the military culture of ancient Carthage. The presence of numerous ancient hearths in the subalpine forest of the upper Guil River and stone walls in the regrouping area on the lee side of the Alps also invite geoarchaeological exploration.

To the north, the Gorges de la Bourne and the Gorge du Brèda are covered with trees on the valley sides along most of the approach route to the high col, making it impossible to engineer rockfall of sufficient magnitude to inflict maximum damage on Hannibal and his army. Where steep cliffs are found, large forest-covered talus cones lie between the ridge and valley flat, providing a buffer zone that would absorb the bulk of a ‘missile’ attack without causing substantial damage to the army marching below. Palaeobotanical records indicate the upper forest limit of today is similar to Hannibal’s time of ~2200 years ago, although the upper treeline drop occurs later, between AD 500 and 1500.

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