Dieter Vieweger, Prof. Dr Dr Dr h.c.
Director-General of the German
Protestant Institute of Archaeology
Amman - Jerusalem
PO Box 183
11118 Amman
Jordan
www.deiahl.de

Dieter Vieweger, Katja Soennecken and Jutta Häser

Accidents in Ancient Times: A Landslide at Tall Zar'ā - Reasons and Consequences

There are only a few areas in Palestine where its history can be studied in such a concentrated manner as in Wādī al-'Arab. This valley, located 4.5 km south-west of Gadara, provided excellent living conditions. The most prominent site is Tall Zar'ā (FIG. 1). The *tall* rises about 25 m above the surrounding area; its highest point is situated at an elevation of 17 m below sea level. The settlements on the *tall* were built on a natural limestone hill which has a diameter of about 240 m at its base. The plateau measures 160 m in diameter and the cultural layers are approximately 16 m thick.

The Special Importance of the *Tall* Stems from Three Facts

First, there is an active artesian spring on top of the *tall*. Being an interesting and surprising feature today, it must have been an attractive, beneficial and wondrous phenomenon in the past (FIG. 2).

Second, the *tall* occupies a strategic position along an ancient and highly important trade route. The tremendous ascent from 290 m below sea level in the Jordan valley to the Irbid - Ramtha area and the hills west of Bayt Rās at 560 m above sea level can be ascended via Wādī al-'Arab without steep or narrow passages. This makes Wādī al-'Arab an ideal route, connecting the trade routes along the Mediterranean coast, via the Jordan valley, with Transjordan and, further to the north-east, Damascus and Mesopotamia (FIG. 3).

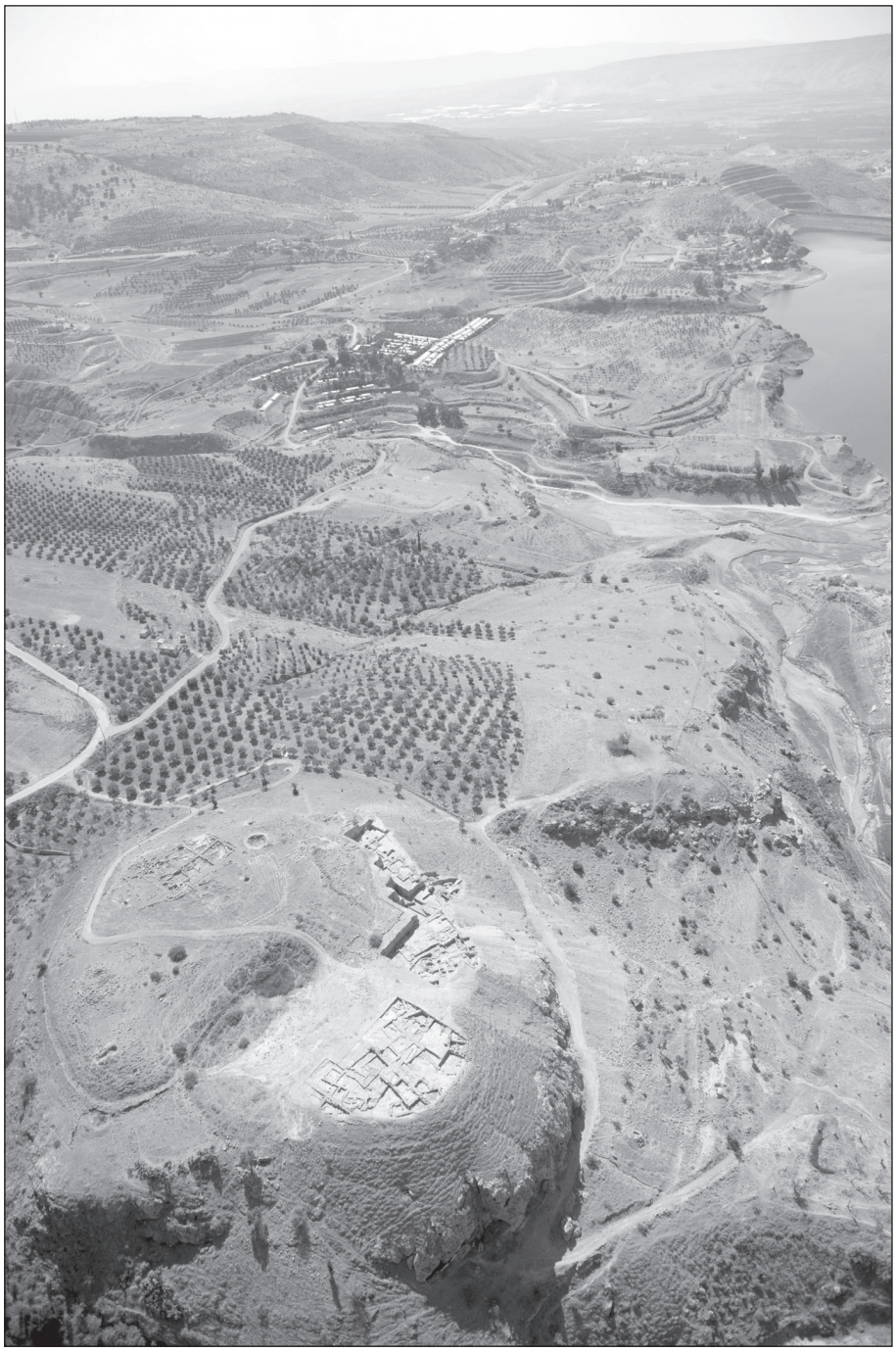
Third, Tall Zar'ā has evidence for more than 5,000 years of settlement, almost without large cultural gaps. So far as the archaeology is concerned, this is perhaps its most important feature. It means that it is possible to observe not only all cultural periods in one location, but also the transitions between them.

Excavation of the Late Bronze Age City

Between 2006 and 2011, the most recent Late Bronze Age stratum (from the 14th - 13th centuries BC) was exposed. The solid architecture, outstanding finds and high proportion of imported pottery from Cyprus and Mycenaean Greece all suggest that Tall Zar'ā was an important urban centre in the Late Bronze Age. It is thus highly probable that it was the centre of a Late Bronze Age city-state (FIGS. 4 and 5). However, the architecture of this stratum has its own remarkable history, in that it witnessed a major natural catastrophe.

The Accident

During the course of excavations at Tall Zar'ā between 2008 and 2011, it became apparent that in about 1400 BC the Late Bronze Age population was hit by a serious landslide. At



1. Tall Zarʿā from the east. © Apaame, courtesy of David L. Kennedy.

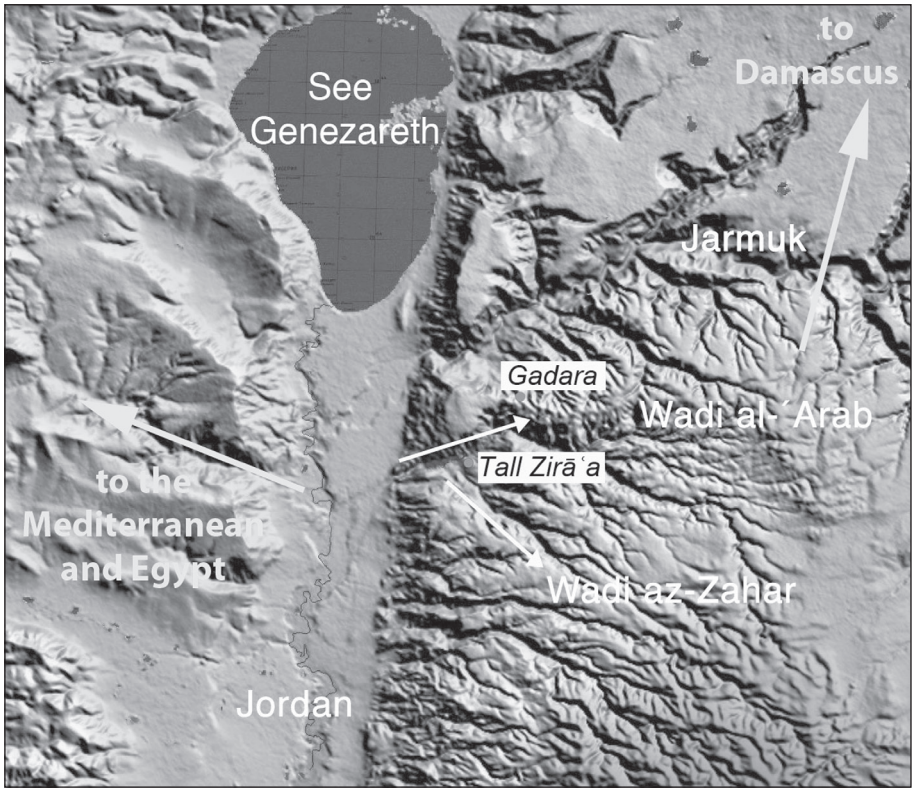
least 1,500 m^2, *i.e.* most of excavation Area I, was affected.

An older water drain and the inner face of slope fortifications were already visible under the Late Bronze Age casemate wall that was removed in spring 2009. These structures were reached quickly but were not, as previously assumed, part of an older Late Bronze Age urban building complex, but rather the final phase of an elaborate renovation of the fortifications in the western part of the city. Initially only a cobbled area *ca.* 8 m-wide was visible within the drain. After some weeks' excavation through artificial layers, the situation resembled that in FIG. 6.

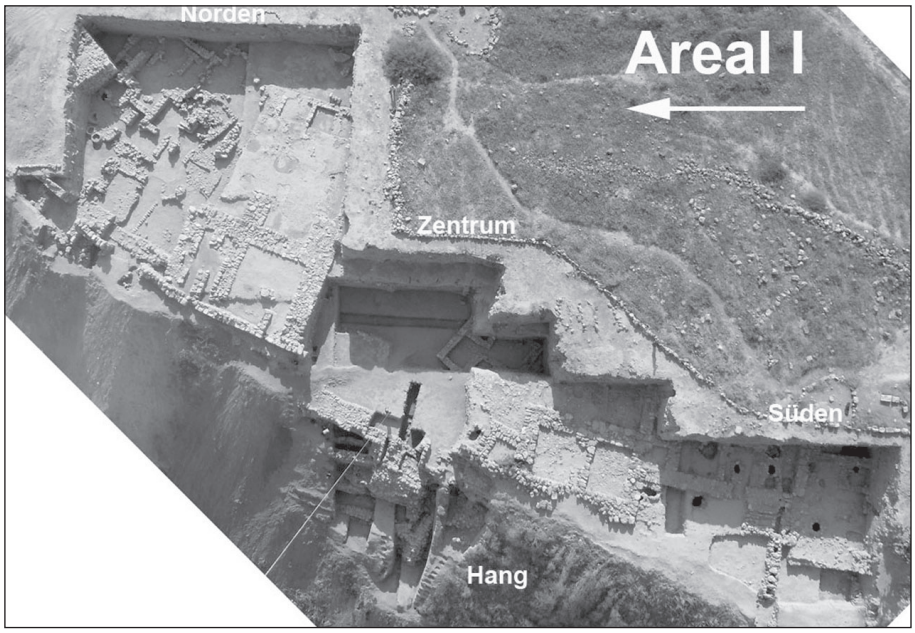
Rebuilding Activity

The eroded part of the slope must have been of such importance to the inhabitants of the Late Bronze Age city that they rebuilt the area of about 1,500 m^2 by backfilling with 30 -

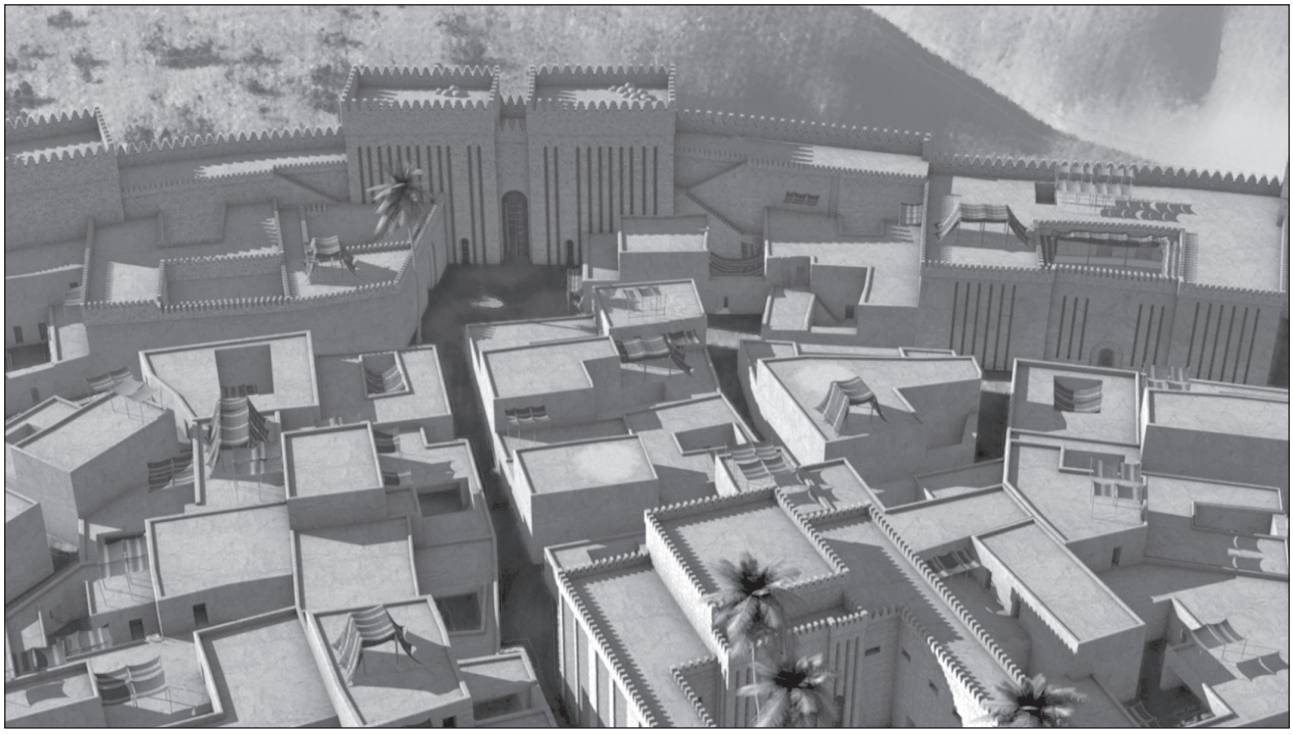
2. Active artesian well on Tall Zar‘ā.



3. Map of northern Palestine, with Tall Zar‘ā.



4. Area I in 2011.

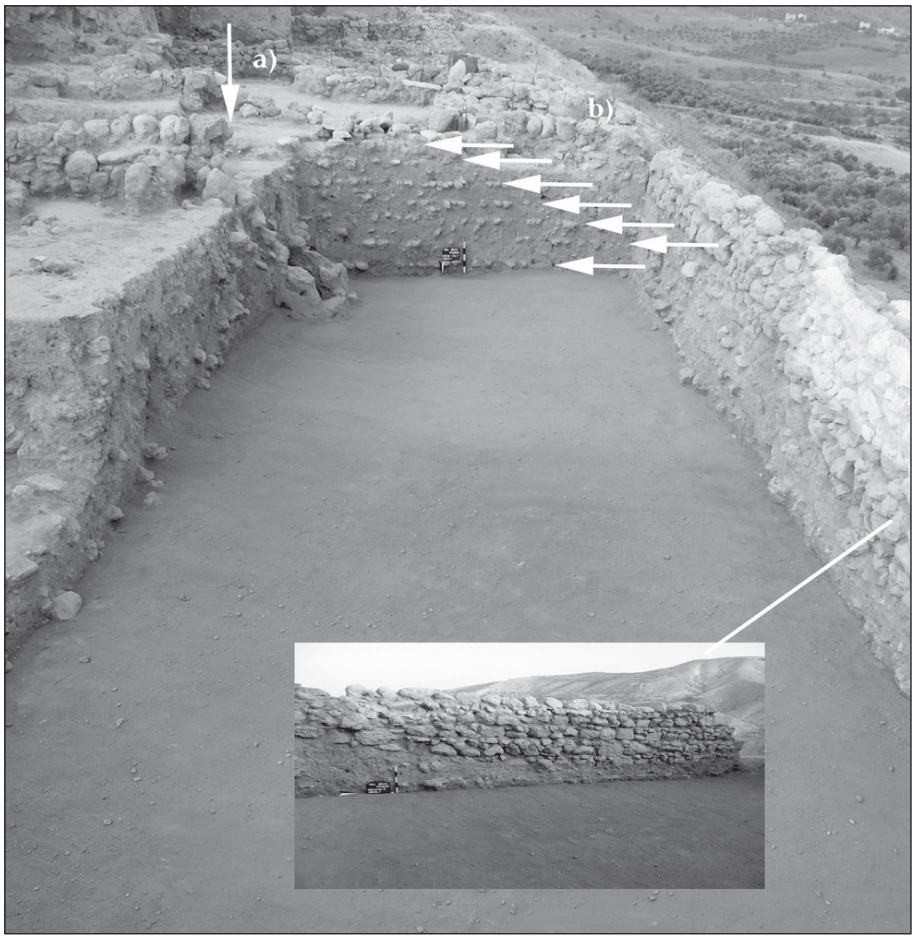


5. Reconstruction of the Late Bronze Age city.

45 cm-thick soil layers, each covered by stone paving. This operation was carefully carried out at least ten times. In the central part the backfill was 4.5 m deep.

These layers were strengthened by a stone wall at the edge of the slope. More than 75 % of the pottery in the backfill was of Early Bronze Age date. This means that it might have been carried from the foot of the hill up the top. The stone wall below was built together with the retaining wall of the back-fill layers - likely year by year.

It would appear from the fact that a *ṭabūn* oven was found on one of the layers of paving associated with this structure that there must have been larger time intervals (seasonal?)



6. Stratum 15 in Area I: different layers of reconstruction activity.

between the construction of the various layers. This would have enabled the top layer to compact and thus be strong enough to support the next layers. Some of the paving layers were linked to minor architectural and functional features that we were unable to interpret.

The inhabitants used the opportunity afforded by the rebuilding to make some useful additions. In the southern part of Area I, the Late Bronze Age cities contained six dry stone-lined subterranean grain silos that were covered with large, round stone lids. They were 2.6 - 3.3 m-deep and had stamped clay floors (FIG. 7).

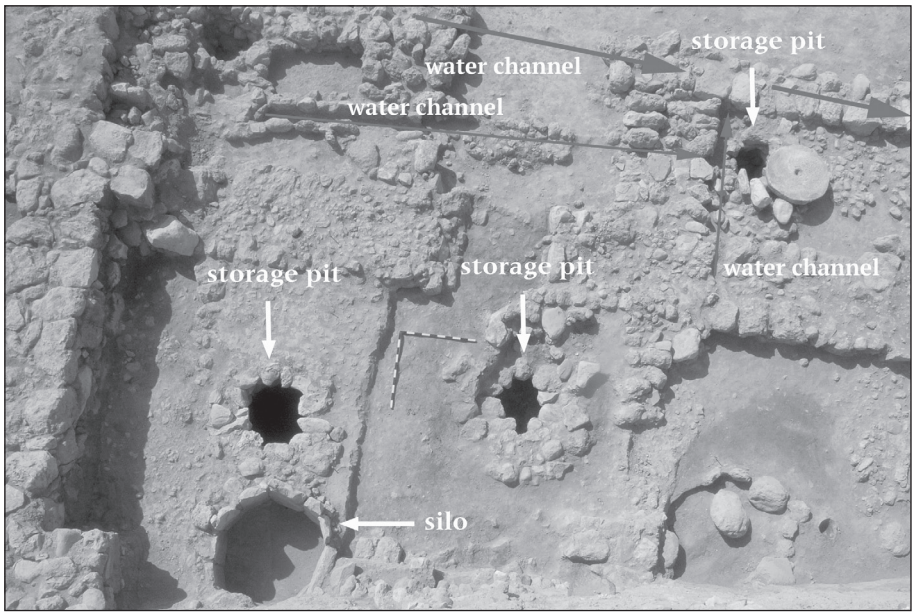
Reason for the Accident

The cause of the landslide is hard to determine. In any event, there was no indication of man-made destruction such as a siege.

There was always plenty of water on the *tall*. The artesian spring supplied a great deal of water that flowed permanently down from the city. In the spring there were heavy and long-lasting rain showers (with which we have had to contend in our spring excavation seasons).

There are some indicators of the destructive power of the water on the *tall*. Of particular importance in this regard are various installations built to channel water out of the city. This appears to have been an important consideration on the *tall*, not only because of the spring in the centre, but also because of the heavy rains that fall in springtime. Three stone-lined, vertical drains at the edge of the slope were excavated to a depth of 2 m, while a large storm water shaft with an impressive drainage capacity was excavated to a depth of 10 m. The latter was particularly carefully stone-lined, covered at the top and displayed horizontal side-shafts that had been dug to clean and repair it underground.

During the last seasons, a straight canal was found running from the last Late Bronze



7. Silos in the reconstructed area.

Age level straight through the slope-cutting city wall and a glacis, probably built in the Early Bronze Age (FIGS. 8 and 9). A further canal, which drained into a straight shaft in the uppermost layer, demonstrates the importance of channeling surface water to the edge of the mound. Another canal was built straight through the older Early Bronze Age fortifications.

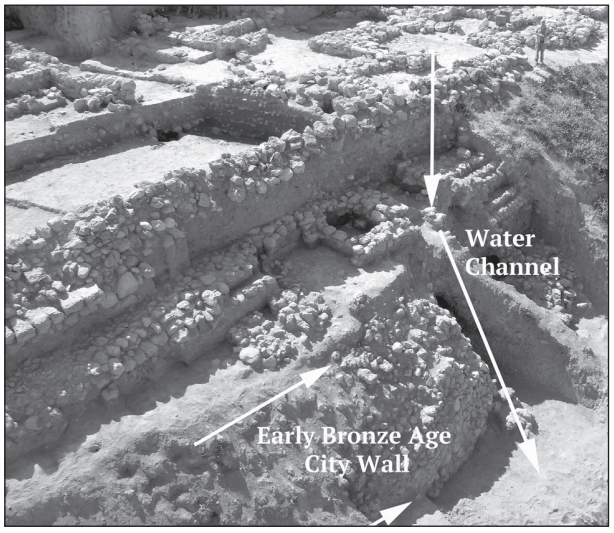
Doubts about this scenario are, however, justified. The landslide we excavated on the *tall* has slopes that seem much too steep; in a normal landslide the break might be expected to have been wider and not so steep, *i.e.* more conical.

If one looks at Tall Zar'ā from the north-east, one can observe a similar phenomenon on the other side of the *tall* (FIG. 10). There must also have been a landslide on this side in the pre-Classical period. Strong rain and permanent dampness from the spring may have played a role here, as there are also the remains of several drainage channels on this side of the *tall*. Also, the slope slid away here at a wider, more crater-like, angle. It is clear that this disaster took place in the Classical period. During Byzantine times, a wall consisting of headers and stretchers was built halfway up the slope, on top of the slumped material, in order to protect the settlement.

Given the steep slopes in Area I, we conclude that water alone cannot have caused the disaster, which probably had other causes. It might have been caused by an earthquake, by the collapse of one of the many caves in the sinter terrace which forms the natural *tall*, or by a combination of multiple factors.

The lower portion of Tall Zar'ā consists of travertine, which is made up principally of calcium carbonate. Coming from hills that rise to elevations of more than 300 m above sea level and which tower over the *tall* to the north, east and south, over the centuries an aquifer appears to have formed a sinter terrace, circular in cross-section, by depositing minerals dissolved in the water (*i.e.* crystallisation; FIG. 11). As a result of a combination of release of pressure, warming of the water after it emerged from the ground and the presence of plants (especially algae), the spring water lost a proportion of its dissolved carbon dioxide (CO_2). As a result of this loss of CO_2, the calcium hydrogen carbonate ($CaCO_3$) dissolved in the water would have become lime.

It can be assumed that the layered structure of the sintered mound overflowing with spring water might have grown by more than 1 cm per year. Since the spring water always flowed from the lowest point, over time a circular



8, 9. One of the big channels associated with the reconstructed city.

mound would have formed, the edges of which were virtually the same on all sides. But the mound did not grow consistently; it is not solid everywhere and contains numerous caves (FIGS. 11 and 12).

In a cave halfway up the rock massif

10. Landslide on the north-eastern side of Tall Zar'ā.

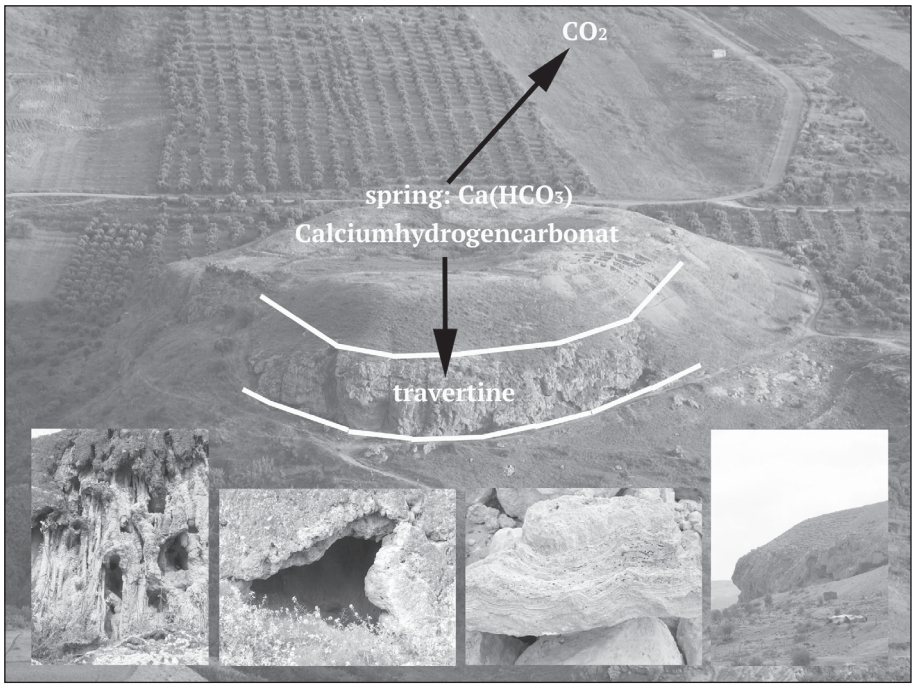
there are stalactites and stalagmites that have grown together, and these bear witness to a considerable flow of water over a long period of time. In a larger cave just a few meters to the north the lime deposits have been removed.

Since the 4th millennium BC, the natural lime mound has been used for settlement. Consequently, its subsequent growth was no longer influenced by the sinter layers of the spring, but by human *tall* activity – resulting in cultural layers 16 m in height.

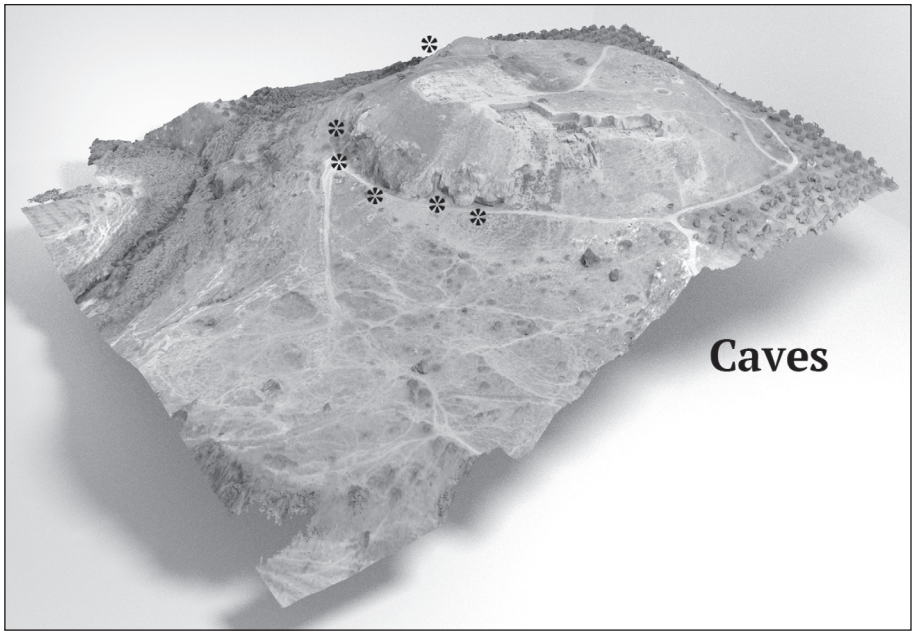
It is therefore more likely that the steep, broken slopes in Area I were caused by the collapse of one or more caves – probably caused by the increasing weight of the man-made cultural layers above and possibly triggered by earthquakes.

Who Repaired the Damaged Quarter of the City?

After this intensive rebuilding operation (Stratum 14), ownership did not change significantly since the outer walls of two of the houses which were excavated in the central part of Area I were rebuilt in the same place; the layout of the houses was very similar to that of their predecessors (Stratum 16). Even a remarkable stone-built oven was constructed on the same spot as before. Therefore, we suggest that the inhabitants repaired their own city immediately, at around 1400 BC (FIG. 13).



11. Chemical processes causing the build-up of the travertine mound.



12. 3D model of Tall Zar'ā, with caves.

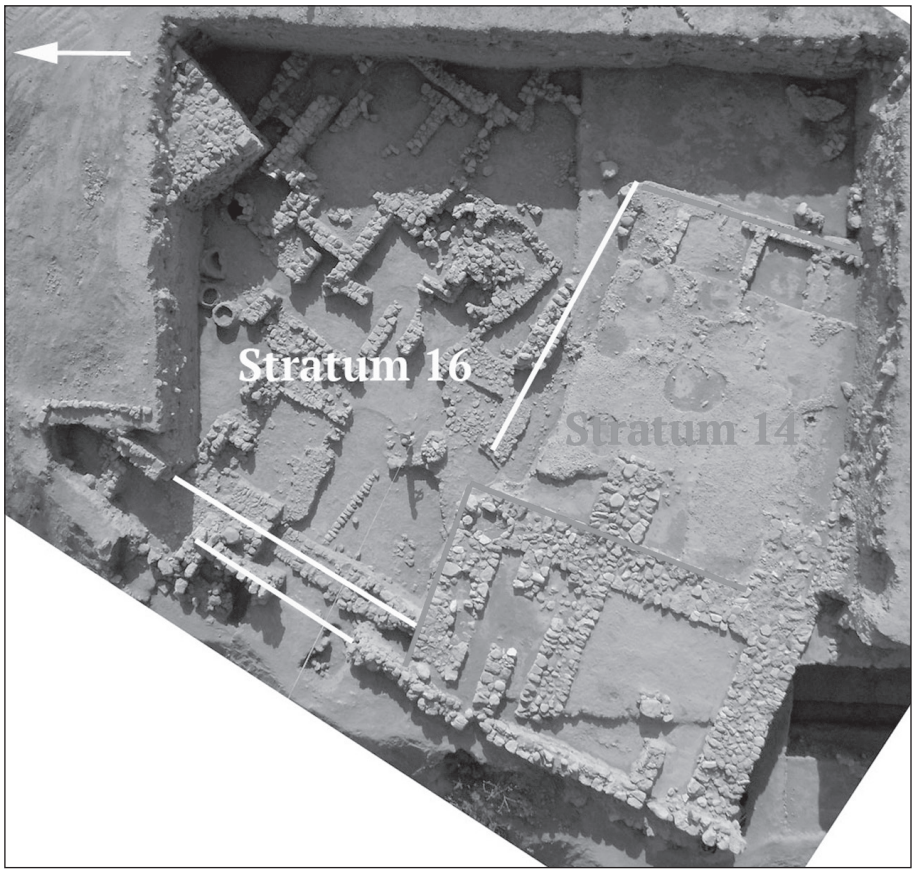
Some More Observations

Only small parts of the north-east of Area I remained unaffected. In these areas, continuous stratigraphy from the Early to Late Bronze Age was excavated, including two strata of the Intermediate Period (EB IV/MB I). The remains of the Late and Middle Bronze Age strata were, however, recoverable in the eastern part of Area I and vividly tell the story of the catastrophe, with truncated walls, uprooted paving and rooms that had fallen down the slope (FIG. 14).

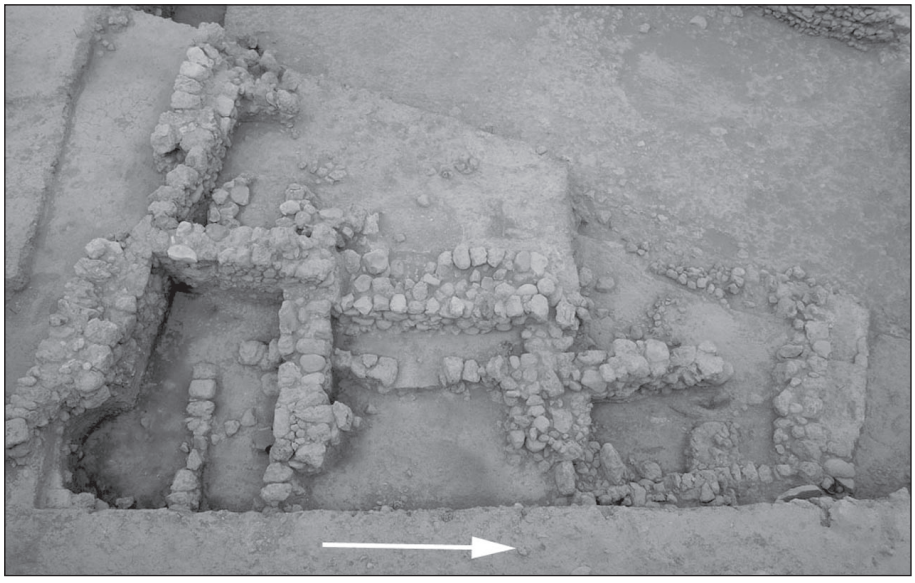
Conclusions

After the reconstruction of the slope, the new city was built up in a splendid manner: the most remarkable feature of this stratum was a massive casemate wall that fortified the settlement on its north-west flank (FIG. 15).

South of the casemate wall a large tower was exposed. It was divided into two rooms paved with small pebbles. The northern room was connected to the southern part of the casemate wall and was probably used by the guard. In



13. Strata 14 and 16 in Area I.

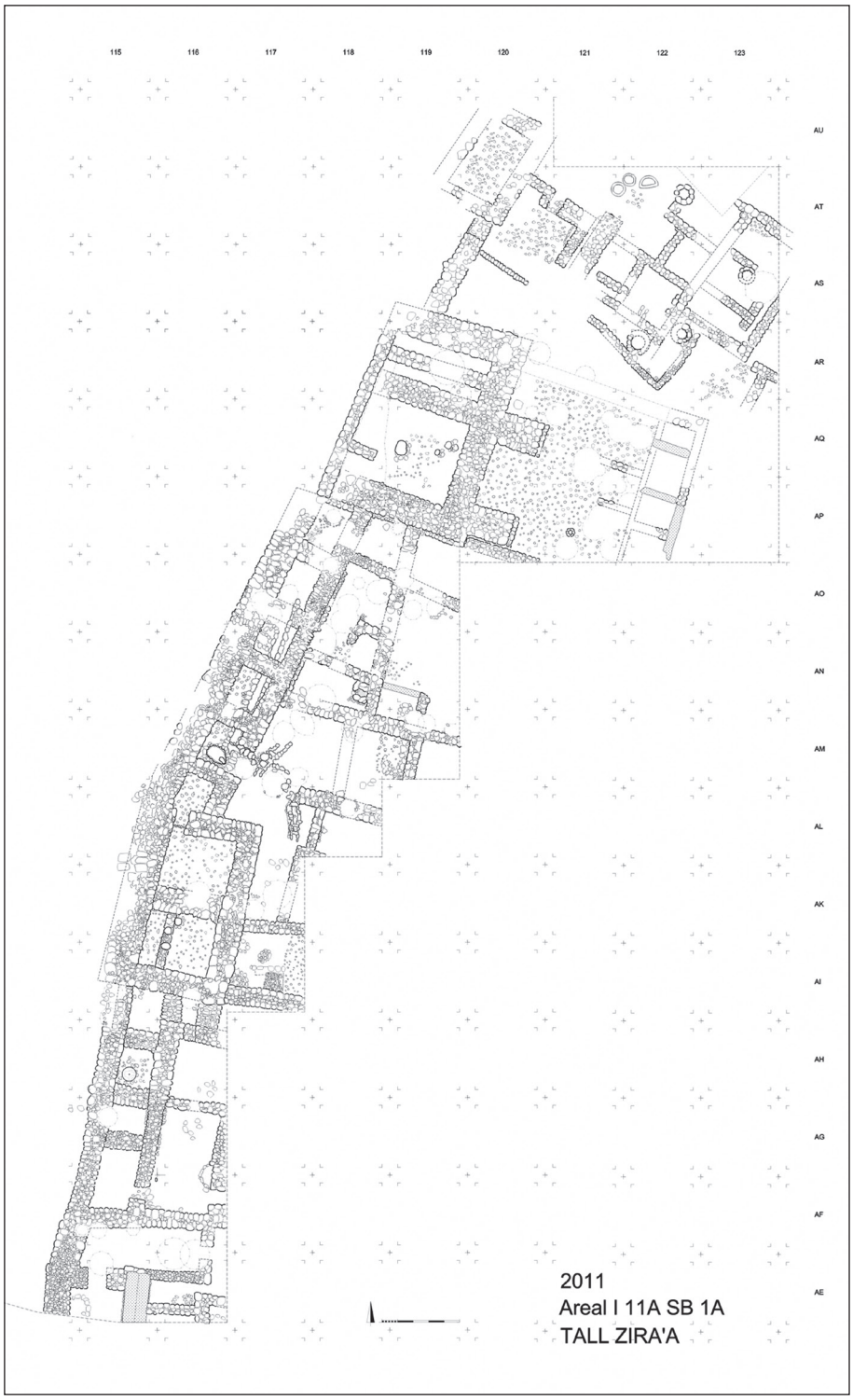


14. Remains of Late Bronze Age strata after the landslide in Area I.

a later building phase, a small wall with two column bases divided the southern room. It served as a temple, outside of which was an altar.

South of the tower, a gate chamber with a width of 2.75 m was discovered. It was the gateway to two lower cities to the north and the west of the *tall*.

The northern monumental building was partly uncovered in 2006 and completely revealed in 2011. It turned out that two *antae* were built against the eastern wall. In front of them, a large and very carefully paved courtyard was laid out. The eastern limit of this courtyard consisted of several small rooms. The northern outer wall could only be detected



15. Plan of the reconstructed Late Bronze Age city, Stratum 14.

by negative features, *i.e.* its foundation trench and the northern limit of the courtyard pavement, since the inhabitants of the Iron Age I settlement used the stones of this wall for their own buildings. The remarkably thin wall on the western side of the building might be explained by its builders appreciating that they should not put too much load on the backfill at the outer edge of the hill.

The wealth of the city and its wide-ranging trade links are reflected in the finds of this period, among them scarabs, some bronze objects and a painted pottery jar. The painting on the jar shows a scene with two lions with upraised

manes, a bull, a flock of smaller animals and a scorpion, as well as coiled and stretched out snakes and a human figure playing a lyre. These interesting scenes probably depict a story, maybe a legend or myth.

The most interesting find from this part of Area I is a ceramic votive plate (TZ 18181 Fig. 11), with a depiction of a man in combat pose. Five heads are shown around him. The fighter is worked in relief, whereas the heads are scratched into the surface. This probably depicts a king or a god who is surrounded by the heads of killed enemies. There is no parallel for this plate in the Near East, but the subject fits well with the depiction of kings with their slain or captured enemies.

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