CHAPTER ONE

INTRODUCTION TO THE GEOGRAPHY AND GEOLOGY OF SAN GIOVENALE

Fig. 8. The Tolfa Mountains seen from San Giovenale.

Guarded in the south by the low but quietly powerful, evergreen Tolfa Mountains (*Fig. 8*) and located at the centre of a desolate valley surrounded by oak-forested hills, the Acropolis of San Giovenale and its lower, northern outcrop, the so-called Borgo, constitute another of those steep, tufa formations typical of the volcanic landscape of north-western Latium. It is dramatically isolated from the surrounding plain by deep ravines cut out by eroding torrents and rivulets (*Figs. 9–10*).[15] Easily defended, the site has been used and lived on from the Middle Neolithic to medieval times and perhaps even later. Today San Giovenale may appear isolated in a valley cut off from the main traffic arteries. But in the past there was a system of busy roads connecting it with other sites in the area, such as Bieda/Blera, San Giuliano and Luni sul Mignone, and with those further away such as Caere, Tarquinia and the Faliscan area.[16]

The occupation of the site through the millennia testifies to the fact that, albeit undoubtedly always a *centro minore*, San Giovenale was not devoid of attraction and importance and that it was always part of a wider world.[17] San Giovenale has many ingredients: the find of a Mycenaean sherd, an extensive late Bronze Age hut village, a socially differentiated early Etruscan community with several *necropoleis* including major tumulus tombs, an impressive Archaic bridge across the Pietrisco, a scarab from Egypt and luxury vases from Corinth and Athens, as well as Roman agricultural activity, an early medieval chapel to the martyr-saint Juvenalis and a castle of the di Vico family dating from the 1240s. Of the long life span of San Giovenale, from the Neolithic to medieval times (*Fig. 11a–b*), the excavations of

[15] For a brief introduction to the site and a summary of research, cf. Welin & Hanell 1962, 279–310, and Gierow 1986. Its Etruscan name is unknown, though the early excavators tried to connect it with Cortuosa and Contenebra, mentioned by Livy (6.4.9–11). For its present name, cf. Ermini Pani 1981, 88–91, and Del Lungo 1999, 244f.

[16] Cf. Wetter 1962, 165–208 and Map II, Supplementary map and Aerial Photomaps 6–8. The impressive bridge across the gorge of the Pietrisco river and the evidence of some kind of "bridge cult" stress the importance of the communication with the south-east, an aspect also hinted at by the strong Caeretan influences at San Giovenale; see Backe-Forsberg 2005.

[17] Berggren 1984, 83–90; *San Giovenale* VI:4–5. Cf. also Calisse 1887, 443 and Mantovani 1984, 128–137 (Documenti 14: Anno 1248 – Doc. 17: Anno 1283, on interesting discussions of several popes, e.g. Pietro's III, IV and V Di Vico, San Giovenale and 170 pigs).

Fig. 9. View from the north-west of the curved oblong shape of the San Giovenale plateau, with the Borgo in the lower picture, the medieval *castello* of the di Vico family in the middle and the Acropolis in the upper part.

the peripheral Borgo NW area illustrate primarily the centuries from the late 8th century BC to *c*. 400 BC possibly punctuated, as we think, around 550–530 BC by an earthquake and its consequences.[18]

THE TOPOGRAPHY OF THE BORGO

The Borgo is an irregular tufa plateau, measuring about 100 × 50–60 m. It is situated to the north of the Acropolis of San Giovenale, from which it is separated by a path that runs along the Fammilume gully on the west side of the Borgo (*Fig. 12*). It then climbs eastward along the Acropolis fortification to reach the present entrance of the Acropolis, located beneath the medieval di Vico *castello* (*Fig. 13*). The Borgo is basically similar to the Acropolis with respect to its mostly very steep eastern and western edges. To the north, there is a gorge with an old road, which in the medieval period was called Via Dogana. The road separates the Borgo from the northern plain, named (Casale) Vignale.

The configuration of the Borgo has changed somewhat over time through the erosive agency of the powerful roots of the numerous trees nesting in the cracks and crevices along its edges and through other disturbances, probably seismic. Huge masses of tufa rock have broken off and fill the slopes beneath the edges. On top of the Borgo, at the northern end, there is an Etruscan road cut into the bedrock (see lower left of *Fig. 13*). It leads from the Vignale to the Acropolis, deeply marked by the wheels of wagons. However, it disappears dramatically and mysteriously at a precipice above the Via Dogana.

Through the last three millennia, the uneven, rocky surface and the mostly thin topsoil of the Borgo have been much dug and cut into, thus transformed by the living and working Etruscans, a fact complicating the understanding of its earlier phases. Although the entire area of the Borgo has not been systematically investigated, even so there is enough on the surface to indicate a high density of habitation. Naturally, the Acropolis always housed the major part of the inhabitants, but from the 8th–7th centuries BC an increase in population caused the Borgo to be settled and used. Remains of an early palisade (possibly Protovillanovan) and an Archaic fortification have been found along its western edge, and there are traces of possibly Protovillanovan huts.[19] Some eight to

[18] For the earthquake, see Blomé, Nylander & Pohl 1996; Blomé & Nylander 2001. The earliest datable sherd from the Borgo NW site is a fragment of an Early Proto-Corinthian *kotyle* (Ka2-1) of the last quarter of the 8th century BC and, an early medieval jug (Ah-1) from a late burial and a few stray fragments of medieval creamware apart, the latest ones are a few pieces of Etrusco-Campanian ware (O1-1) datable to the 2nd century BC; *San Giovenale* V:2, 123, pl. 1; 69, pl. 101; 189.

[19] Actually, rock cuttings for only one hut have been found, but the amount of pre-house, Protovillanovan to late 8th–early 7th century ceramic material in several places on the Borgo indicates the existence of several early huts in the area; see also Karlsson 1999.

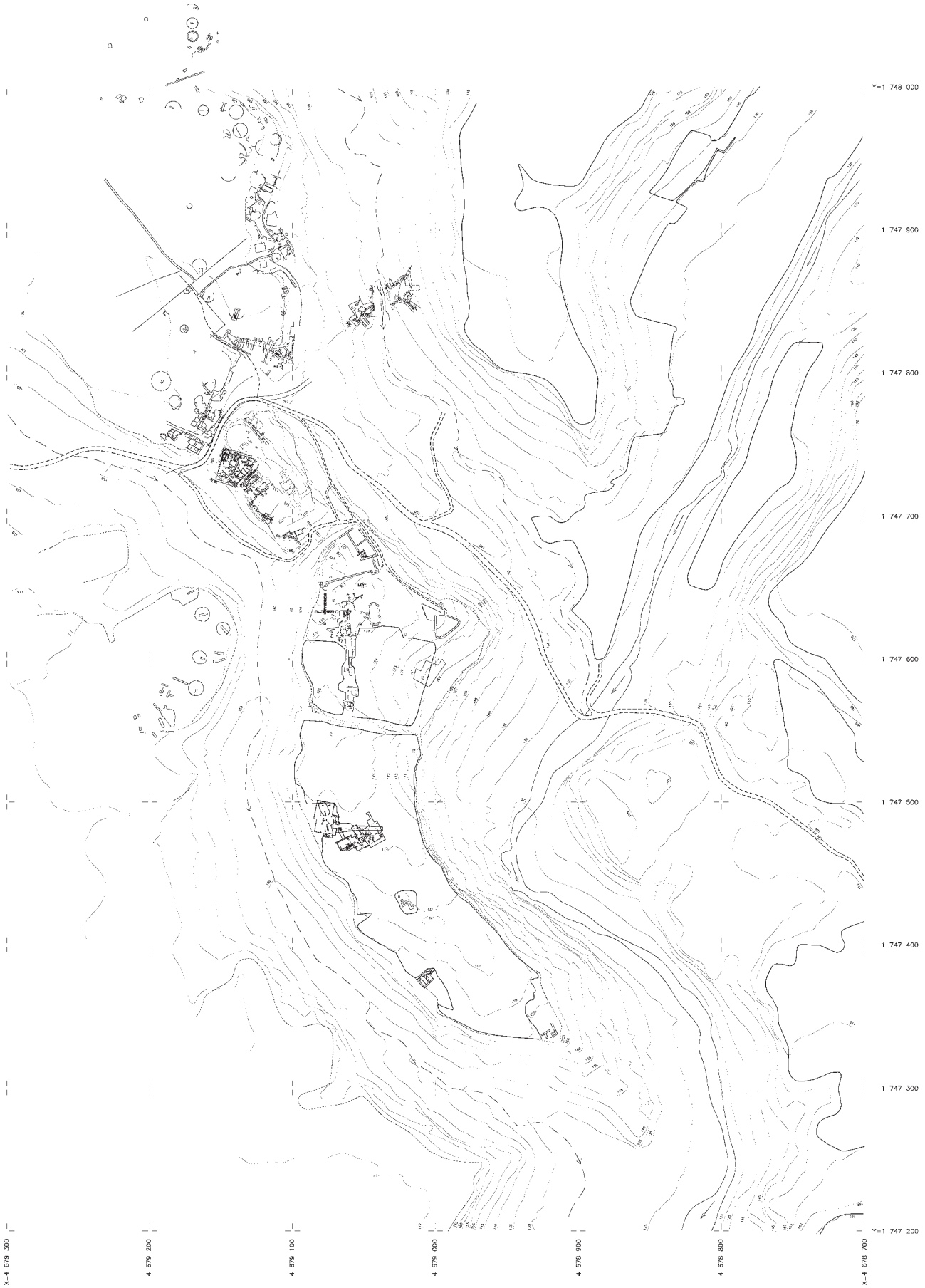

Fig. 10. Plan of San Giovenale and the excavation areas of 1956–1965. North is towards the upper side.

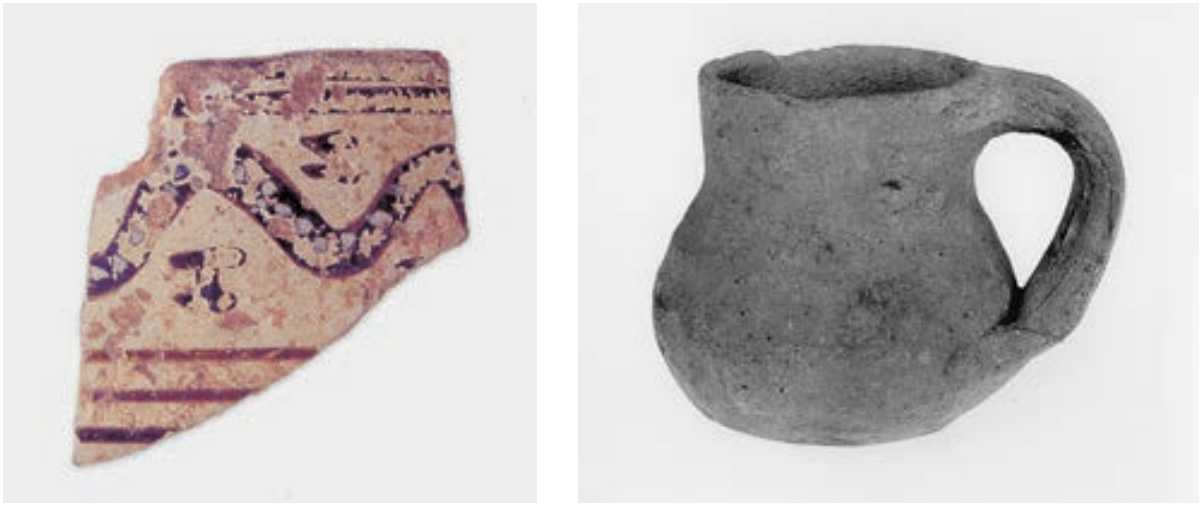

Fig. 11. The earliest and the latest finds from the Borgo NW excavations. To the left a fragment of an Early Protocorinthian *kotyle* from the late 8th century BC (cf. *San Giovenale* V:2, pl. 1, K:a-2-1) and to the right an early medieval spouted jug from the 6th–7th centuries AD (cf. *San Giovenale* V:2, pl. 101, A:h–1).

Fig. 12. View towards the north before the excavations. The area of Borgo NW is to the right of the path leading to the car parking area.

Fig. 13. The Borgo NW excavation in 1962, seen from the northeast. To the left is the Etruscan road cut and to the right the medieval–modern road up to the Acropolis.

Fig. 14. The female terracotta antefix from the late 6th century BC (cf. *San Giovenale* V:2, 191, find out of context, cat. no. 26).

Fig. 15. The terracotta ram's head (cf. *San Giovenale* V:2, 191, find out of context, cat. no. 25, fig. 15, pl. 104).

ten Archaic houses, partly cut into the rock and some of them, with courtyards and adjacent *pozzi* (wells), can still be seen or traced on its upper surface, either located along the old Etruscan road to the Acropolis or more closely towards the edges of the Borgo.[20] It seems clear that an extensive use was made of the available surface.

The highest area of the Borgo, which is a rather flat surface of some *c*. 500 m² to the west of the Etruscan road, shows no cuttings or remains of houses. Instead there are three cellar-like *pestaruole*, i.e. cut working areas for the trampling of grapes for wine making, and two *pozzi*.[21] There is reasonable doubt that, on the rather densely built-up Borgo, the highest and flattest area would have been reserved exclusively for such activities which do not demand much space and could easily have been located elsewhere. On the contrary, there is some reason to conjecture the existence of a building of some importance (a temple?) on this advantageous site. The discovery of a great number of ashlar blocks and of broken roof-tiles thrown down into the nearby north-west slope of the Borgo and the find very close by of a female terracotta antefix (of the late 6th century BC and unique at San Giovenale, *Fig. 14*) and a terracotta ram's head (*Fig. 15*), may indicate the existence of a small sanctuary of some kind.[22] Such a building may have been destroyed or robbed-out at a later time, perhaps after the Roman take-over of the area and the decline of the old village, when the remains were cleared away to allow the area to be used for the agricultural activities of a Roman *villa rustica*.[23]

The north-western part of the Borgo differs from the Borgo's otherwise steep edges by sloping more gently towards the Fammilume gully, which is why the slope served as a shortcut approach to the Borgo surface and then to the Acropolis. The area is separated from the rest of the Borgo surface by low rocky outcrops and, towards the north, by the fairly steep cliff above the Via Dogana. The difference in level, from the highest to the lowest point within the excavation area, is no less than 7.75 m. On *Fig. 16a* are indicated the highest (173.01 masl) and the lowest (165.26 masl) points of the excavated area. The arrow in the middle indicates the fix point used in this publication. It is located at a level of 171.17 masl; for the exact location, see *Fig. 16b*.

The slope receives very violent autumn rains along the entire area and this fact did not encourage extensive agricultural activity.[24] Its undisturbed remains were thus protected by earth and vegetation and, paradoxically, this forlorn area, the least inviting of the entire Borgo, has turned out to yield an unexpected amount of valuable information. This north-western slope of the Borgo is the place of the excavations dealt with in this publication. The excavation area will in this volume be abbreviated Borgo NW.

[20] Ingrid Pohl is preparing a publication on the other houses of the Borgo.
[21] For such rock-cut *monumenti minori*, cf. Quilici 1988, 41–65.
[22] Cf. *Etruscan culture* 1962, fig. 282. In the very same area was found, in 1957, an expressive, albeit enigmatic, terracotta head of a ram, 15 cm high, of coarse, gritty, reddish clay decorated with rows of impressed circles and with two well-smoothed holes in the crown of the head. It was interpreted as a protome or part of some teriomorph sacral vessel; Berggren & Moretti 1960, 3–6, figs. 1–2; *San Giovenale* V:2, 191, Sp. 26; 191, Sp. 25, fig. 15, pl. 104.
[23] Hemphill 2000. The 1956 report notes that the *pozzi* in this area had been systematically filled with ashlar blocks and roof-tiles.
[24] There are, however, a few plough marks on some blocks of the A4/A7 walls.

THE GEOLOGY AND NATURAL RESOURCES OF SAN GIOVENALE

By Sheldon Judson

This report focuses on the natural resources available to the inhabitants of the site of San Giovenale. It includes an examination of the geology and landscape of the local area as they relate to San Giovenale and its immediate neighborhood. An explanation of the origin of the site precedes a discussion of building materials, soils and water.[25]

Origin of the site of San Giovenale

The site of San Giovenale represents the most recent of three major stages in the area's landscape development. The first, or pre-volcanic stage, is represented by a landscape formed by normal stream erosion on the pre-volcanic sedimentary rocks of the area. Over a million years ago volcanic activity began the construction of the Bracciano, Vico and Bolsena volcanic edifices that now dominate this area of Italy. The volcanism created the second stage of landscape by partly filling pre-existing valleys with volcanic material. In the Vesca valley the volcanic fill, which there is about 500,000 years in age, reached a maximum thickness of about 60 meters and lapped up onto of the pre-volcanic topography to a level of about 175 m above sea level in the San Giovenale area (*Fig. 17*). Above this level the upper slopes of the older landscape were still exposed. With the cessation of volcanism the third stage of landscape development began. Streams immediately started to cut down into the flat-floored valleys underlain by the volcanic deposits creating the third and present stage of landscape (*Fig. 18*).

The site of San Giovenale is a narrow promontory between the small Fammilume stream on the north and the Vesca river and its tributary, the Pietrisco, on the south. The promontory has a narrow neck where erosion between the Pietrisco and the Fammilume has markedly reduced the width of the promontory. This has produced a topographic feature that has been referred as a necked promontory. The tufa, from which the promontory has been cut, forms steep to vertical walls. Their steepness is due to the behavior of the tufa when it is cut into. It holds a vertical face. As a stream erodes laterally and undercuts a cliff, the cliff face retreats as vertical slabs of tufa split away and tumble toward the valley bottom. The stream eventually carries away the fallen tufa. The original surface of the tufa is little modified until the retreat of the cliffs completely removes the tufa. The result of this history is a flat-topped area defined by steep rocky cliffs approached across a narrow neck. Its adaptation to settlement and defense is clear.

The three-tiered topography of the San Giovenale site is not unique to the Vesca valley. The present-day village of Civitella Cesi occupies a similar site as does the now-abandoned locality of Luni and the Roman villa site at Petrola. Nearby, in the headwaters of the Biedano valley, Blera, Barbarano Romano and the ancient site of San Giuliano all have locations of like history and form. Elsewhere in Etruria many settlement sites, both large and small, have similar histories. These include, to name but a few, Veii, Acquarossa, Norchia, Cerveteri and Pitigliano.

Occupation of the area has not been restricted to the site of San Giovenale itself. Hemphill has shown that Etruscan occupa-

[25] Cf. also Hemphill 2000, 19–22.

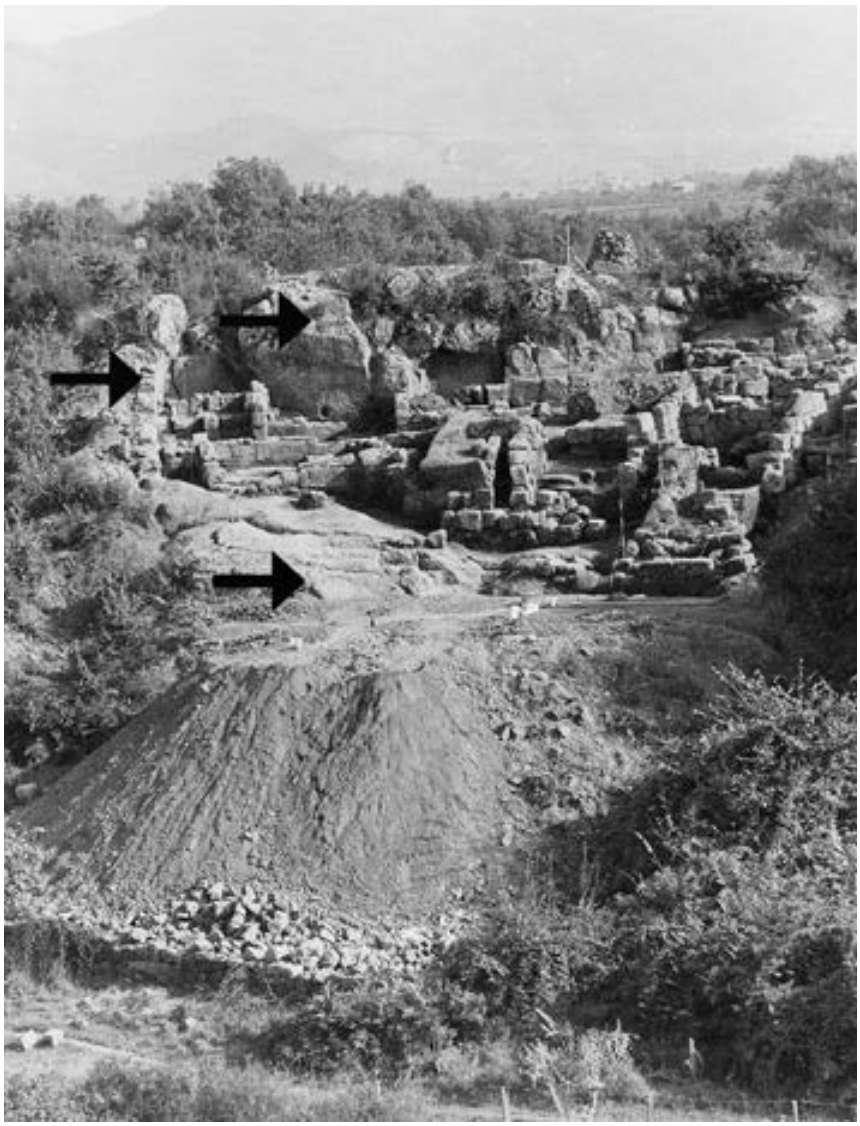

Fig. 16a. The Borgo NW excavation area has a difference in level of 7.75 m from the highest to the lowest levels. The upper arrow is pointing at the highest point = 173.01 metres above sea level (masl). The lower arrow is pointing at the lowest point = 165.26 masl. The middle arrow points at the fix measuring point = 171.17 masl.

Fig. 16b. Close-up view of the fix measuring point for all levels, located at the level of 171.17 masl.

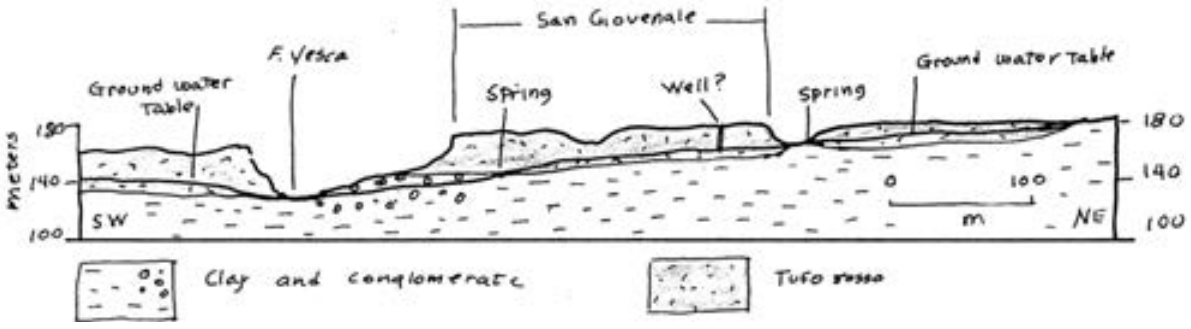

Fig. 17. Section through the natural topography of the area, by S. Judson.

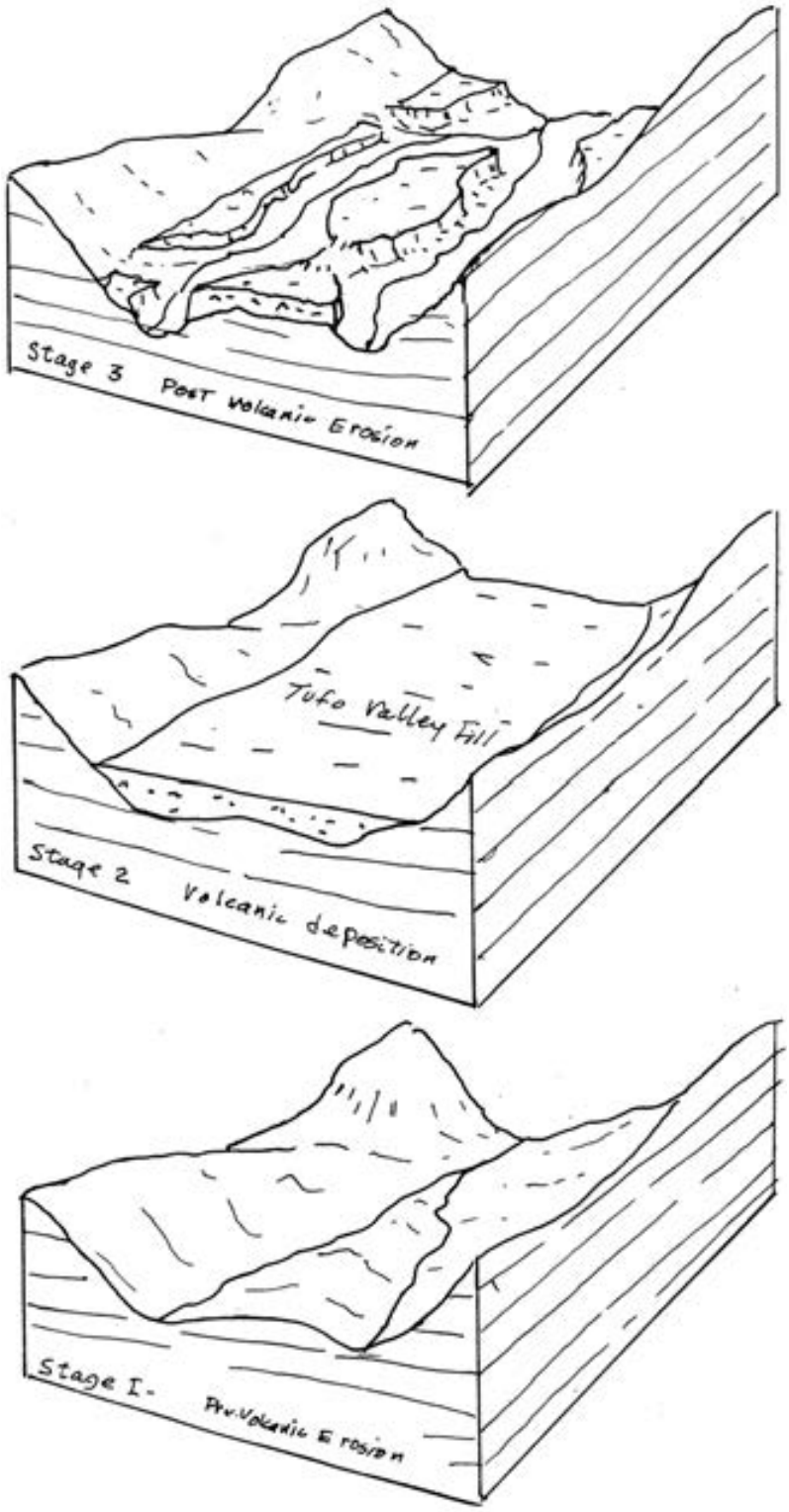

Fig. 18. Sketch showing the erosion by the water currents of San Giovenale, by S. Judson.

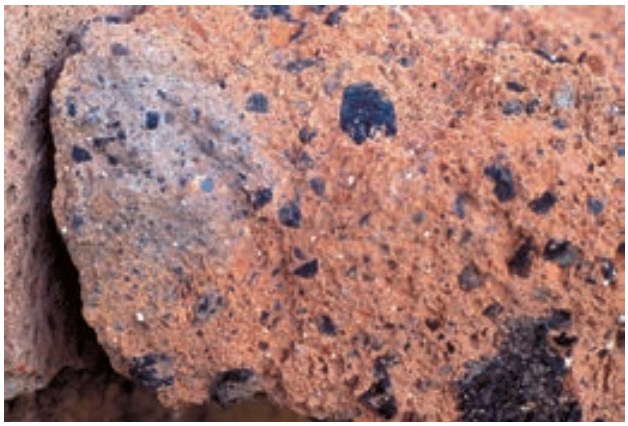

Fig. 19. *Tufo rosso* and *peperino*. Photograph by J. Sigurdsson.

Fig. 20. *Tufo rosso*. Photograph by J. Sigurdsson.

tion was extensive beyond the immediate site and concentrated on the areas of tufa.[26] Later Roman occupation avoided the San Giovenale promontory and spread throughout the area, not only on the zones of tufa but also onto the hills underlain by beds of clay, limestone, and conglomerate.

Building material

Tufa

The term tufa (Italian *tufo*) embraces several variations of the rock type. Fundamentally tufa is a deposit of volcanic ash. It may be unconsolidated layers of material both water or wind laid and measuring a centimeter to a meter or more in thickness. It may be a massive deposit tens of meters thick. It may be very compact or only loosely consolidated.

Most of the tufa at San Giovenale and in the immediate area is a massive, partially fused or lithic deposit of volcanic ash. It is mapped on the Geological Map of Italy as Ignimbrite III, and more informally and familiarly known as *tufo rosso a scorie nere*.[27] It is the most extensive volcanic unit on the eastern and southern flanks of Monte Vico. All of it was erupted from Monte Vico in an enormous explosion. In addition, small amounts of a dark gray tufa occur locally. It is called *tufo grigio a scorie nere*. *Tufo grigio* can occur as lenses within the *tufo rosso* or as separate and distinct tufa older than the *tufo rosso*. At the site of the Borgo at San Giovenale gray tufa occurs in one area at the base of the excavations. It also occurs along the north side of the path leading to the site of San Giovenale where it crosses the Fammilume. A more extensive exposure is seen associated with the *tufo rosso* in exposures on the north side of the Vesca river along the road to Civitella Cesi. It is not known whether the *tufo grigio* in these exposures represents the pre-*tufo rosso* deposits to the younger material associated with the *tufo rosso*.

Tufo rosso is overwhelmingly the major volcanic material at the site and in the local region (*Figs. 19–20*). It is described in the paragraphs immediately following. Some comments on the *tufo grigio* follow the description of the *tufo rosso*. The eruption of the *tufo rosso* began with an ejection of a towering cloud of particles of white pumice that soon settled. This was followed by a pyroclastic flow, a turbulent, incandescent flood of volcanic ash and cinders that spread outward, west and south from the Vico caldera. Its temperature was at least 700°C, and probably more. As it spread it moved along the low areas in the pre-existing topography. In the San Giovenale area it partially filled the upper Biedano valley and spilled into the lower-lying Vesca valley, crossing the divide now marked by the Blera–Barbarano Romano road. The glowing flood was hot enough that particles fused to each other as the mass settled across the irregularities of the countryside. It was the fusion of the volcanic debris that gave the tufa its coherence and qualifies it to be called ignimbrite in the geologic literature.

In general the *tufo rosso* is a homogeneous deposit. It lacks the layering or bedding so characteristic of most sedimentary rocks and successive floods of lava. Fractures, or cracks, however run through the tufa. On large exposures, as along a cliff line, the dominant fractures are vertical and large slabs of tufa eventually break away from the cliff along these fractures. The slabs are a meter or more in thickness and several meters in width and length. At the surface vertical fractures may be only 10 to 20 cm apart, often accentuated by weathering. Fractures perpendicular, or nearly perpendicular, to these vertical fractures are less well-developed. They are most noticeable within a few meters of the surface where they are generally spaced a meter or less apart. Fractures form as the tufa cools and contracts a small amount. The major, vertical fractures develop at right angles to the surface at the top of the tufa. As the mass of the tufa cools it contracts slightly and fractures propagate downward from the cooling surface. The horizontal, or nearly horizontal, fractures may also develop as the deposit cools. Those close to the surface may also form because the tufa there, being under less pressure than deeper portions, can expand upward slightly, parallel to the surface.

The color of the *tufo rosso* varies. It is reddish in many exposures but may also exhibit other warm colors including yellows, oranges and browns. On exposure it weathers to a rough, light gray surface that may be partially covered by lichens that are light gray, brown or bright yellow in color, or by a green moss, or both, and small clumps of grass may grow in crevices. Extensive and long continued weathering decomposes the tufa to a pulverant clayey brown soil.

On a fresh surface the *tufo rosso* at the site of San Giovenale is an orangeish-brown color. It has a blotchy aspect, in which orangeish patches 1 to 2 cm in diameter are set in a somewhat grayer material. Its texture is sponge-like in appearance, with many voids and vesicles. On a fresh surface the rock is rough and somewhat crumbly. The black scoria are small, seldom more than one or two centimeters in maximum dimension. Volcanic

[26] Hemphill 1993 and Hemphill 2000.
[27] *Carta geologica d'Italia, Bracciano*, Foglio 143, II edizione, 1:100.000, Firenze 1971.

minerals can be seen, often with the naked eye, and easily with a low powered hand lens. These include crystals of dark pyroxene (an iron-manganese silicate) and clear, transparent crystals of *sanidine* (a sodic feldspathoid mineral). White inclusions measuring a few millimeters up to a centimeter in diameter and sometimes with dodecahedron crystal shapes, are mineral Lucite, (a potassic feldspathoid).

Tufo rosso's desirability as a building stone arises from several characteristics. Although crumbly on a fresh break the surface hardens on continued exposure, a process known as case hardening. It is soft enough to be shaped easily with a pick, chisel, or saw. It is this characteristic that has made it possible to fashion building blocks, road cuttings, *cuniculi* and tombs in the tufa. Tufa's rough surface provides a good surface for the application of a coating from daub to stucco. Its spongy texture has the effect of giving the tufa a low density. The density varies but on average is about 1.4 g/cm^3. This compares with about 2.4 g/cm^3 for a compact limestone and about 2.8 g/cm^3 for basalt. Expressed in terms of a large building block measuring 10 cm × 25 cm × 50 cm the tufa would weigh 17.5 kg, the limestone 30 kg and the basalt 35 kg. Despite the difference in density the tufa still retains more than enough strength to serve as a desirable building stone and is durable enough to last for thousands of years. It makes a good foundation on which to erect buildings and heavy walls. From the point of view of quarrying the masses of tufa defined by joint planes are more than large enough to provide unfractured building blocks. A disadvantage of *tufo rosso* for construction is that it can absorb a great deal of water, perhaps up to 30% of its volume.

The *tufo grigio* as it occurs locally differs from the *tufo rosso* not only in color. It is more crumbly and cindery than the *tufo rosso*. As such it is less desireable as a building stone. As a foundation for other structures it may not be as stable as *tufo rosso*. Where very cindery the *tufo grigio* may serve as *pozzolana*, long used for making concrete.

Peperino

Peperino is a form of lithic tufa. It is dark gray in color. It is different from the *tufo rosso* in that it is more compact, and hence weighs more per unit volume of rock, its density being about the same as compact limestone. Its origin is very similar to the *tufo rosso* or *tufo grigio*, but greater fusion has welded it into a much firmer and stronger material. Its texture is characterized by flame-shaped inclusions, usually pieces of black scoria that have been stretched in the process of fusion and flow. No *peperino* is locally available in the San Giovenale area. Presently it is quarried east and north-east of Viterbo on the northern slopes of the Monte Cimini.

Basalt

Basalt, a very dark gray to black igneous rock, crystallizes directly from a rock melt that has flowed out on the Earth's surface. There are no occurrences closer than 10 to 12 km to the San Giovenale area. It does exist closer to the craters of both the Vico and Bracciano volcanoes. Two types have been used in the past. The first type is a very compact, non-vesicular basalt, which has been widely used in the construction of Roman roads. The Via Clodia, which lies less than 6 km north-east of San Giovenale, provides a local example. The second type is a scoracious basalt, pitted with the vesicles of old gas bubbles formed near the top of a lava bed as it cooled. It is represented in the San Giovenale area by imported pieces used for mill stones and presses.

Limestone

Limestone is found in the hills both east and west of San Giovenale. It occurs in well-defined layers up to 50 cm thick. These beds have naturally fractured into pieces that, with minor amount of shaping, make very suitable building stones and paving blocks.

Gypsum

Small amounts of gypsum occur in the clay beds in the immediate vicinity of San Giovenale. Its use would be in the manufacture of plaster. Whether the local gypsum has been exploited is unknown.

Limestone pebbles

Limestone pebbles, found in some of the Etruscan structures, are plentiful in the beds of the Vesca river. They occur also in the conglomerate immediately below the tufa on the south side of the San Giovenale promontory.

Two situations in which limestone pebbles, or the conglomerate from which many of the large ones have been derived, are of interest. Along the Pietrisco river natural exposures of the local conglomerate served as foundations for buttresses of the Etruscan bridges across the stream. The ford across the Vesca on the south side of San Giovenale is the result of the weathering out of large cobbles from the local conglomerate. It particular, occasional torrential flooding by the small Pietrisco river has moved large cobbles down to the Vesca where they form a partial dam making it possible to cross the Vesca except during very high water.

Clay

Beyond the extent of the tufa, clay is widely available. It occurs beneath the gentle slopes topographically above the tufa on either side of the Vesca. In the limestone bearing hills east and west of San Giovenale clay is interbedded with the limestone. Any of these beds could serve as a source for tiles, daub, and pottery. Stream sands, rich in volcanic particles, could be a source of temper for tiles and pottery.

Soils

The tufa of the San Giovenale area forms the base of a productive soil. There are several reasons for this. First, the volcanic material contains the basic elements needed for plant growth. Only a small percentage of these are locked up in mineral structures. Most are found in the glassy components of the tufa and as such are more easily available to plants. Even unweathered tufa, if broken up by the plow, will support a sturdy plant growth. A second advantage of tufa in the agricultural setting is that its permeability promotes good drainage into the underground. Finally, large expanses of tufa retain their original flat surfaces little altered by stream erosion. This characteristic has provided the level surfaces so suitable for farming and settlement.

Beyond the extent of the tufa, the clay and limestone bedrock will support plant growth but the soils developed on them, precisely because they contain a smaller range of plant nutrients, are less productive than the soils originating on tufa. Areas underlain by clay are poorly drained and limestone zones create stony soils. When limestone and clay occur in combination poorly drained stony soils result.

Fig. 21. The Vesca river valley south of the San Giovenale plateau. Photograph by J. Sigurdsson.

Water

The Vesca is a perennial river carrying some water even in dry, summer months (*Fig. 21*). During the rainy season it can become a formidable torrent. Even the smaller rivers and streams adjacent to the site, the Pietrisco and the Fammilume, provide some water most of the year.

Springs occur in the area. A good example occurs on the track from San Giovenale to the Vesca. Here water seeps out of the surface being supplied by ground water flowing in the tufa and diverted to the surface by underlying clay. The permeable tufa serves as an aquifer and the impermeable clay acts as an aquitard over which water emerges at the surface as a spring. The relationships are shown in *Fig. 18*. Whether the *pozzi* in the areas of the Borgo and the Acropolis at San Giovenale exploited ground water perched in the tufa above the clay is not known, but seems reasonable. Some are reported to be up to 14 meters deep, deep enough to reach ground water in the Borgo area and probably on the Acropolis as well.[28]

Elsewhere in the area small springs occur in the rainy season. Water moves through permeable beds of limestone and is diverted to the surface by impermeable beds of clay. Some of these springs have been developed into fontaniles.

[28] Hanell 1962, 300.