

The coast in the area of the Herculaneum excavations at the time of the Romans

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ABSTRACT

Recent excavations carried out in the area of the old beach at Herculaneum and stratigraphic boreholes in the area of the Villa dei Papiri have permitted clarifying the topography of the old city as well as the orientation of the urban plan which results to have been conditioned by the morphology of the tuffaceous terraces about 15-20 m above sea-level on which the town existed; a new comprehensive plan of the city is presented based on all the data available to date. A considerable tract of the old littoral has been found resulting to be a cliff coast made of volcanic tuff with sandy beaches. The sedimentary characteristics of the beaches are described. The updated position of more than 200 skeletons found in the chambers at the southern side of the city, close to the beach, is reported for the littoral area of Herculaneum as well as the outcroppings of sand and of tuff.

1 INTRODUCTION

The famous eruption of Vesuvius in 79 A.D. assailed a number of old cities (Pompeii, Herculaneum, Stabiae) and the many villas situated on the Campania coast south of Naples. In the space of two days the pyroclastic material erupting from the volcano almost instantaneously buried these settlements, favouring their preservation (Fig. 1).

The city of Herculaneum was located at about 7 km to the south of the volcano; near the city stood the Villa dei Papiri, the most famous of the seaside villas, where papyri with texts of Epicurean philosophy were found.

The area of Herculaneum was struck by the products of the eruption - as thick as 25 m - arriving there by a flow and surge mechanism (Kent et al. 1981, Sigurdsson et al. 1982).

In particular Sigurdsson et al. (1985) seemingly have recognized - in the stratigraphic succession of pyroclastic products of the eruption - six units, each made up of a pair of pyroclastic surge and flow, attributing their origin to the collapse of the eruption column (Fig. 2).

The excavations of the town of Herculaneum and of the Villa dei Papiri began in the 1700's and have led to important historical and archaeological discoveries. Unlike the town of Pompeii, at Herculaneum very few skeletons were found until 1980 when more than 200 were discovered in the chambers overlooking the old town beach.



Fig. 1 Site of the town of Herculaneum with areal distribution of A.D. 79 volcanic deposits.

During this phase of excavation, a boat - some 9 metres long - has come to light, overturned onto the sands of the beach and extremely deformed. It has been retrieved and is in the course of being restored (Ferroni & Meucci, 1989).

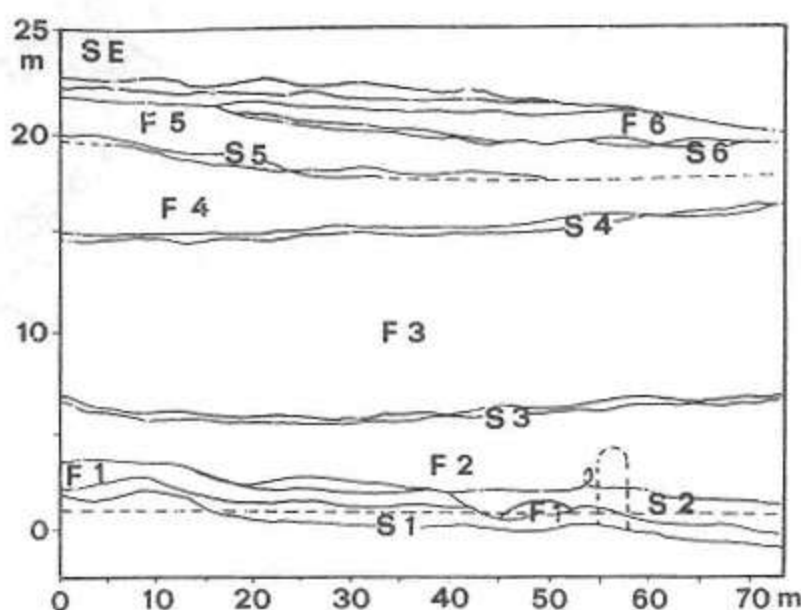


Fig. 2 Stratigraphy of the A.D. 79 volcanic deposits at Herculaneum. Note that the vertical scale is based on datum that originates 5 m below present sea level (from Sigurdsson et al. 1995).

With the discovery of a large number of skeletons, a new phase of study and excavation has been opened in this exceptionally important archaeological site. Although as yet the discoveries have not had an adequate archaeological edition, they have consented a thorough study of the various eruptive phases (Sheridan et al. 1981, Sigurdsson et al., 1982 and 1985).

Following these significant findings, in 1984 a group of researchers, among whom A. Croce was the leader - set up an interdisciplinary program which contemplated the study, by boreholes, of a large territory on the edges of the excavations for the reconstruction of the physical environment of this sector of the Vesuvian territory prior to the 79 A.D. eruption; the program also foresaw the subterranean excavation of the Villa dei Papiri which had remained englobed in the pyroclastic material of the eruption that had buried it. The tourist and cultural attainment of a subterranean villa would have heightened the fascination of this singular monument of ancient times. The proposal had no sequel.

Instead, the project which was approved, and is in the course of being realized, foresees, the excavation of an ample trench, some ten metres deep, connecting the Herculaneum excavations and the Villa dei Papiri for more than 200 metres (De Simone, 1987, Conticello and Cioffi, 1990); at present the trench has reached only the atrium of the Villa, brought to light in May 1996.

The study by Sigurdsson et al. (1985) reports the data relative to the excavations up to 1983, describing the characteristics of the beach deposits from Roman times found at the southern edge of the town. After 1984, in the area overlooking the old shore line of Herculaneum, excavations of the chambers were completed. Many skeletons were

found often packed into the small spaces - of the people of Herculaneum fleeing the city and searching a way of escape by sea. Exploration of the area of the beach has permitted the retrieval, in the deposits of the pyroclastic flow, of marble columns and other architectural fragments of the pronaos and of the roof covering of the largest of the temples situated on the overlying terraces of the Sacred Area.

The southern border of the excavations has been moved back some ten metres in respect of that of 1983; at present the width of the shore area is about 20 m beginning from the foundation terraces of the Sacred Area and of the Suburban Thermae

The aim of this work is to describe the environment of the old Roman beach based on the recent excavations and investigations carried out in the area between the Suburban Thermae and the Villa dei Papiri.

2. THE TOWN IN ROMAN TIMES

The old town of Herculaneum (Fig. 3) was situated on a terrace composed of volcanic tuff overhanging the sea and slanting slightly towards it. The plateau was circa 20 m above the sea and limited on two sides by rivers mentioned in a fragment by the ancient historian Sisenna. Herculaneum had "safe landing-places at any moment", wrote Dionysius of Halicarnassus.

Mythology recalls the legendary founding by Hercules as he led Geryon's herds along the coast of the Gulf of Naples. Strabo (V, 4, 8) rapidly deals with the most ancient events of the town: like Pompeii, in Herculaneum - before its conquest by the Romans - the Opici were succeeded by Etruscans, the legendary Pelasgians and, finally, by the Samnites. The area of Herculaneum was considered healthy because the promontory was particularly well exposed to the south-west wind. Numerous trial excavations carried out in several places in the area excavated to date have not revealed archaeological objects datable prior to the IV century B.C., the period during which at least the greater part of the town was planned.

The excavations, begun in 1980 and still in progress on the sea side, together with the investigations conducted on the documentation of the eighteenth century have allowed individuating the course and the extension of Herculaneum.

A recent study (Pagano, 1993a and b; 1996a), based mainly on historical documents but also making use of the results of the recent excavations, indicates that the town had limited dimensions with respect to Pompeii; in the W-E direction, parallel to the coast line, it was circa 320 m wide, in the meridian direction - from the sea towards the slope of the volcano - it extended for at least 350 m with an extension of about 15-20 hectares. The limits of the

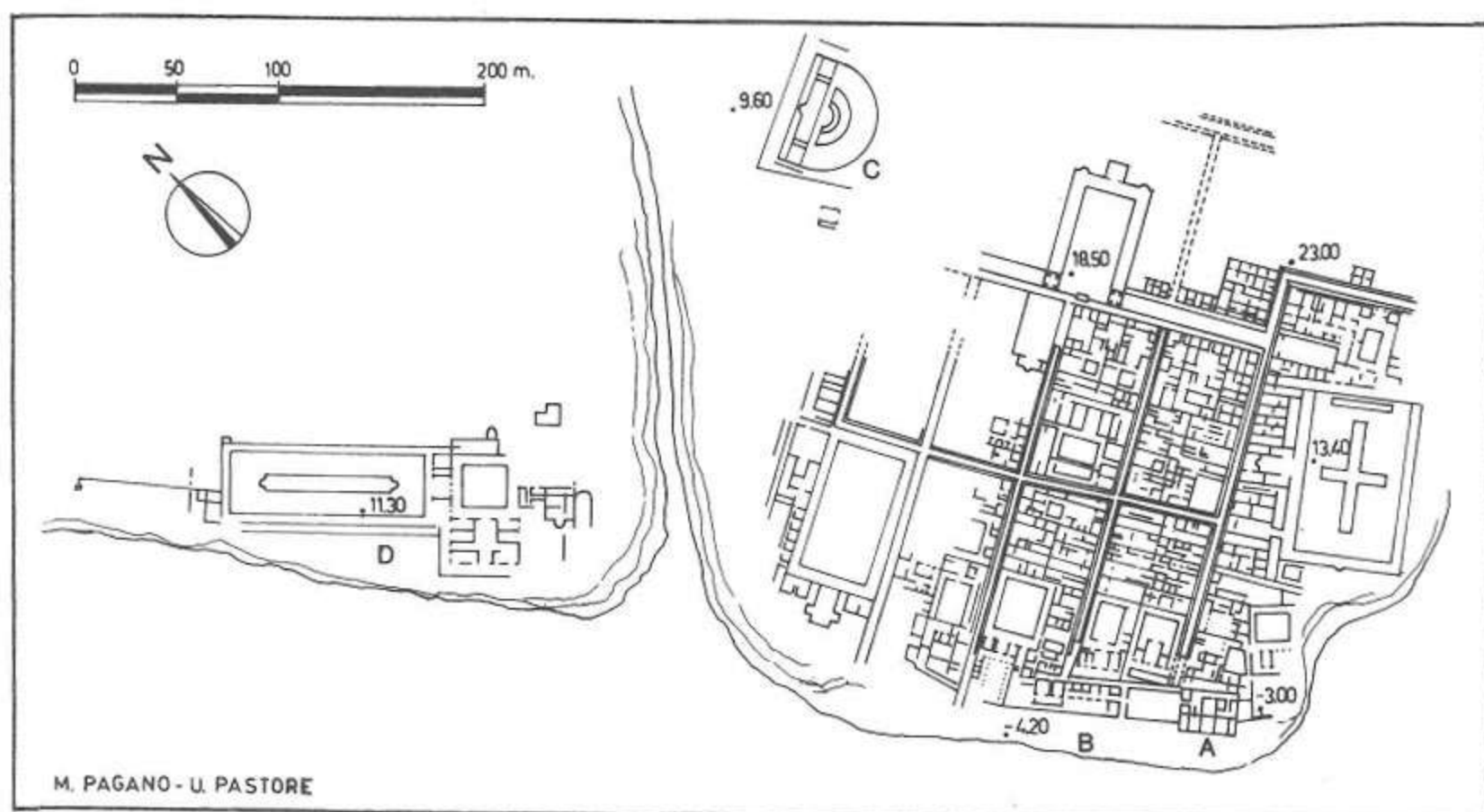


Fig. 3 Old topography of Herculaneum and of the Villa dei Papiri (D) with the river separating them. Sands (A) and pre-79 A.D. tuff (B) from the Roman beach. Theatre (C). The heights refer to the present-day sea level.

inhabited centre landward remain questionable but it is certain that there was a narrowing of the plateau in that direction (Fig. 3).

The urban plan known today includes two major streets (decumani) running in an approximate SE-NW direction, i.e. they adapt to the configuration of the border of the plateau seaward. A third decumanus landward, still buried, was found but not plotted in the eighteenth century. At right angles to the decumani three of the five cardines known in the eighteenth century have been brought to light. The town was enclosed by walls constructed of large blocks of tuff, a section of which has recently been found in the Casa di Argo.

Outside the walls, on terraces overlooking the sea, on one side stood a Sanctuary with 2 temples (Sacred Area) and on the other the building of the Suburban Thermae, extremely well preserved, flanked by little square at the centre of which stood the statue and the honorary altar of the praetor M. Nonius Balbus.

The statue and part of the inscription were found in the 80's during the course of the excavations on the underlying beach, whereas the head and other fragments had already been discovered in 1942 during the excavations on the square.

The first drawing up of a general plan of the town of Herculaneum was carried out by F. La Vega in 1792 at the request of the Accademia Ercolanese and published only in 1797; it was based on partial surveys - conducted in the narrow underground passages - executed in former years by the military en-

gineers assigned to the excavations.

A new general plan has recently been drawn up on the basis of aerial photographs and utilizing the eighteenth century documentation and new data.

In respect of the cartography concerning excavations of Maiuri, the erroneous indication of the North has been corrected, rotated clockwise by circa 30° (Pagano, 1996 b). With the new correct orientation it is seen that the plan of a town was conditioned by the morphology of the plateau and particularly by its seaward edge.

Beginning from the age of the Emperor Claudius, the limited space inside the city wall caused a development in height of some of the buildings along the decumanus maximum as well as the utilisation of the space up to the fortification beginning in the Augustan age.

Immediately west of the town, beyond the river recalled by Sisenna, rose the aristocratic Villa dei Papiri, the celebrated villa overlooking the sea.

The dimensions of this building are most impressive. The facade facing the sea is slightly less than the frontage of the town and the presumable area is about 1/10 of the urban area.

Analogous characteristics of grandeur are found in two other villas in the old Herculaneum territory, along the littoral, near cemetery at Torre del Greco.

3. THE ROMAN COAST IN THE AREA OF THE EXCAVATIONS

At the bottom of the archaeological excavation in

Area underneath the secondary access stairway to the Suburban Thermae

A - Room underneath the secondary access stairway to the Suburban Thermae

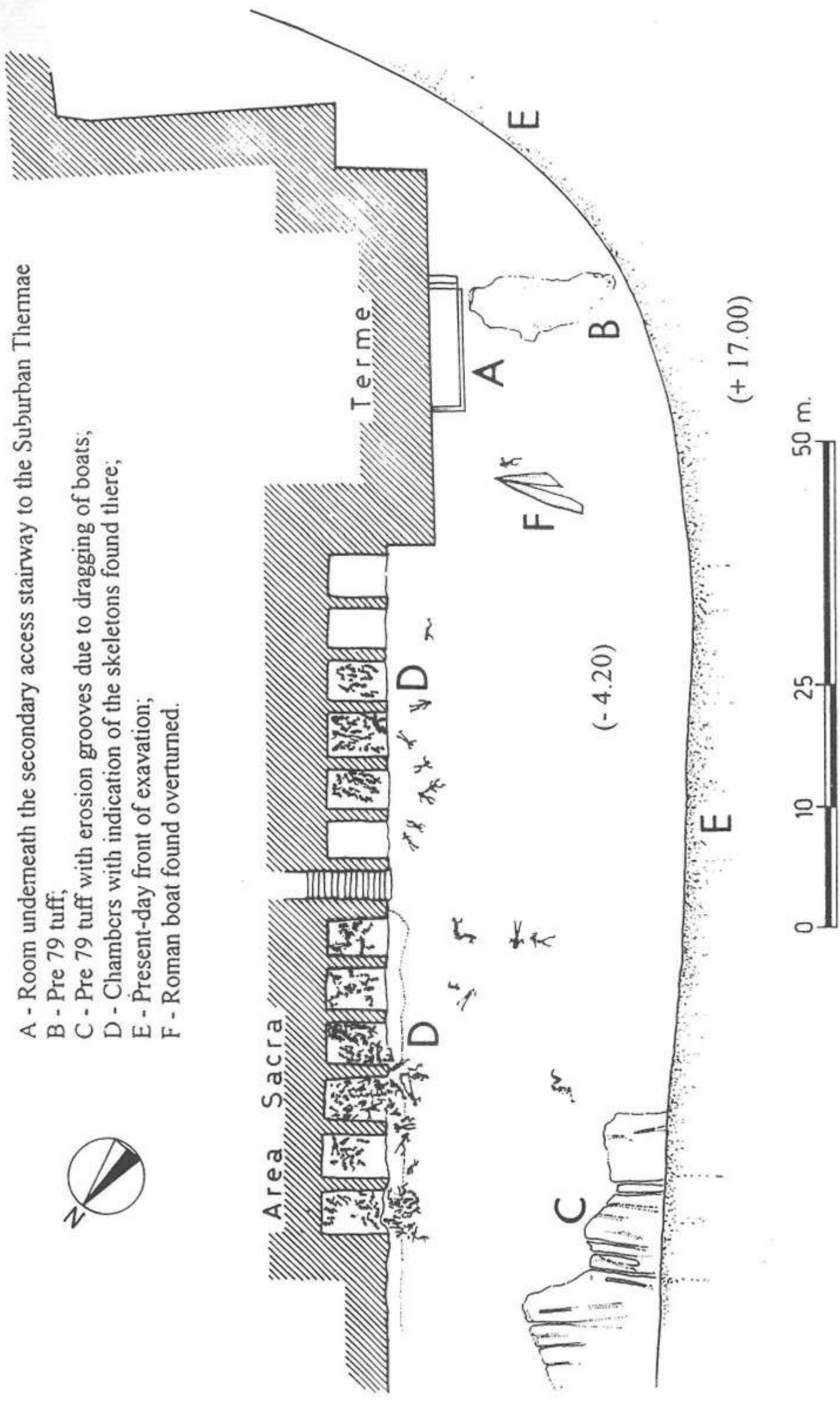
B - Pre 79 tuff;

C - Pre 79 tuff with erosion grooves due to dragging of boats;

D - Chambers with indication of the skeletons found there;

E - Present-day front of excavation;

F - Roman boat found overturned.



M. Pagano - U. Pastore

Fig. 4 Old beach between Sacred Area and the Suburban Thermae (updated as of 1996)

the area overlooking the Sacred Area - (Pagano 1996b) at a depth of about 4.20 m below the present-day sea level - deposits have been found representing the beach at the time of the Romans (Fig. 3 and 4).

Already the excavations during the period 1980/1983 had permitted a definition of the features of these deposits and attributed them to a coastal environment (Sigurdsson et al. 1985).

In particular epiclastic (sand and gravel) and pyroclastic (tuff) deposits are seen in this area.

The epiclastic deposits outcrop in the area of the Suburban Thermae where they present a thickness of 0.5/1.0 m. Resting on a bank of lithoid tuff, they are covered by a layer of very fine ashes about 1.0 m thick; the ashes represent the first product of the 79 A.D. eruption reaching the area, individualized as S1 (first surge deposit) by Sigurdsson et al. (1985).

Trending NW the sandy level disappears and the underlying tuff outcrops; it is also covered with fine ashes (surge S1).

Sands form the absolutely predominant fraction of this epiclastic level; there are, however, modestly thick levels of pebbles and gravel whose dimensions reach about 10 cm. The degree of roundness of the pebbles is very high and many of them have a flat form. The lithology of the pebbles refers to lava from the apparatus of the Somma; rounded fragments of brick are also frequently seen.

Unfortunately the operations of excavation have removed the greater part of these deposits and there has been no possibility of studying and describing in detail the sedimentary structures present.

An accumulation of these sands was present in the small room below the stairs leading to the Suburban Thermae but today it has been almost completely removed (Fig. 4, A). Nonetheless, along the walls of the same room a film of sands has been preserved which evidences the structural characteristics of the original deposit. Moreover, the arrangement

of the walls in the room permits a three dimensional view of the sedimentary structures present in the sands.

The back wall presents sands with flat parallel laminations - from a few millimetres to a centimetre - with levels of pebbles, both lava and brick, in a flat parallel position as well. On the side walls of the room the sand and the pebbly levels present, a seaward - dipping cross bedding with an inclination of about 15°-20° (Fig. 5).

The top surface of this sandy accumulation is also seaward-dipping, at about 10°. Above - with a clear difference in colour and grain size - one observes the fine ashes of surge S1.

On the left side, towards the lower part of the room, sandy and pebbly materials are present (Fig. 6) with steeply sets; the inclination of these laminae is high, exceeding 25°-30°.



Fig. 6 Rounded and flat pebbles and bricks.

On the same side of the room, marine lamelli-branches englobed in the sand have been observed.

On the other hand, numerous indications on the finding of marine shells were reported in the 1980-81 excavation journals and the finds are still conserved today.

All these elements are unanimous in supporting the belief that these sandy and pebbly deposits formed the upper zone of the beach assailed by waves during sea-storms. The sand is carried up by the storm waves and deposited against an obstacle.

Even today epiclastic deposits outcrop at the sides of the room described earlier, they are delimited below by the bank of ancient tuff and above by the deposits of 79 A.D.

At present, at the bottom of the excavation, there are only residual and limited strips of sand, reworked by water coming from a phreatic table; the pebbly material is present only in the area facing the chambers.

The granulometric composition of beach sands (Fig. 7) indicates that these are medium to coarse

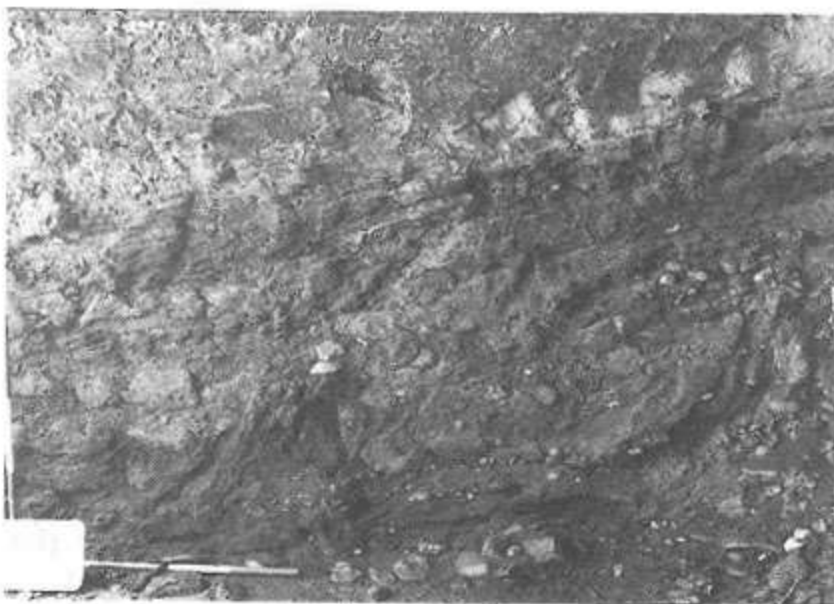


Fig. 5 Beach sand with seaward-dipping cross bedding.

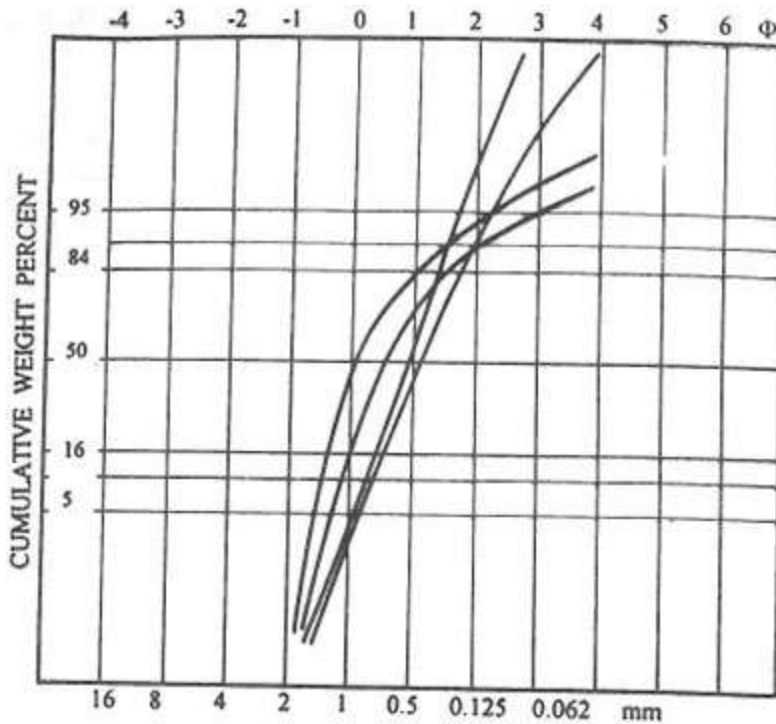


Fig. 7 Granulometric composition of beach sands.

grained, as a rule fairly well sorted.

The petrographic composition indicates a prevalence of lava fragments and abundant femic minerals (clinopyroxenes, amphiboles garnet and magnetite) which confer a black colouring to the sediment. The salic minerals are rarer and are principally represented by k-feldspar and leucite.

The sands of the present-day Vesuvian coast have similar colour, composition and texture. Yellow-coloured tuff outcrops in the NW sector of the excavation. It is a deposit from a well-cemented pyroclastic flow that forms the framework of the plateau on which the inhabited area of Herculaneum is located.

In the area of the excavation, the top of the tuff forms a plane surface which, in all probability, due to marine erosion. Incisions perpendicular to the town walls, approximately parallel one to the other, are present on the plane surface along its entire extension.

The length of these furrows exceeds 2/3 of a metre the width and depth are in the order of a few decimetres. From what the excavation journals tell us, these furrows were partially filled with sandy and pebbly material.

At the present time the form and depth of these furrows have been modified by waters washing over them.

The furrows, already described by Sigurdsson et al. (1985), have been attributed to the action of the keels of boats being dragged up onto the beach.

Investigations carried out on the bottom of the excavations disclose that the tuff is 2-4 m thick, resting on a older lava bank.

The distribution relative to the area of beach deposits described earlier is illustrated in Fig.... These

various observations lead to the supposition that the morphology of the beach in Roman times was quite articulated, the tuff formed both coastal terraces and cliffs and sandy and pebbly deposits that accumulated in the depressions of the tuffaceous material.

Also the present day coasts which are cut into tuff, e.g. the coast of the hill of Posillipo, have these morphological characteristics.

In 1987, in the area of the Villa dei Papiri and surrounding areas, studies were carried out for the purpose of studying the local stratigraphic succession and of individuating the basis of the products of the 79 A.D. eruption.

The stratigraphic succession near the Villa dei Papiri is the following (Pescatore & Rippa, 1987):

- Terrains subsequent to the 79 A.D. eruption.

A lava flow of a tefritic, leucitic nature attributed to the eruption of 1631 is present below a modest thickness of loose pyroclastic material, in a primary position or as backfill.

The lava flow has a quite regular trend and its top is parallel to the present day surface. The average thickness of the lava is circa 10-12 m reducing south-eastward until it extinguishes in correspondence with the south-east margin of the Villa dei Papiri.

The lava bank is crossed by scoriaceous levels that individuate the succession of lava flows.

- Terrains in 79 A.D.

The soils of the 79 A.D. eruption are similar to those found in the area of the excavations at Herculaneum. They are formed of more or less cemented tuff with cineritic material englobing pumices, scoriae, and lava fragments in a chaotic structure. An examination of the material extracted from the boreholes does not consent individuating the various units and their characteristics (surges, pyroclastic flows) as it has been possible in studying the outcropping deposits.

The passage between the deposits of the 79 A.D. eruption and the overlying ones is frequently marked by a humus-rich layer, evidence of a period of quiescence after the eruption.

- Terrains prior to the 79 A.D. eruption.

Below the terrains referring to the 79 A.D. eruption, different terrains have been found in the investigations located landward from the Villa dei Papiri in respect of those located seaward.

The boreholes located landward have evidenced humus-rich ash with silty-sandy grain size and rare intercalations of coarse cineritic material.

Instead, the borehole located seaward, have shown only epiclastic soils: sands and rounded, flattened pebbles analogous to those described for the excavations area of the town of Herculaneum.

Such deposits are to be attributed to a beach environment.

The humus-rich level on which the Villa dei Pa-

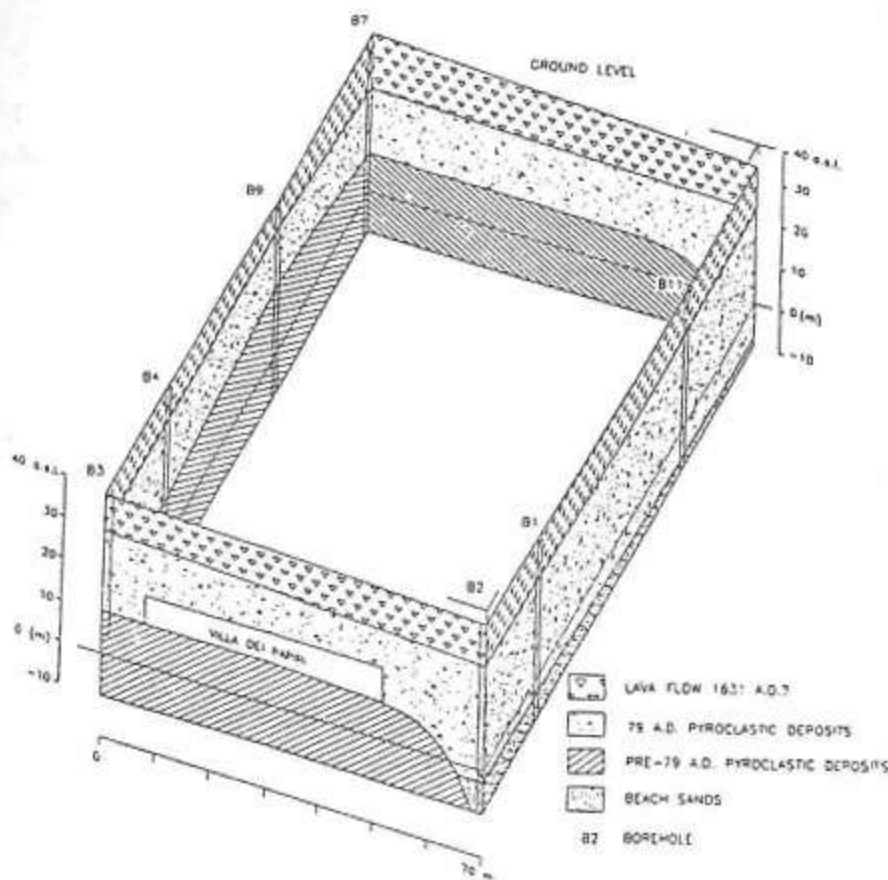


Fig. 8 Block diagram of Villa dei Papiri area.

Villa dei Papiri is constructed rests about 16 m above the level of the sands and pebbles of the beach environment. These data lead to the belief that the Villa dei Papiri was situated on a terrace, probably cut into the same yellow tuff on which Herculaneum was constructed, perhaps at the edge of a terrace overlooking the beach below. It is also possible that an artificial

flight of steps allowed the Villa to be in communication with the beach.

These beach deposits are located at about 3-6 m below sea level, just as it is for the area of the excavations (Fig. 8).

These sandy and gravelly deposits represented the beach at the time of the Romans. As of today there are no data giving indications of the possible extension of the beach or of the location of its shore line.

4. CONCLUSIONS

The geological history of Somma Vesuvio (Santacroce, 1987) has conditioned the evolution of the Campanian coast and the 79 A.D. eruption, in particular, almost instantaneously buried the Roman town and the natural environment of the area surrounding the volcano.

The old city of Herculaneum and the nearby Villa dei Papiri were situated at the end of volcanic tuff plateau overlooking the sea. At the base of the cliffs sandy beaches are present (Fig. 9).

This reconstruction has its counterpart in numerous other documented archaeological situations along the shores of the Gulf of Naples which the geographer Strabo, at the beginning of the first century A.D., describes so very rich, in Roman times, in settlements and villas to give the aspect from the sea of a single city.

The more detailed reconstruction of the physical environment in those times allows us to understand

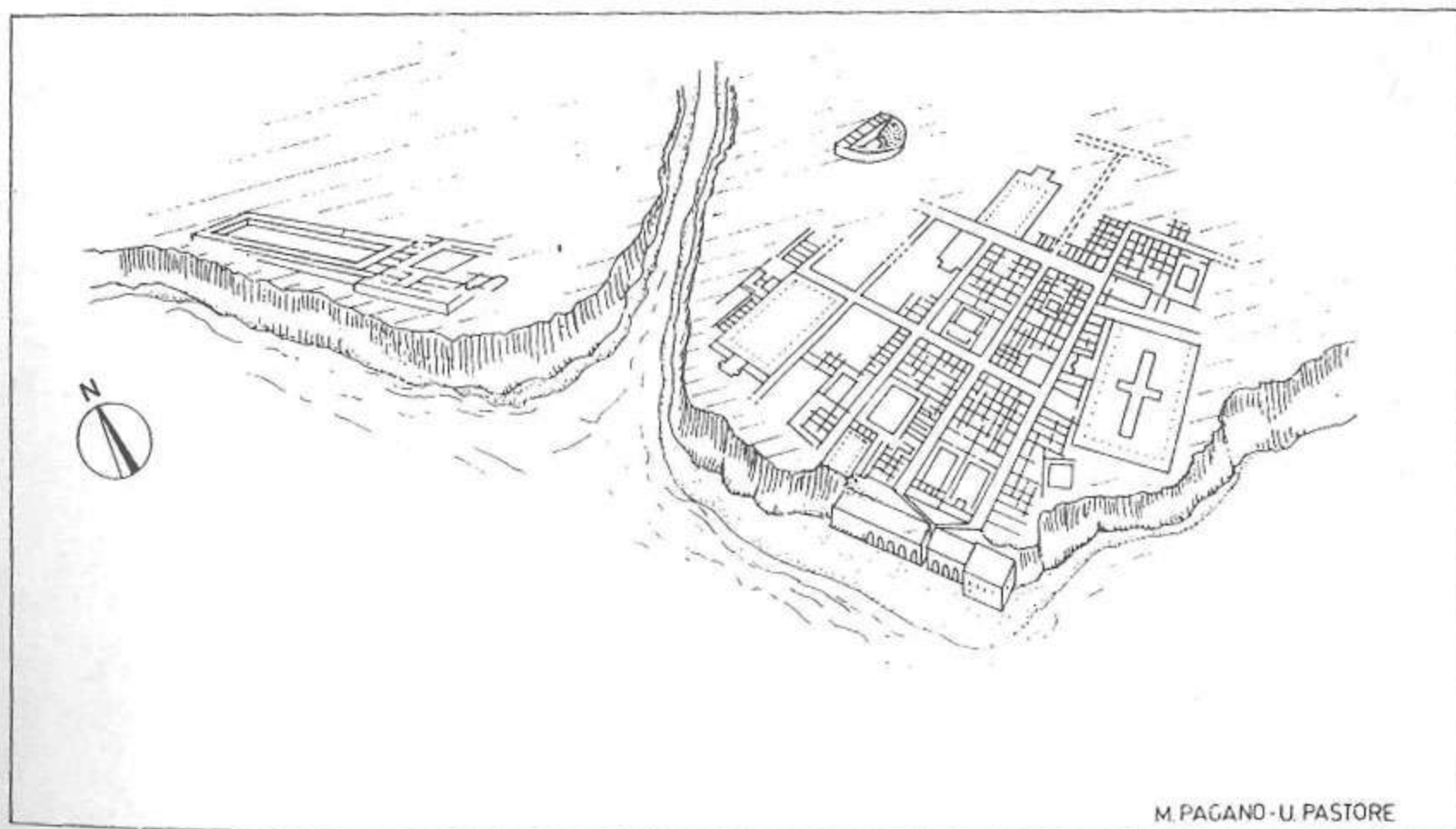


Fig. 9 Tentative reconstruction of Herculaneum and Villa dei Papiri.

the reasons for the non-meridian orientation of the cardines and the decumani perpendicular to them. In fact, the cardines at the edges of the terrace seem normal, allowing a greater utilisation of space and facilitating the carrying off of waters.

The study carried out permits specifying that there were sandy beaches at the edge of the town centre and at the area of the Villa dei Papiri.

The sandy deposits are to be referred to beaches which, however, give no precise indications for the position of the shore line. The beach is found at - 4.20 m below sea level. Similar situations are found all along the littoral from Torre del Greco - where submerged Roman ruins have been found (Golser et al. 1990), to Castellammare di Stabia (Pagano 1990; 1996 b); investigations have also disclosed an analogous situation at the mouth of the Sarno river (Albore Livadie et al. 1990; Barra et al. 1992; Cinque, 1991).

The data indicate a volcanic-tectonic collapsing of the area occurring after the 79 A.D. eruption, taking into consideration that the level of the sea in Roman times was about 1 metre lower than the present day level (Pirazzoli, 1976).

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