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The Leiden Ancient Cities of Boeotia Project: Preliminary Report on the 2001 season.

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THE LEIDEN ANCIENT CITIES OF BOEOTIA PROJECT: Preliminary Report on the 2001 Season

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From mid-July to mid-August 2001 a team from Leiden University under the direction of Professor John Bintliff, together with Greek colleagues (Dr K. Sbonias, Dr K. Sarri) and a small team from the University of Ljubljana under the direction of Professor B. Slapšak, undertook a second season of surface survey in the city of Tanagra, Eastern Boeotia and in its immediate rural surroundings. The first season at Tanagra, in summer 2000, has seen a detailed preliminary report published in this journal.[1] It is intended that each season will produce a similar report for *Pharos*. The co-directors of the Project are John Bintliff and Božidar Slapšak, the assistant director is Kostas Sbonias. The Geoprospection team is led by Branko Mušič, the Total Station topographic recording team are Lefteris Sigalos and Emeri Farinetti, and the GIS data integration of the artefacts, architecture and topography is carried out by Emeri Farinetti. In 2001 the prehistoric finds were studied by Kalliope Sarri, those of Geometric to Hellenistic by Vladimir Stissi, and the Medieval and Postmedieval by Joanita Vroom. Work on the Roman to Late Roman ceramic finds will commence in May 2002 with a new member of the Project, Dr Jeroen Poblome from Leuven University.

As usual we would like to express our fulsome gratitude to the Ephor of Classical Antiquities for Boeotia, Prof. Vassilis Aravantinos, for his constant support, encouragement and interest in our

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[1] Bintliff *et al.* 2000a.

work, and to Bishop Hieronymus and his assistant Mr. G. Kopanyas for the wonderful facilities offered to our team at the Ecclesiastical Research Centre at Evangelistria. The staff at the Dutch Institute in Athens were a perfect support team for us and our students. Professor L. Louwe Kooijmans, Dean of the Faculty of Archaeology, Leiden University has given enthusiastic support for the Tanagra programme, not least through making available major funding for the main field season and the collaborative Geoprospection season by the Ljubljana team.

Our 2001 preliminary report begins with a general overview of the Project's work, focussing chiefly on the archaeological surface artefact survey of the city and its rural hinterland (directed by J. Bintliff and K. Sbonias). There then follows a discussion of the Greco-Roman finds by V. Stissi (University of Amsterdam), a contribution by E. Farinetti and L. Sigalos on the Total Station survey, and finally a report on the Geoprospection by Branko Mušič and Božidar Slapšak. Further information on the prehistoric finds and those of Roman-Late Roman and Medieval-Postmedieval date will be offered in the next preliminary report, when more work has been done on them.

General overview of the surface artefact survey (John Bintliff and Kostas Sbonias)

In the 2001 season, within the ancient city walls, another major sector of the surface was systematically planned topographically using a total station (directed by L. Sigalos and E. Farinetti), with careful note being taken of the location of all wall lines and architectural fragments. In total now over the two seasons 2000-2001, some 13 hectares of the city have been exhaustively planned in this fashion, with the main aims being to reveal microtopographic variations in the surface which can be connected to buried structures, roads, the variation in soil depth and surface artefact finds, as well as to provide a firm and absolute recording surface for locating the surface collection grid placed over the city interior by the archaeological teams. In conjunction with the results of Geoprospection, carried out by Ljubljana specialists led by B. Mušič, the plan of the city blocks and roads is gradually being elucidated, to compare with the differential spreads of ceramic surface finds of various occupation phases of the town, and with the tentative city plan published in 1987 by a previous team working at the site.[2] These different kinds of spatial information are being linked together using sophisticated computer technology (a Geographical Information System) by E. Farinetti. More detailed reports on these studies are given in the specialist sections later in this article.

The surface artefact survey of the ancient city interior achieved its aim for 2001 of reaching some two-thirds of the total surface area. Thus of the approximately 30 hectare city interior, some 12 were surveyed artefactually in the first season, a further 8 in 2001. The final one third will be covered in 2002. A slightly slower pace was the result of two factors. Firstly, whereas the 2000 surface survey technique had deployed a collection and recording grid of ca. 50 metre by 50 metre squares across the city, with a subsample in each quadrat corner of 30m x 10m as an intensive control on the data from the large squares, we decided to move in 2001 to a more refined control of the data, by continuing with the 50 x 50 m base grid but subdividing it into four mini-quadrats for recording and collection (see Figures 1-2). As in 2000, density of artefacts (almost entirely ceramic and tile) was

[2] Roller 1987.

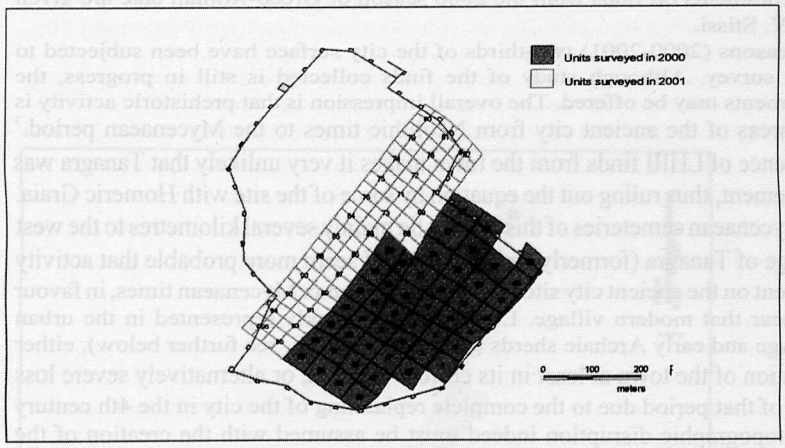

Figure 1: The plan of the city grids surveyed in 2000 and 2001 fieldseasons.

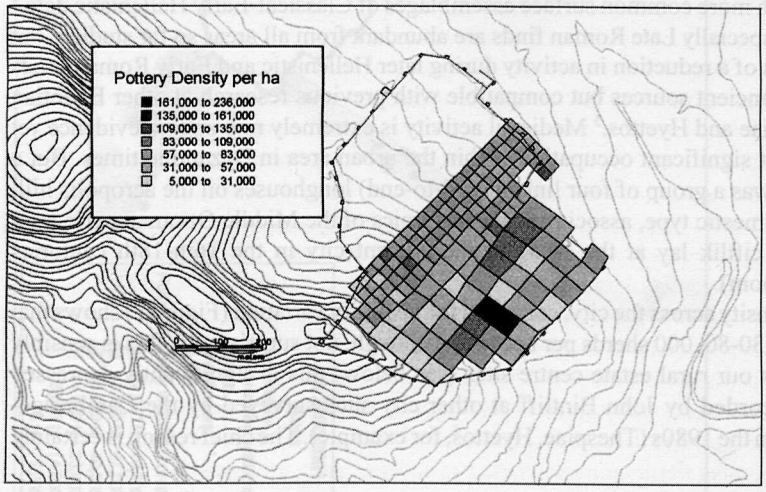

Figure 2: Ceramic densities of the 2000 survey season city units and the 2001 four quadrants.

measured and a representative sample of feature sherds and fabric types collected for each of the 4 units within each large grid square, with the ultimate aim of identifying variation in the chronological spread of material across the city area and its indications for functional zonation and trade activities. Some very provisional comments on finds from the 2000 season of Greco-Roman date are given below in the section by V. Stissi.

Thus, so far in two seasons (2000-2001) two-thirds of the city surface have been subjected to intense surface artefact survey. Although study of the finds collected is still in progress, the following tentative comments may be offered. The overall impression is that prehistoric activity is widespread over large areas of the ancient city from Neolithic times to the Mycenaean period.[3] However the virtual absence of LHIII finds from the town makes it very unlikely that Tanagra was a major Mycenaean settlement, thus ruling out the equation by some of the site with Homeric Graia. Since the famous Late Mycenaean cemeteries of this district lie mainly several kilometres to the west around the modern village of Tanagra (formerly Bratsi), it would seem more probable that activity at the prehistoric settlement on the ancient city site faded away in climax Mycenaean times, in favour of a major settlement near that modern village. Likewise very weakly represented in the urban surface finds are Dark Age and early Archaic sherds (study by V. Stissi, see further below), either suggesting a late foundation of the town at least in its current location, or alternatively severe loss or burial of the material of that period due to the complete replanning of the city in the 4th century BC. Although massive topographic disruption indeed must be assumed with the creation of the gridplan town in the latter period, there is the problem that prehistoric sherds are surprisingly widespread in most parts of the town so far surveyed. To try and resolve this contradiction, it may be pointed out that sherds of Geometric to Archaic date which have lost their paint due to the kind of subsequent site disruption as here postulated in the 4th century BC, are commonly believed to get classified in with the much more common surface assemblages of Classical-Early Hellenistic date.[4]

Classical Greek, and especially Late Roman finds are abundant from all areas so far studied, but there are some indications of a reduction in activity during later Hellenistic and Early Roman times – not predicted from the ancient sources but compatible with previous research at other Boeotian urban sites such as Thespiae and Hyettos.[5] Medieval activity is extremely rare and no evidence yet has been found to suggest significant occupation within the urban area in Byzantine times. But a major discovery of 2001 was a group of four linked (end-to-end) longhouses on the acropolis hill, of traditional Boeotian domestic type, associated with ceramics of the Middle Ottoman period – a small hamlet, perhaps a ciftlik lay at the heart of the ancient city in the 16th-18th centuries (preliminary dating J. Vroom).

The surface ceramic density across the city, corrected for visibility variation (Figure 2) shows that most quadrats range from 30-80, 000 sherds per hectare. Although, not surprisingly, this is sensibly greater than the density at our rural estate centre sites (see below) this is significantly depressed compared to densities recorded by John Bintliff at other city sites surveyed by the Cambridge-Bradford Boeotia Project in the 1980s (Thespiae, Hyettos, for example). The chief reason is certainly

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[3] pers.com. Dr K. Sarri, see also our previous report (Bintliff *et al.* 2000a)

[4] previous urban survey in Boeotia has also recorded apparent underrepresentation of the G-A centuries – cf. Bintliff and Snodgrass 1988.

[5] see Bintliff and Snodgrass *op.cit.*

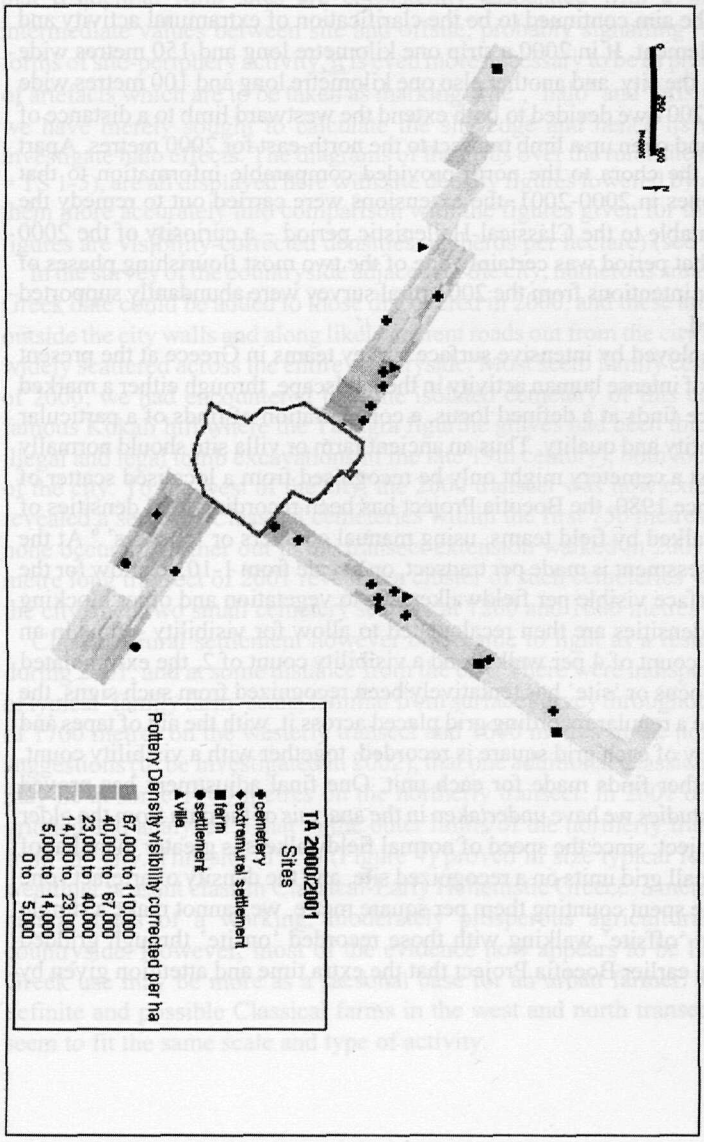

Figure 3: Off-site activity and extramural settlement.

the site protection unique to Tanagra, in that the area inside the enceinte has been taken out of cultivation and is merely lightly grazed by a flock of sheep based beside the city in sheds. Instead of annual cultivation stirring up rich assemblages of pottery, typical for these other cities, what can be seen on the surface of Tanagra remains from what had been brought to the surface in cultivation some years ago, or has been disturbed by much lighter processes of natural weathering and the process of grazing since then.

At the same time as we were conducting urban survey, our fieldwork in the immediate rural surroundings of the site, its inner chora, continued and with the method deployed in 2000, *i.e.* long strips or transects were walked outwards from the city wall along compass bearings not far off the cardinal directions (Figure 3). The aim continued to be the clarification of extramural activity and representative signs of rural settlement. If in 2000 a strip one kilometre long and 150 metres wide had been walked south-east from the city, and another also one kilometre long and 100 metres wide had been walked north-west, for 2001 we decided to both extend the westward limb to a distance of 1900 metres from the city wall, and open up a limb transect to the north-east for 2000 metres. Apart from the desire to see whether the chora to the north provided comparable information to that obtained in the east and west zones in 2000-2001, the extensions were carried out to remedy the absence of rural sites hitherto datable to the Classical-Hellenistic period – a curiosity of the 2000 fieldwalking results, given that that period was certainly one of the two most flourishing phases of the city site's occupation. All our intentions from the 2001 rural survey were abundantly supported by the interesting results obtained.

The standard methodology deployed by intensive surface survey teams in Greece at the present time is to identify 'sites', or foci of intense human activity in the landscape, through either a marked increase in the quantity of surface finds at a defined locus, a concentration of finds of a particular quality, or a combination of quantity and quality. Thus an ancient farm or villa site should normally stand out through quantity, whilst a cemetery might only be recognised from a localised scatter of distinctive types of ceramics. Since 1980, the Boeotia Project has been recording total densities of all finds across every transect walked by field teams, using manual counters or 'clickers'.[6] At the same time, a surface visibility assessment is made per transect, on a scale from 1-10, to allow for the varying amount of actual soil surface visible per fieldwalker due to vegetation and other blocking cover. The raw surface artefact densities are then recalculated to allow for visibility – thus in an overgrown vineyard with a sherd count of 4 per walker and a visibility count of 2, the extrapolated count becomes 20. Once such a locus or 'site' has tentatively been recognized from such signs, the site is returned to, in order to have a regular recording grid placed across it, with the aid of tapes and ranging-poles. The artefact density of each grid square is recorded, together with a visibility count, and a sample of ceramics and other finds made for each unit. One final adjustment has proved necessary from the very detailed studies we have undertaken in the analysis of the data from the older Cambridge-Bradford Boeotia Project: since the speed of normal fieldwalkers is greater than that of students and staff studying the small grid units on a recognized site, and the density of artefacts one records is proportional to the time spent counting them per square metre, we cannot make a simple comparison of sherd densities in 'offsite' walking with those recorded 'onsite' through gridded analysis. We have found from the earlier Boeotia Project that the extra time and attention given by

[6] cf. Bintliff and Snodgrass 1985.

the teams in site grid counts is approximately 2-3 times that typical for normal fieldwalking, thus in the Tanagra Project we have divided the recorded densities on our rural sites by a factor of 2.5 to make them directly comparable with the figures obtained from fieldwalking the surrounding transects in which the site was discovered. The importance of this correction lies in the need to try and identify the edges of rural sites, and since there is here as in the rest of Boeotia, a very notable density of finds in almost all fields due to the urban manuring phenomenon, it is only through quantitative comparisons which are as reliable as possible that we can hope to define the borders of sites and hence calculate their maximum size. Since we have also shown in previous work in Boeotia that residential rural sites are consistently associated with a 'halo' or surrounding zone of intermediate values between site and offsite, probably signalling refuse areas, gardens and other forms of site-periphery activity, it is even more necessary to be as precise as possible about the levels of artefacts which are to be taken as marking 'site', 'halo' and 'offsite'. In this preliminary analysis we have merely sought to calculate the site edge and hence its maximum area, and will later investigate halo effects. The diagrams of the grids over the rural sites studied in 2001 (Tanagra Sites = TS 1-5), are all displayed here with site density figures lowered by a factor of 2.5, in order to locate them more accurately into comparison with the figures given for the associated field transects (all figures are visibility-corrected densities of sherds per hectare) (see Figures 4-8).

In the survey of the countryside adjacent to the city, numerous small cemetery scatters of Classical Greek date could be added to those discovered in 2000, and these are both as expected immediately outside the city walls and along likely ancient roads out from the city to neighbouring towns, but also widely scattered across the entire countryside. Most seem family cemeteries. In the easterly transect of 2000, we had encountered just one isolated cemetery of this date, but it lay not far from the famous Kokali hill where the Tanagra figurine graves had been thickly clustered (according to the illegal and legal tomb excavations of the late 19th century), both locations being within 500 metres of the city. To the west of the city, the 2000 transect was now extended to 1900 metres; this had revealed a series of Classical cemeteries within the first 750 metres out from the wall in 2000, but none occurred further out in the transect extension walked in 2001. To the north, the new, 2000-metre long transect of 2001 revealed a cluster of such cemeteries within the first 800 metres from the city, then two small cemetery scatters at 1200 and 1600 metres respectively.

Classical rural settlement however only came to light as a result of our long transect strategy during 2001, and at some distance from the city. There were indisputably two small Classical farms of typical 'family farm' scale, familiar from surface survey throughout Southern Greece, at a distance of 1700 metres on the westerly transect and 1600 metres in the northerly transect. But there were suggestions (to be investigated in 2002), that one additional Classical farm of a similarly small scale may lie at some 1200 metres on the northerly transect. In 2001 only one of these farm sites was gridded and analyzed – that in the outer limits of the northerly transect some 1600 metres distant from the city. This site (TS 1) (Figure 4) proved in size typical for presumed 'family farms' of a wealthier peasant class in Classical-Early Hellenistic Greece: a mere 0.2 hectare in size, with all the natural finds of a working, moderately prosperous agricultural and residential base in the countryside. However, most of the evidence now appears to be Earky Roman, and the Classical Greek use may be more as a saesonal base for an urban farmer. The finds observed at the other definite and possible Classical farms in the west and north transects, awaiting analysis for 2002, seem to fit the same scale and type of activity.

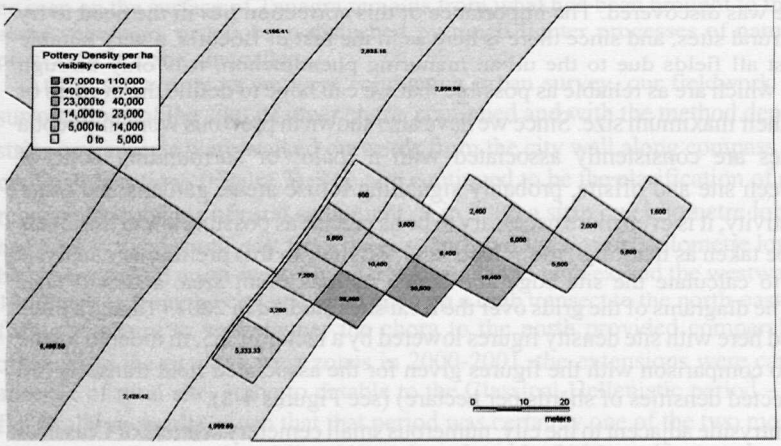

Figure 4: TA_TS1 visibility corrected, site grid reduced by a factor of 2.5.

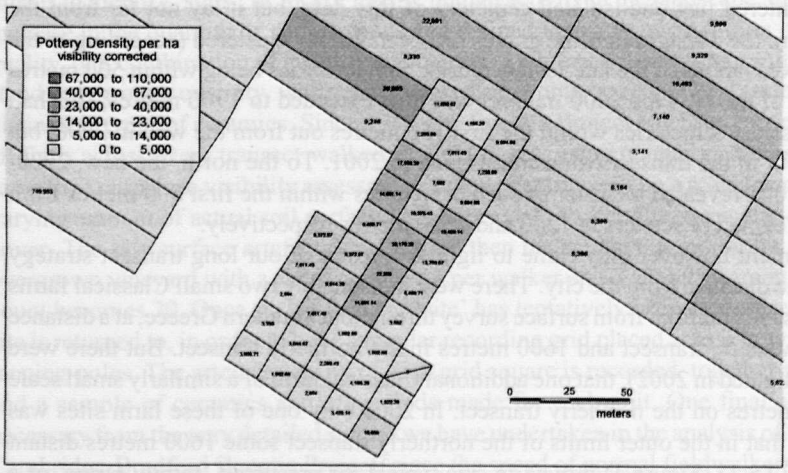

Figure 5: TA_TS2 visibility corrected, site grid reduced by a factor of 2.5.

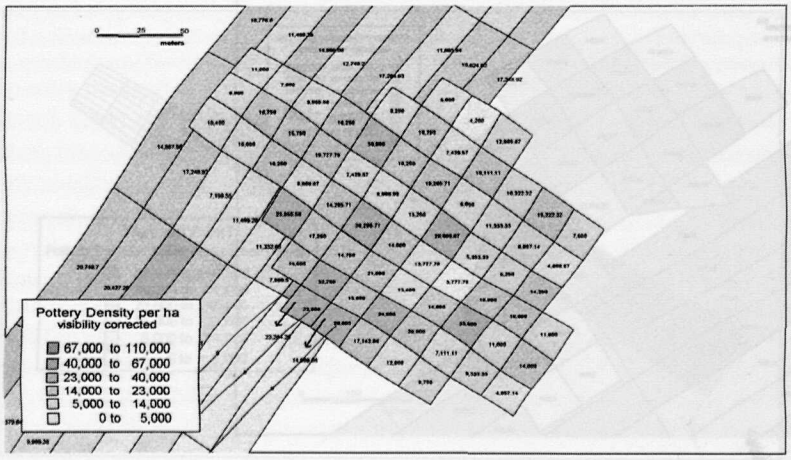

Figure 6: TA_TS3 visibility corrected, site grid reduced by a factor of 2.5.

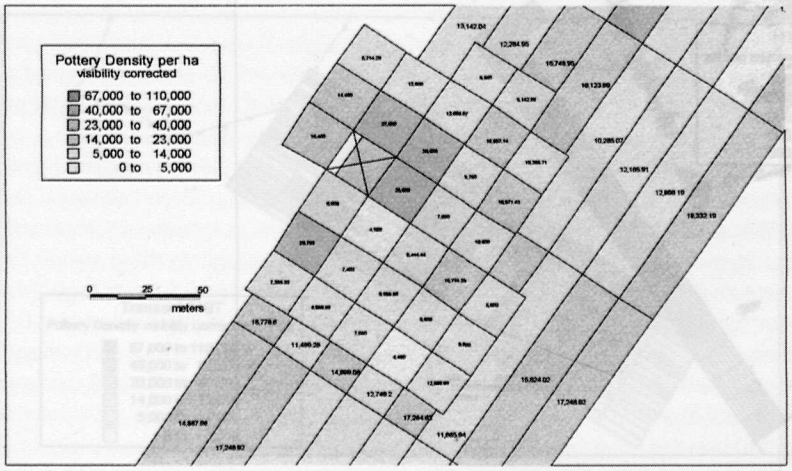

Figure 7: TA_TS4 visibility corrected, site grid reduced by a factor of 2.5.

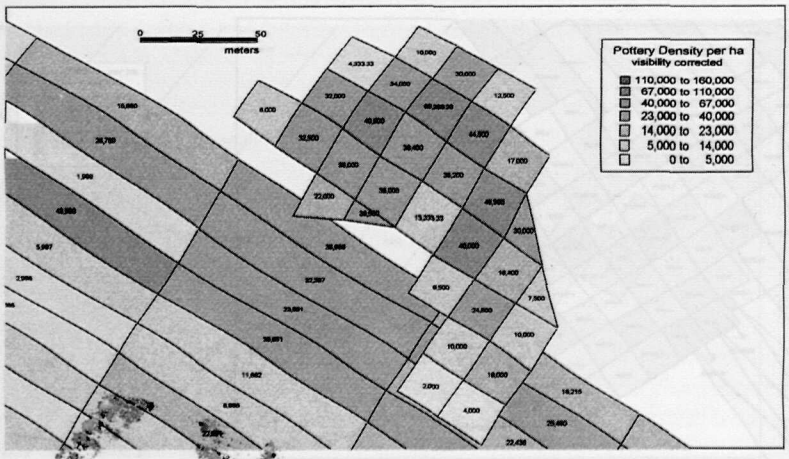

Figure 8: TA_TS5 visibility corrected, site grid reduced by a factor of 2.5.

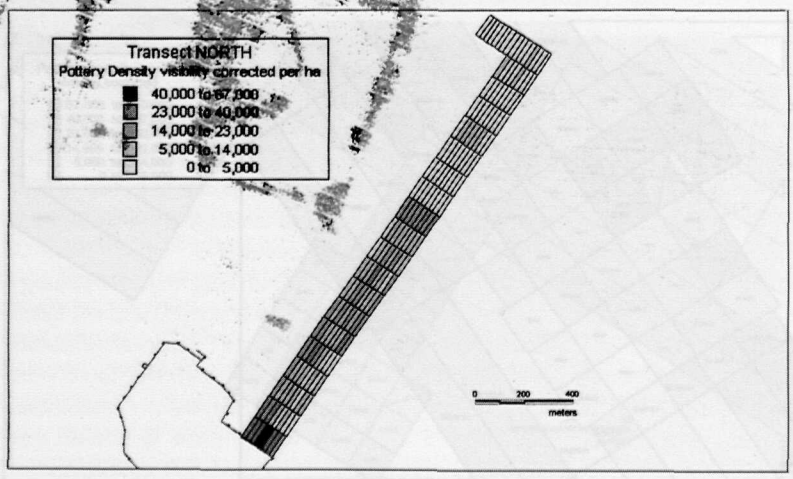

Figure 9: North Transect.

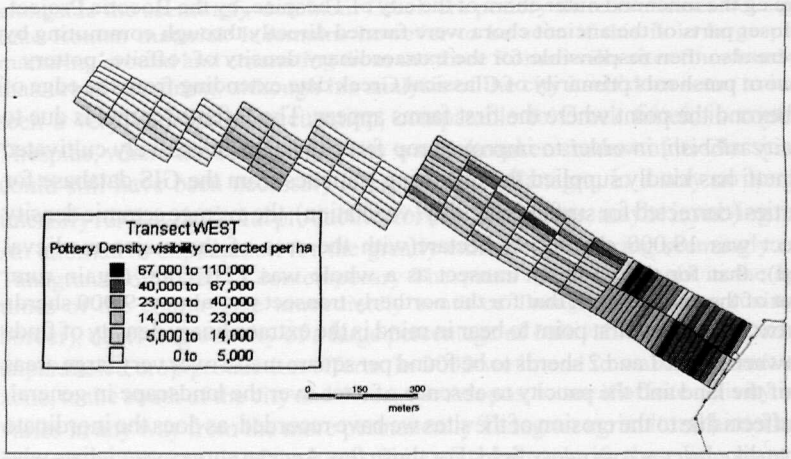

Figure 10: West Transect.

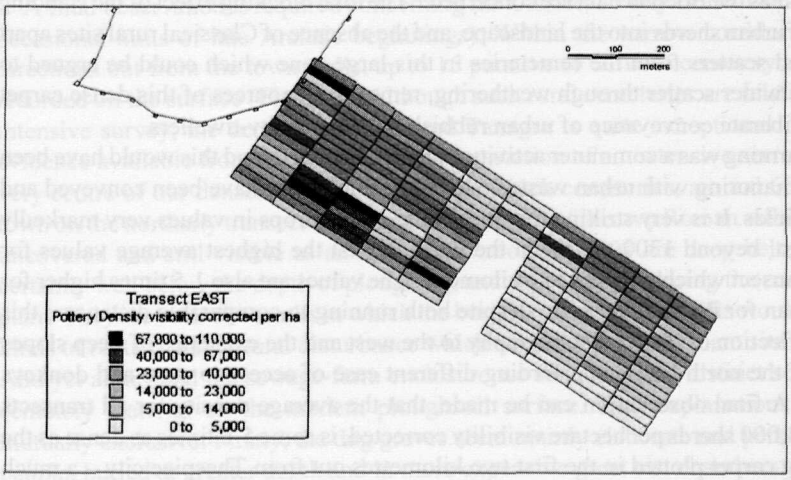

Figure 11: East Transect.

We can draw attention to the coincidence of information for the Classical-Early Hellenistic period: a concentration of small cemeteries and an absence of rural farmsteads within the first kilometre radius around the city, then the appearance of farms within the second kilometre. Such a pattern has been observed elsewhere eg the inner and outer chora of the city of Thespiae, by the Boeotia Project. This signifies that the closer parts of the ancient chora were farmed directly through commuting by urban residents, who were also then responsible for the extraordinary density of 'offsite 'pottery – a continuous carpet of worn potsherds primarily of Classical Greek date extending from the edge of the city up to and then beyond the point where the first farms appear. The 'offsite' carpet is due to urban manuring using city rubbish, in order to improve crop fertility in the intensively cultivated inner chora. Emeri Farinetti has kindly supplied the following statistics from the GIS database for our offsite ceramic densities (corrected for surface visibility/ vegetation): the average ceramic density for the eastward transect was 19,000 sherds per hectare(with the area of the major medieval settlement site excepted); that for the westerly transect as a whole was 12-13,000 (again rural settlement sites taken out of the calculation); that for the northerly transect was almost 9,000 sherds per hectare, settlements excepted. The first point to bear in mind is the extraordinary density of finds between rural sites – between about 1 and 2 sherds to be found per square metre over very large areas (Figures 9-11). The lie of the land and the paucity to absence of sites over the landscape in general, rule out any significant effects due to the erosion of the sites we have recorded, as does the inordinate density of finds in a carpet-like layer across every field. For those few Aegean survey specialists who continue to believe that such carpets are not the result of deliberate ancient manuring,[7] the evidence from the first kilometre outwards from Tanagra city should mark the nail in the coffin of their skepticism, at least as far as the Boeotia data are concerned.[8] The total blocking effect of the standing city wall on dispersal of urban sherds into the landscape, and the absence of Classical rural sites apart from very thin localized scatters from the cemeteries in this large zone which could be argued to likewise produce some wider scatter through weathering, removes all sources of this dense carpet material except the deliberate conveyance of urban rubbish by ancient city-dwellers.

In this inner sector farming was a commuter activity from the city itself, and this would have been the prime zone where manuring with urban waste could most effectively have been conveyed and distributed across the fields. It is very striking that the offsite carpet drops in values very markedly beyond 1km to the west, beyond 1300 metres in the north, whilst the highest average values for offsite are in the east transect which only ran to 1 kilometre. The values are also 1.5 times higher for the westerly transect than for the northerly one despite both running to comparable distances; this is almost certainly a reflection of the level topography to the west and the existence of steep slopes in the further sector of the north transect, affording different ease of access to carts and donkeys carrying urban waste.[9] A final observation can be made, that the average density for all transects walked hitherto – 13-14,000 sherds per hectare visibility corrected, is some 5-6 times as dense as the contemporary manuring carpet plotted in the first two kilometres out from Thespiae city – a much larger town by far (and, moreover, perhaps 3-4 times the size and population of Tanagra at this

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[7] cf. Alcock, Cherry, *et al.* 1994.

[8] but see already Snodgrass 1994.

[9] a distinction verified in the access analysis GIS work by Phil Howard of Durham University for comparable data in the chora of Thespiae city – see Bintliff and Howard 1999.

period). Given the reasonable assumption that both towns had an equal potential per family to produce manurable rubbish, this would seem to demand additional explanations. In his contribution to this article, Vladimir Stissi points out that the dating of the offsite finds is only provisional, but alongside the seemingly-dominant Greek era pottery there is a lesser but significant component of Late Roman material. It remains however to be seen if this is in large part the 'halo' effect of manuring around and emanating from the three Roman villa sites found and gridded in 2001, rather than urban manuring, although his analysis of the city itself does seem to indicate that it may have seen a very widespread occupation, comparable to Greek times, in contrast to the situation at Thespiae, where the Late Roman city was a shrunken shadow of its Classical Greek extent. Thus it could still have been necessary at Late Roman Tanagra, in a way no longer so for Thespiae, to intensify rural agricultural production for city inhabitants, maybe involving renewed rural manuring. An alternative explanation for the greatly enhanced manuring seemingly carried out by Classical Tanagrans compared to contemporary Thespians might be sought in the appropriation at various times of the countryside immediately south of Tanagra by Athens (using the River Asopos as border), depriving our city of a large percentage of cultivable land, and perhaps creating a need for unparalleled crop production efforts. In 2002 we intend to walk a transect exactly in this disputed zone, to the south of the city and across the Asopos, to see if offsite activity in Classical Greek times varies in any way from the more permanently Tanagran agricultural hinterland. We also await with interest the fuller study of the rural offsite material to clarify these important issues, but would point out that offsite finds can now be seen to offer very significant information for questions of demography and land use history where ancient sources are weak or non-existent.

A final observation is required concerning the Classical-Early Hellenistic rural cemeteries (with occasional hints of late Archaic beginnings). Within the narrow corridors fieldwalked in three directions out from the town walls, up to 15 putative or definite cemetery scatters have now been recorded on the surface (Figure 3). Although such rural cemeteries are relatively well-known from intensive survey, the density found around Tanagra is quite exceptional. Equally striking is the evidence available from a recent Ephorate excavation of an extensive sector of such graves in the very centre of our densest distribution focus of such cemeteries, around 600 metres out from the town on the northerly transect and immediately south of the two Roman villa locations.[10] The tombs uncovered and still visible as an open excavation till 2001 are deep below the modern surface, certainly well below the depth of ploughing, and came to light during the construction of a sewage-plant. They are built cist tombs in which the burials and associated gifts would be protected from the kinds of regular agricultural disturbance which normally brings ancient site deposits to the surface. And yet all around the sewage-farm enclosure we found several distinct scatters of characteristic cemetery material on the modern ploughsoil surface. Two explanations offer themselves, not mutually exclusive. Firstly, the dug graves seem mainly elaborate and perhaps represent wealthier people, buried at greater depth and in more expensive great cist chambers. Thus shallower burials without such constructions might be far more prone to reveal themselves within the ploughsoil, and hence perhaps our surface cemetery scatters reflect the latter rather then the former type of graves. Alternatively, the surface scatters we find all around the dug graves may also have been evident at the time the sewage-farm was laid out and on its groundsurface too, and hence there would have to

[10] *Arch. Deltion* 1994, 49, 286.

be another way that such deep cists betray their presence. Two additional forms of behaviour spring to mind. One is the offerings made over and around burials at the time of the funeral but also later in acts of regular commemoration of the dead by friends and family, which could form a deposit of shallower depth available for plough disturbance. The other factor, known from the historic records, is the way in which in the late 19th and early 20th century AD local tomb-robbers pillaged the Tanagra district cemeteries.[11] Thousands of tombs were discovered and ransacked, the valuable figurines being the main target, but significantly for us accounts stress the vandalistic smashing of accompanying pottery vessels. Either through ancient associated deposits, or through very recent robbing-debris, or both, we can imagine then how even such graves as the deep-dug excavated tombs can create detectable surface traces. The generally otherwise limited surface density of cemetery finds can thus also be explained, perhaps, an observation typical of rural cemeteries discovered by intensive surface survey.[12]

We have already passed some comments on the growing evidence for vigorous activity in the city in Late Roman times (4th-6th centuries AD). The Late Hellenistic and Early Roman Imperial periods are however more obscure than those which bracket them. Vladimir Stissi (below), suggests from very provisional study of the 2000 city finds that urban activity is reduced in scale in 'H-R' times. This is striking, and we look forward with interest to the future results from our new Roman ceramic specialist Jeroen Poblome for fine-tuning of these initial readings of the finds. Whereas writers of the final centuries BC and early centuries AD such as Polybius, Strabo and Pausanias routinely describe Boeotia as in urban and rural decay, it is precisely the cities of Thespiae and Tanagra that are isolated as exceptional in their prosperity.[13] Having already demonstrated that nonetheless, Thespiae city shrank to some one third of its Classical Greek size by Early Roman times,[14] one of the aims of the selection of Tanagra for research was to verify if a similar fate had befallen the other partner in the ancient source pairing. The first indications do indeed seem to bear out the more negative picture which has emerged from archaeological study, as far as the city is concerned. Let us now turn to the Roman countryside around Tanagra.

In 2000 we had discovered an impressive Roman villa site at some 900 metres out in the westerly transect (site TS2, see Figure 5). This small villa was gridded in 2001 and found to be approximately 0.35 hectares in size, but it nonetheless showed clear signs of status pretensions with several fluted stone columns recorded in stone piles within the site. Within the new northerly transect of 2001 we came across more evidence for Roman rural settlement: two further Roman villas/farms were found at a comparable distance, 600 and 700 metres out from the town and very close to each other (some 100 metres or less apart). The southerly site (TS3, see Figure 6) is approximately 1.6 hectares large, its neighbour close to the north (TS4, see Figure 7) much smaller at some 0.2 hectares. The signs of wealth observed at TS2 were now matched by complementary indications of status at TS3 and 4 - mosaic tesserae, wall-painting fragments and much recycled Classical grave architecture. Although it is quite possible to suggest that the two small, and one very large, villa/farm sites merely reflect status differences within a non-peasant landowning class, the close spacing of TS3 and 4 might also

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[11] R. Higgins, *Tanagra and the Figurines*, London, n.d.

[12] cf. also Bintliff and Howard 1999.

[13] cf. Bintliff and Snodgrass 1985; Alcock 1997.

[14] Bintliff and Snodgrass 1988.

lead to an alternative model – does the pair represent rather an elite residence (TS4, small including furnishings) and associated more functional estate centre (TS3, a hamlet) for a single Roman estate? The change of land-ownership in country residents from modest family farms in Classical times to wealthier villa landlords in Roman times seems in any case clearly marked in these sites. We await close dating of the three Roman rural sites, as to whether they arose at the time of apparent decline in urban activity, during the Early Imperial centuries, or during the Late Roman revival of the town, quite contrasted contexts.

Immediately around the edge of the city walls for several hundred metres, the density of surface finds is especially high, almost at urban levels. Some small areas with high quality Classical pottery were identified within this zone and raised the question of sanctuary or cemetery origin. V. Stissi, our specialist for this period, provisionally suggests that the types present are more plausibly seen as burial assemblages rather than those from shrines. This has a wider significance, because the high surface pottery in the immediate extramural zone could also have been suggesting domestic suburbs outside the defence walls. Since we now seem to have graves on most sides of the walls, then this has to be rejected, with the conclusion being that domestic occupation, at least in Archaic through Hellenistic times, was confined within the 4th century BC surviving enceinte. We interpret the dense extramural ring of pottery as indicating a number of discrete burial zones, and more diffuse areas of industrial and craft activity and especially market gardens. Only in the eastern rural transect of 2000 are there still possible signs of extramural domestic buildings near the walls, some distance from the nearest cemeteries; these will be closer studied in 2002.

The important medieval settlement (TS5, see Figure 8) discovered in 2000 around the Middle Byzantine church of A. Thomas some 1 kilometre east of the city (at the end of the easterly transect), was gridded and analysed in 2001, proving to be a village site of some size (1.5 hectares provisionally) of the 11th-13th (-14th?) centuries AD (provisional dating J. Vroom). A helpful visit in the field by the Ephor of Byzantine Antiquities Mrs. Chilakou provided us with the vital information that the Byzantine church of Thomas (constructed in the mid-12th century AD) had been converted into a Frankish feudal tower with chapel in the 14th century.[15] Although the ceramic collection has so far only been very partially studied, this may with study of the total collection from the site, give us another Boeotian example of an older Byzantine village taken into close control by the incoming Frankish minor lords during the 13th-14th century.[16] Since the ancient city site itself has only very isolated sherds of Byzantine-Frankish date hitherto, it would seem at this stage of our research reasonable to suggest that the town of Tanagra was abandoned during post-Late Roman times and replaced as a local farming settlement by the village at Agios Thomas; this was awarded to one of the numerous petty feudal lords of the Frankish Duchy of Athens and Thebes in the early 13th century AD, who took over the village church as both residence and chapel.

As has been shown to have been characteristic for Boeotia and Attica, the troubled 14th century AD saw general abandonment of Greco-Frankish villages in the lowlands of these regions, followed by a planned recolonisation by Albanian clans at the invitation of the final Dukes and subsequent

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[15] provisional commentary in the *Abstracts of the 13th Symposium of Byzantine and Postbyzantine Archaeology*, Athens, 1993, 54-55; information from Kostas Sbonias.

[16] see the publication of a similar situation in the Valley of the Muses and the village of Askra from earlier work by members of our Project in Bintliff 1996; and in the paper by Vroom 1998.

early Ottoman Turkish authorities. The bulk of the Attic-Boeotian countryside by the time of the detailed Ottoman village tax archives of the mid-15th century AD is revealed as settled by a dense network of small Albanian hamlets.[17]

In these 15th century AD Ottoman records, the Tanagra district is covered with such small Albanian hamlets, including the direct ancestor of the modern village, today renamed Tanagra in honour of the ancient town, but till recently retaining its original 'Arvanitic' name of Bratsi. The localised locational discontinuity between the Agios Thomas hamlet and these Albanian hamlets is also repeatedly observable across this transition, but nonetheless is not so great that considerable overlap of land use was possible between the indigenous farming centres and those established as a result of the planned recolonisation. In contrast, the reasonable possibility of a Greco-Roman population continuity across the much earlier localised settlement shift from the ancient city site to A. Thomas, should warn us of the ambiguity of interpreting movements around natural areas of fertility from period to period as clear evidence either for population continuity or rather for population change.[18] However, the context of the four-longhouse hamlet we found in 2001 on the acropolis of the ancient city needs now to be considered.

If modern Tanagra village several kilometres west of the city was a 'Bratsi' Albanian village in the Early Ottoman tax records, we are unsure which one of several 'Bratsi' hamlets in these records (although on rather circumstantial evidence it may be 'Bratsi Todor/ Theodore'). Just one survives into the fuller documentation from the late 19th century, later becoming 'Tanagra' village. Usually we can see a thinning out of numbers of villages and hamlets from its peak in the 16th century AD, during the 17th-19th centuries, due to the economic, political and security problems of the Late Ottoman and Early Greek Independence eras.[19] The provisional study of finds from the Tanagra Acropolis hamlet by J. Vroom identified most datable sherds as Post-Medieval, 16th-17th (-18th?) century in age, but there was also a small component of the (12th-13th) – 14th centuries, Frankish and perhaps even Byzantine. It thus might be possible that in Byzantine times the city was at first abandoned for the Agios Thomas hamlet, which formed the focus for local farmers around ancient Tanagra. In the 12th , when the Thomas church was built, perhaps a dependent farm - a tiny rural site, began on the ancient city Acropolis. Probably both the larger Thomas hamlet and the tiny city farm coexisted in Frankish times, at some point of which the church was adapted for feudal purposes by the lord of the manor. In the troubled late 14th to early 15th centuries there was probably abandonment of both sites till the recolonisation of the whole district by incoming Albanian clans. They almost certainly refounded an abandoned Byzantine-Frankish village at or near modern Tanagra village (there is a fine Frankish feudal tower to its north). Our dating of the refounding of the Acropolis hamlet will be rather critical in its final form, because its current hypothesized date is rather mature Ottoman. Although settlement expansion out of existing Arvanitic colonies (often distinguished in the archives as 'Greater/ Lesser' or 'Upper/ Lower' for daughter villages close to their founders) characterized the 16th century boom, the 17th century decline of settlement is associated with fragmentation of a declining number of villages into discrete estates or 'ciftliks', indicating a very different process of demographic and economic downturn. The longhouse group

[17] cf. Kiel 1987; Bintliff 1995; Kiel 1997.

[18] see further on this Bintliff *et al.* 2000b.

[19] Bintliff 1995.

with its provisional dating could reflect either process, so we await more refined analysis to seek to resolve the historical processes at work.

One final mini-project carried out in 2001 deserves mention. In 2000 we had been struck by the very low recovery of surface lithic artifacts, both from the city site and the countryside. Given the many thousands of years of prehistoric farming activity represented at the ancient urban site, there ought to be a very considerable cover of such lithics, and the same might be expected from a countryside long exploited before metal tools dominated in agricultural and pastoral activities. Since one problem long recognized by field surveyors has been the difficulty of seeing lithics when fieldwalkers' eyes were trained to ignore stones and identify pottery fragments, we decided to invite a Palaeolithic lithic specialist student from Leiden, Yannick Henk, to walk alongside the teams but look only for stone tools. To our surprise, this experiment did not significantly increase the number of lithics observed and collected. We are uncertain as to the reasons for this continuing failure to recover what in theory must have been a vast discard of used artifacts from later Palaeolithic to Late Bronze Age times (with low amounts in use even later as threshing flints). There may be some factor in taphonomy which discriminates against lithic tools and makes them less likely to lie on agricultural surfaces. Alternatively, the tools may have been made on local stones with limited retouch, hence making them very hard to see separately from natural stone cover. Or again, since we did notice that one or two students had rather more success than the Palaeolithic specialist in picking up lithic tools, recognition of such material in agricultural land with dense ceramic cover may be a gift confined to very rare individuals. We intend to carry out further experiments on this problem in 2002.

The total station topographic survey (Emeri Farinetti and Lefteris Sigalos)

In the framework of the surface survey, during the 2001 field season, we continued the intensive mapping of the morphology of the city surface and the careful recording of all the architectural features visible on the surface, using a Total Station device. The total area covered during the two survey seasons is 129,000 sqm, which shows a progression from the 59,300 sqm surveyed in the 2000 campaign (Figure 12). We tried to cover as much as possible of the total area surveyed in both 2000 and 2001 seasons by the ceramic collection team, moving towards the Western part of the city, as well as the areas examined by means of geophysical prospection, moving towards the North to reach the city wall outline. In fact some 13 of the 20 hectares surveyed by the archaeology team have also now been covered by topographic survey.

The base unit for the recording was the 50 by 50 metre unit grid, used by the surface ceramic and lithic collection team, as in the previous season. Within each unit we took detailed measurements at regular 4 metre intervals, and special attention was paid to topographical features such as terraces, depressions or bumps. The result of the intensive mapping is an interpolated surface, a Digital Elevation Model (DEM), which is used within a GIS environment as a base over which to display the different data sets produced by the survey project. In figure 13 we present in 3D a virtual continuous representation of the surface morphology together with plotted surface architectural features (discussed below).

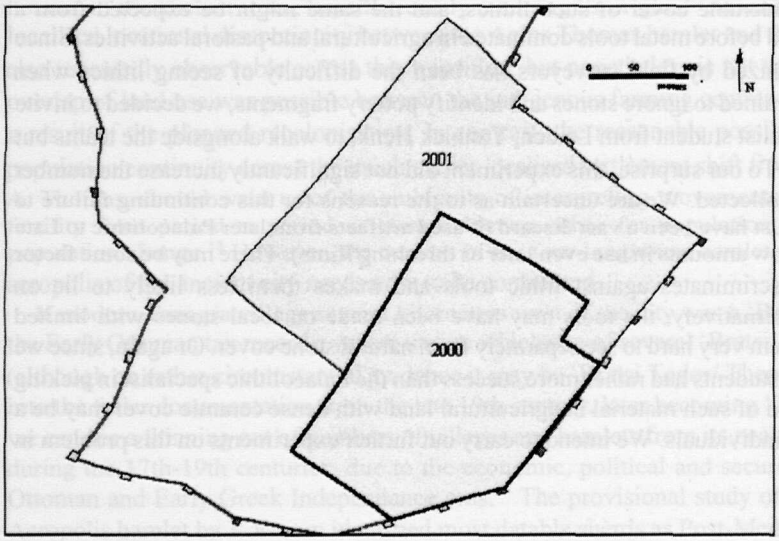

Figure 12: Situation map (TA0 & TA1 surveyed areas).

In certain areas, we employed methodologies slightly different from the previous season, as far as densities in measurements are concerned. In fact, some areas were covered by a grid of points at 5 by 5 metres. These areas are characterised by minor topographical anomalies and gentle or abrupt slope difference, such as the very steep slope coming up the highest part of the central ridge, or the Northern part of the walled city extending from the foot of the central ridge to the city wall. Towards the North approaching the theatre, on top of the Classical and Hellenistic acropolis ridge, which is slightly sloping towards the West, a group of four houses dating back to the Ottoman period was discovered. The location of the buildings is detectable on the surface with dry-stone walls and piles of rubble forming the rectangular outlines of the houses (see the line of these structures in the lower left corner of Figure 13). This area, being of special interest, was surveyed with much more topographical detail. A denser grid of points (1 by 1 metre) was applied for the recording of these features. The result of the intensified mapping was a micro-detailed Digital Elevation Model, clearly showing, through microvariation of z values, the outline of the buildings, terraced in relation to one another. Their pattern of arrangement closely fits to surviving examples of Ottoman rural houses in most Boeotian villages.[20] These so-called long houses are built alongside each other and in rows.

[20] Dimitsantou-Kremezi 1986.

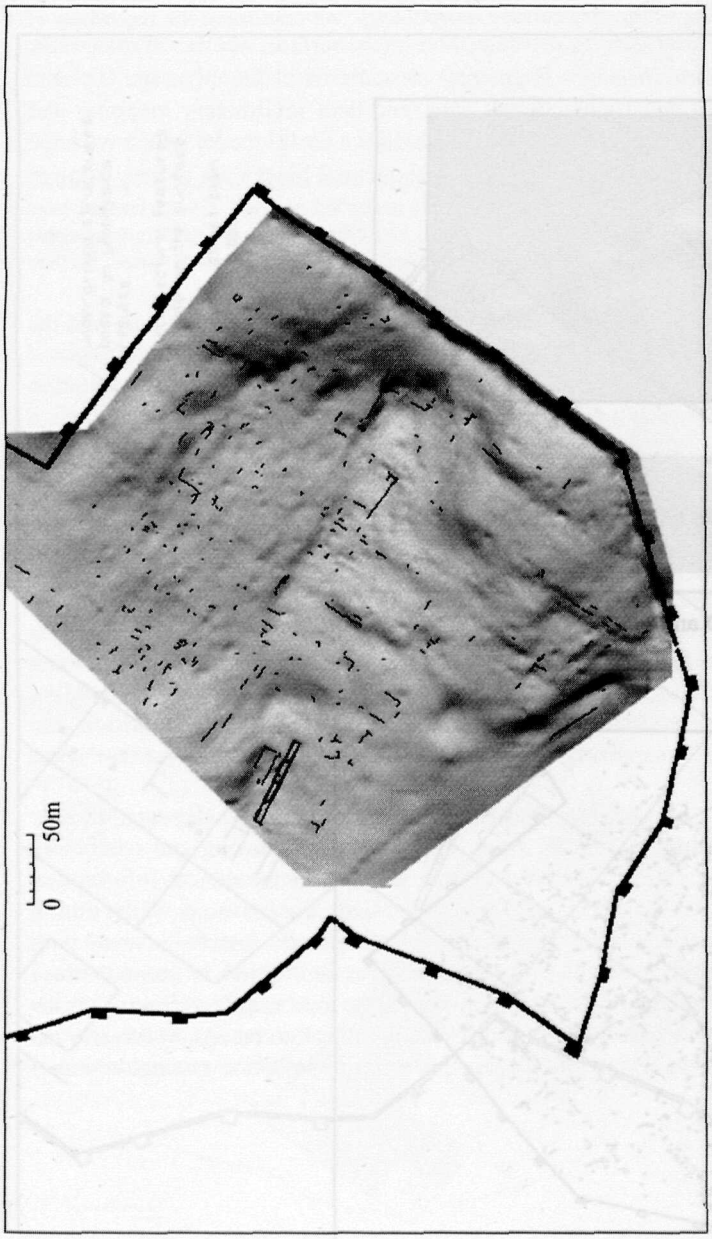

Figure 13: DEM TA0 & TA1 (surface) with architectural features (walls).

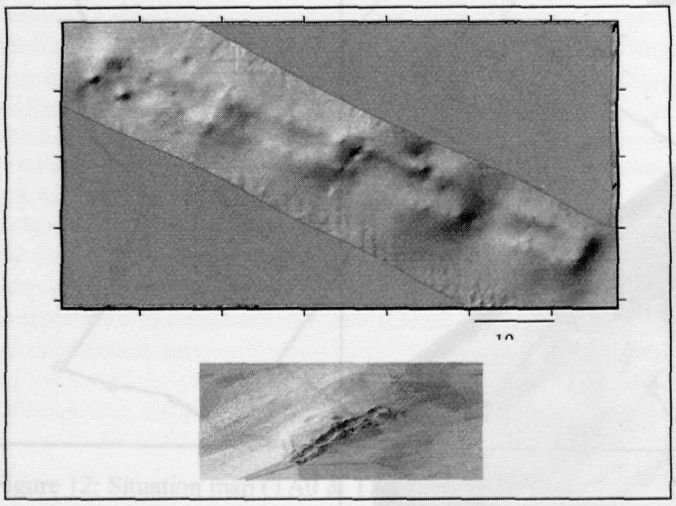

Figure 14: Ottoman houses (2D and 3D).

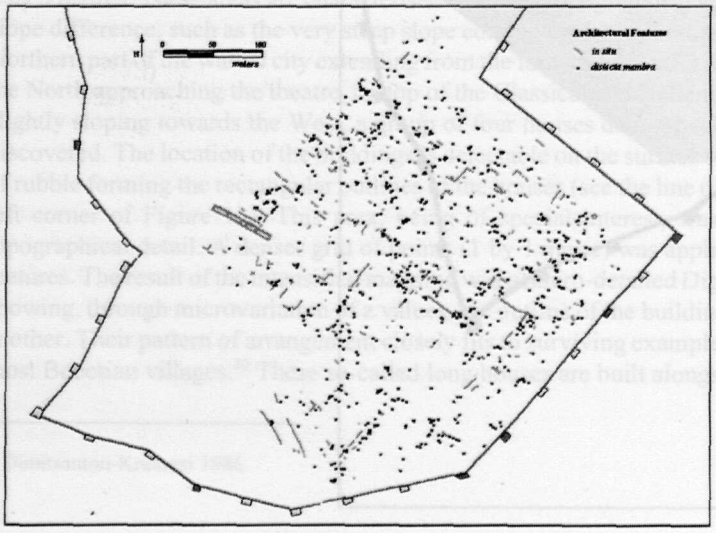

Figure 15: Architectural features recorded (*in situ* and *disiecta membra*).

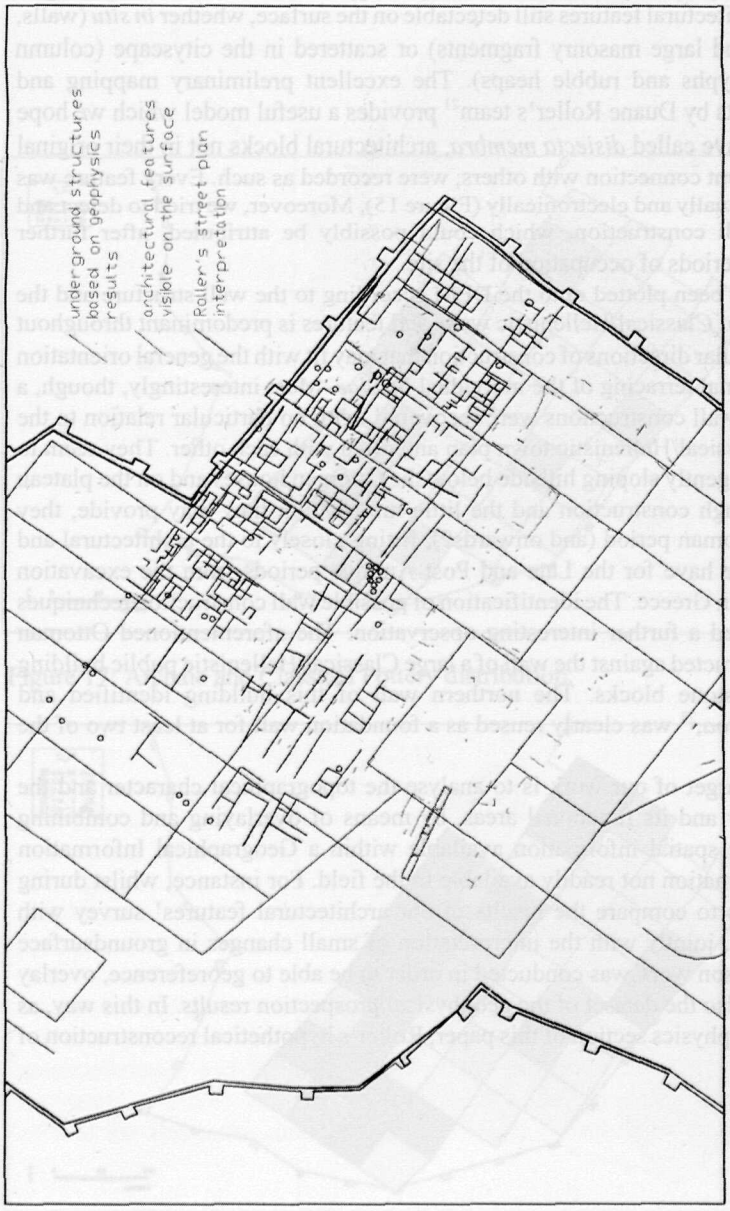

Figure 16: Geophysics and Architectural features (walls).

Both *in situ* observation and analysis of the detailed topographical data further revealed the possible location of the doorways (Figure 14), placed off-centre along the Southern long side of the structures and complying with the majority of façade orientations noted elsewhere in the wider region. Since the ceramic assemblage associated with these houses also lies almost entirely to their south, a very clear idea emerges of the main working area of these presumed farmhouses of related families.

Alongside the intensive mapping of the city surface morphology, we continued the recording of the precise location of the architectural features still detectable on the surface, whether *in situ* (walls, terrace walls, cornerstones and large masonry fragments) or scattered in the cityscape (column drums, capitals, friezes, triglyphs and rubble heaps). The excellent preliminary mapping and interpretation of these elements by Duane Roller's team[21] provides a useful model which we hope to test and refine. What we have called *disiecta membra*, architectural blocks not in their original place or, if *in situ*, not in evident connection with others, were recorded as such. Every feature was located and recorded both manually and electronically (Figure 15). Moreover, we tried to detect and record different types of wall construction, which could possibly be attributed, after further architectural study, to broad periods of occupation of the site.

Thus, their distribution has been plotted onto the DEM according to the wall structure and the masonry types. The presence of Classical/Hellenistic walls and features is predominant throughout the site, often indicating particular directions of construction that may fit with the general orientation of the street plan and the internal terracing of the individual *insulae*. Most interestingly, though, a series of insubstantial rubble wall constructions were recovered, with no particular relation to the strict arrangements of the Classical/Hellenistic town plan and often with each other. They seem to be mainly concentrated on the gently sloping hillside below the Ottoman houses and on the plateau above them. Despite their rough construction and the little information they may provide, they should be dated to the Late Roman period (and onwards?), fitting closely to the architectural and constructional information we have for the Late and Post Antique periods from the excavation records of other major centres in Greece. The identification of possible wall construction techniques with particular periods allowed a further interesting observation. The aforementioned Ottoman period long houses were constructed against the wall of a large Classical/Hellenistic public building built of regularly cut large stone blocks. The northern wall of this building identified and reconstructed by Roller as a *stoa*,[22] was clearly reused as a foundation wall for at least two of the Ottoman houses.

Concluding, the ultimate target of our work is to analyse the topographical character and the spatial distribution of the city and its functional areas, by means of overlaying and combining different data sets and all the spatial information available within a Geographical Information System, producing fresh information not readily available in the field. For instance, whilst during the 2000 season the goal was to compare the results of our architectural features' survey with Roller's map of surface walls, jointly with the interpretation of small changes in groundsurface elevation, during the 2001 season work was conducted in order to be able to georeference, overlay and therefore analyse jointly also the dataset of the geophysical prospection results. In this way, as we will see in detail in the Geophysics section of this paper, Roller's hypothetical reconstruction of

[21] Roller 1987.
[22] Roller 1987.

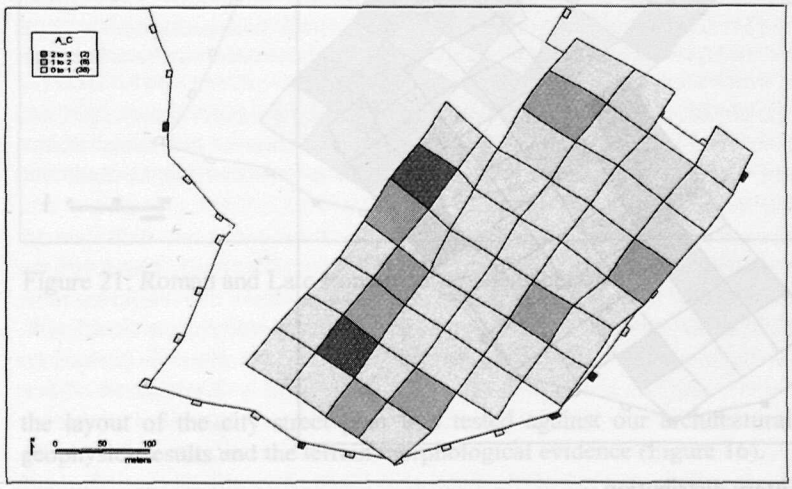

Figure 17: Archaic and Classical Pottery distribution.

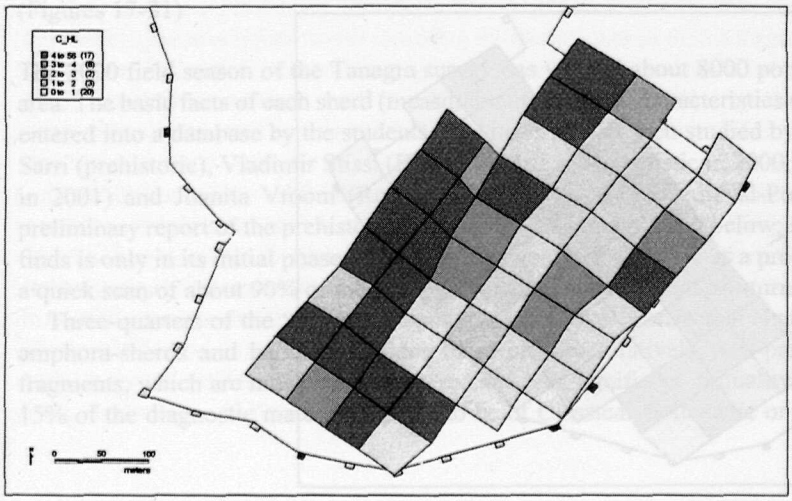

Figure 18: Classical and Hellenistic pottery distribution.

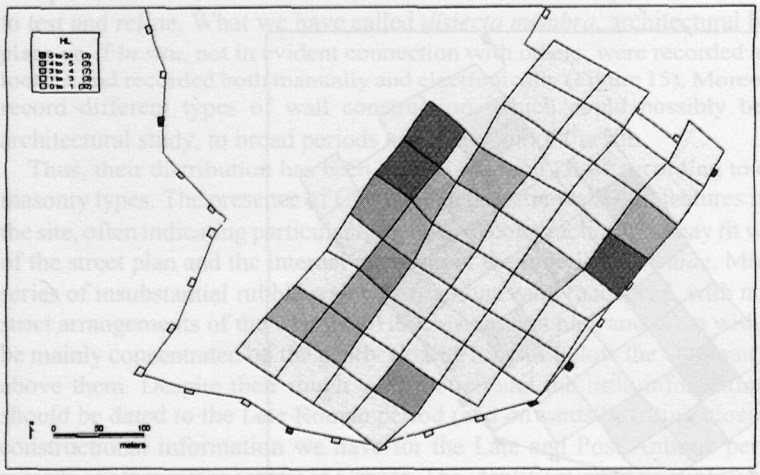

Figure 19: Hellenistic Pottery distribution.

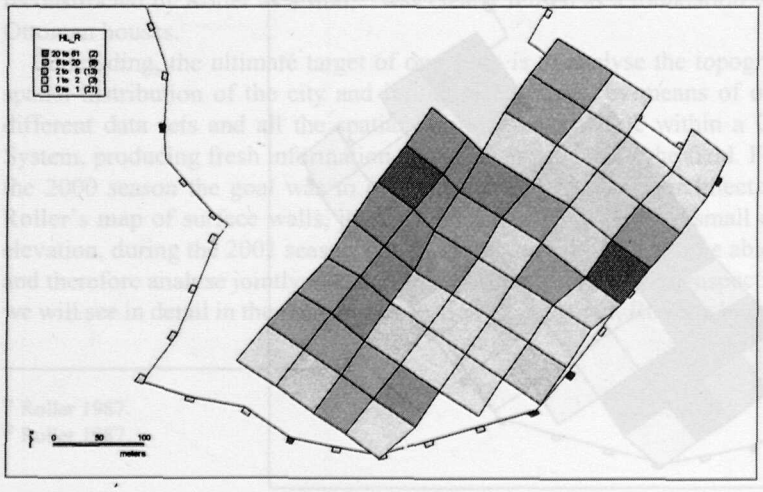

Figure 20: Hellenistic and Roman pottery districbution.

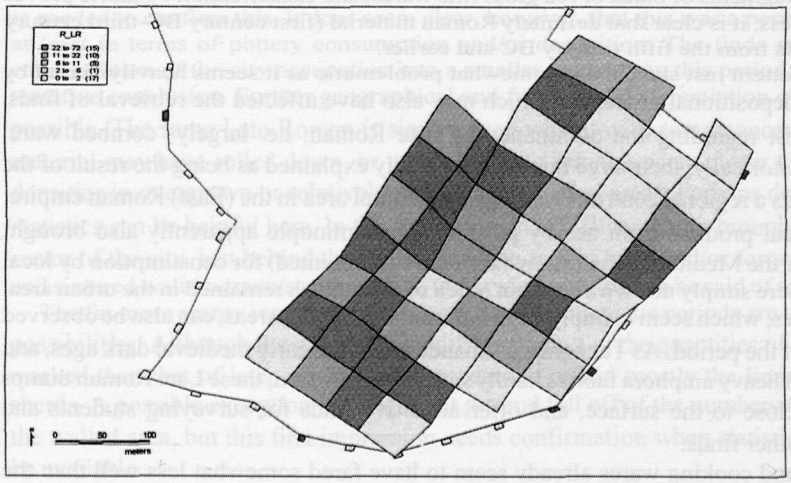

Figure 21: Roman and Late Roman pottery distribution.

the layout of the city street plan was tested against our architectural 2000/2001 survey, the geophysics results and the terrain morphological evidence (Figure 16).

The classical ceramics: first impressions (Vladimir Stissi)
(Figures 17-21)

The 2000 field season of the Tanagra survey has yielded about 8000 pottery sherds from the city area. The basic facts of each sherd (measurements, general characteristics of fabric and shape) were entered into a database by the students. The material was then studied by three 'specialists': Popi Sarri (prehistoric), Vladimir Stissi (Early Iron Age to Hellenistic in 2000, Early Iron Age to recent in 2001) and Joanita Vroom (Roman to recent in 2000, Medieval-Postmedieval in 2001). A preliminary report of the prehistoric material can be found further below; study of the other pottery finds is only in its initial phase. What follows should be regarded as a provisional report, based on a quick scan of about 90% of the finds, of which about one-third has turned out to be diagnostic.

Three-quarters of the 'diagnostic' material, moreover, consists of 'Late Roman', merely large amphora-sherds and handles. Besides these chunky relatively well-preserved items, the other fragments, which are much more shattered, are less significant in quality and quantity. About 10-15% of the diagnostic material appears to be of Classical-Hellenistic or Hellenistic date (mainly

fourth-third centuries BC), and about 10% Hellenistic or (Early) Roman (third century BC-first century AD). More precise dating of many of these finds is as yet difficult, as most consist of very small, often shapeless fragments of black or red gloss fine wares, and classification by fabric proves problematic. Nevertheless, it is clear that definitely Roman material (first century BC-third century AD) is rare, just as finds from the fifth century BC and earlier.

The chronological pattern just sketched is somewhat problematic as it seems heavily biased by depositional and post-depositional processes, which may also have affected the retrieval of finds. The situation is clearest regarding the dominance of Late Roman, i.e. largely 'combed ware' transport amphorae. Historically, their large numbers are easily explained as being the result of the flourishing of Tanagra as a regional centre of a strong agricultural area in the (East) Roman empire. The ships that took local produce from nearby ports to Constantinople apparently also brought foodstuffs from all over the Mediterranean (many fabrics are represented) for consumption by local elites. The containers were simply thrown away, but much of the rubbish remained in the urban area. Similar discard strategies, which seem to imply large intramural dumping areas, can also be observed in other urban centres of the period. As Tanagra was abandoned in the early medieval dark ages, and the well-fired, thick and heavy amphora fabrics hardly suffer from erosion, these Late Roman dumps have remained on or close to the surface, and offer attractive finds for surveying students and specialists, obscuring other finds.

Contemporary fine and cooking wares already seem to have fared somewhat less well than the Late Roman amphorae, but are still found in significant numbers. The troubles really come with the earlier material, first covered and/or moved around by subsequent occupation, then suffering more from erosion than later items, as they are generally less robust and lighter in weight, and finally also, to some extent, lying in the shadow of the mass of Late Roman. It is clear that all earlier periods are underrepresented in the finds, and some categories have (almost) entirely disappeared. Most problematic in this regard is the near-absence of finds prior to ca. 400 BC. Although it is possible that some of the barely diagnostic fragments classified as Classical or Hellenistic are in fact earlier, the match with the historical and stylistic date of the presently visible city walls (shortly after 400 BC) can hardly be coincidental. The reorganisation of the city presumably coinciding with the building of the walls (and perhaps reflected in the city plan revealed by geophysical research) appears to have obliterated all earlier ceramic traces – at least of the historical period: the presence of prehistoric finds remains a riddle in this context. In any case, the situation is strange. Indeed, if the presently visible city would not have been surrounded by Archaic and Classical cemeteries one might even have argued that the pre-400 city had a different location. An alternative solution may be that the survey has not reached the original city, but with two-thirds of the walled area covered now, not much space remains for that.

That obliteration is not entirely impossible may be confirmed by the finds of the late Classical and Hellenistic periods. The shattered black gloss fragments are barely accompanied by the plain and cooking wares and the amphorae that must have gone with them, and tile of the same period is also rare and very worn. Initially, it was thought that sampling biases and lack of specific expertise of the staff could have influenced the limited range of Classical-Hellenistic finds, but during the extra-urban survey of the 2001 season two to three isolated farmsteads of the same period were easily spotted and recognized. The coarse wares from these sites, moreover, appear to have few equivalents in the city. The fact that much of it proved to be quite brittle and thin-walled, may at least partly

explain its near absence in the city.

The relatively few later Hellenistic and early Roman finds seem to show the same concentration on fine wares as the earlier pottery, but further study of the material by a specialist of this material is needed to confirm this. It does seem clear, however, that this was a period of decline of the city, at least in terms of pottery consumption and/or deposition. The finds moreover may suggest a concentration of the city occupation into a smaller area during this period, but this again is only a tentative conclusion. Further geographical and functional differentiation of the finds hardly seems possible. The same Late Roman is simply everywhere, with some concentrations in areas where material may have rolled down, or where building remains seem closer to the surface, and lower densities in overgrown or relatively exposed and eroded areas. Perhaps detailed classification and statistics can be helpful here. In the meantime, the 2001 campaign brought to light in the northern sector of the city, just behind the wall, a possible area of kilns and/or forges, recognizable by burnt and sintered wall fragments and wasters. Otherwise, nothing can be said of specific activity areas yet.

The far more scanty remains of the Classical and Hellenistic periods are unlikely to offer any such possibilities. Although the geographical differentiation of the quantities of finds is somewhat more marked than that of later material, this appears to reflect mostly the limited number of retrieved sherds. A possible exception is a slight but general fall off of the numbers towards the periphery of the walled area, but this first impression needs confirmation when statistics for more squares will be available.

The pottery of the extra-urban survey, which has been mainly used for density counts and rough dating of sites, has not yet been studied comprehensively. As a first impression it can only be noted that the material seems to confirm excavation data from the area and survey results from elsewhere in Boeotia. The city itself is surrounded by a high-density halo of, presumably, rubbish and pottery related to extra-urban building (sheds, workshops?) and graves. Clear sanctuary material has not been found. At some distance from the city, some probable Classical-Hellenistic farmsteads and Late Roman villas have been found, as concentrations of better preserved sherds and other small finds in areas full of heavily worn, small bits, arguably remains of manure. As far as it can be determined from the pottery, most of the manuring seems to have taken place in the Classical-Hellenistic period, but some is Late Roman.

The pottery from the rural settlement sites is generally poorer than that from the contemporary city, *i.e.* it consists of more coarse and plain wares, and less fine table pottery. This may be explained by both the find circumstances in the city as just sketched and different pottery consumption patterns: clearly, contents of rural sites are more strictly utilitarian. As the state of preservation is better than in the city, shapes and fabrics can be recognized more easily, however, so that further interpretation and somewhat more precise dating will be possible.

Besides the manure and the probable villas and farms quite some concentrations of funerary material (decorated pottery, including Corinthian and Attic, and statuette fragments) have been found. They are generally similar to the well-known Tanagra finds all over the world, that is, for the pottery: quatrefoil aryballoi, skyphoi, kantharoi, palmette cups. The Hellenistic figurines, or even bits of them, are surprisingly missing – surely because they were too precious to escape Early Modern pillaging. In contrast, even now, some of the sherds that have been left behind at cemetery sites are large, very well preserved and freshly broken.

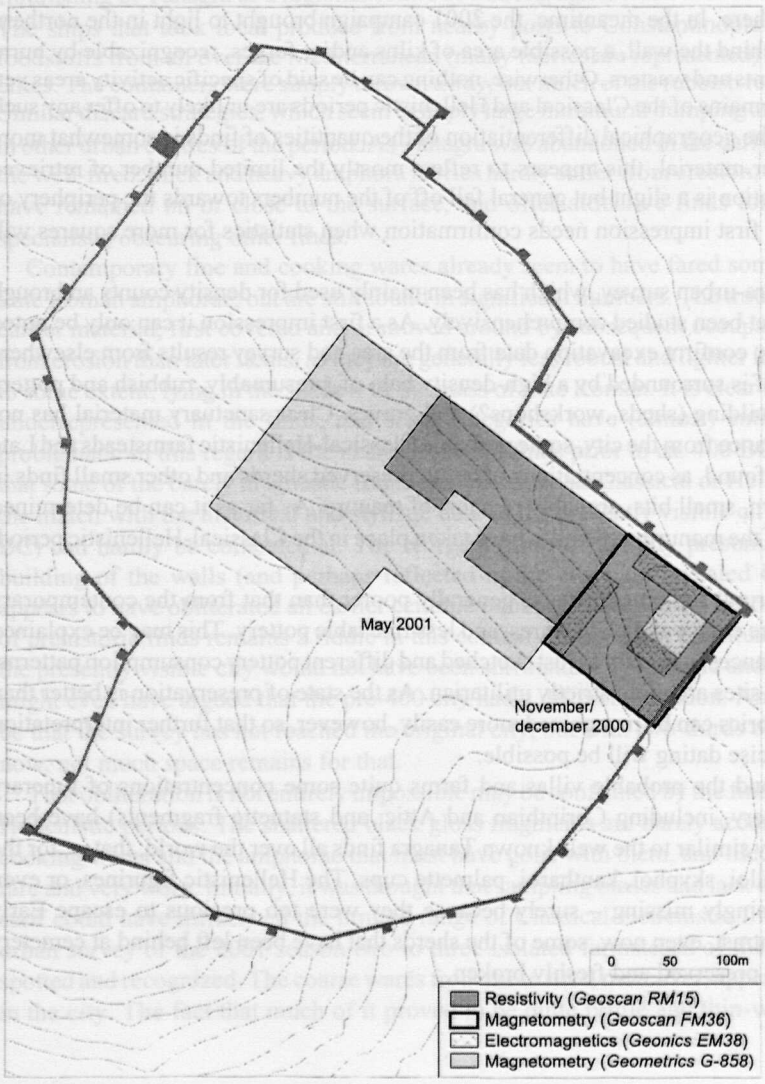

Figure 22: Area surveyed and geophysical methods applied.

The geoprospection survey (Branko Mušič and Božidar Slapšak)

In May 2001, a 2 week geophysical survey was conducted at Grimadha, the site of Ancient Tanagra, by the team led by dr. Branko Mušič and Professor Božidar Slapšak of Ljubljana University, with the assistance, also from Ljubljana, of Jure Soklic, archaeologist and Igor Rižnar, geologist; in addition, from Leiden, Emeri Farinetti, computer-archaeologist; and finally, from the Athens University Polytechnic School Geology Department, students under the tutorship of Niki Evelpidou and Andreas Vassilopioulos of the Remote Sensing Laboratory. The research was made possible through promotional funding by the Faculty of Archaeology, University of Leiden, in view of our planned partnership within the IUAP programme, and through the International Collaboration Support Programme of the University of Ljubljana, in view of the collaborative agreement between Leiden and Ljubljana (involving graduate student exchange and the joint field training for undergraduate students from both Universities, mainly during the main Summer season).

Based on the results of the 2000 preliminary prospections,[23] measurement of total magnetic field by caesium magnetometer Geometrics G-858 was chosen to eventually cover the totality of the site. In 2001, 5.25 hectars were surveyed in the NE part of the city, adjacent to the area tested in 2000 (Figure 22) to verify further the complementarity of the results in specific situations as suggested by the 2000 results. 1,72 ha were mapped by a Geoscan RM15 resistivity instrument (Figure 22). It should be mentioned at this point that May 2001 was unseasonably hot in Boeotia, with temperatures rising well above 35° C. While this was obviously a hindrance to the team, conditions for geophysical prospections were in fact excellent, because there was enough moisture in the subsoil to permit good readings of georesistivity. We could therefore confirm that under such favourable circumstances, georesistivity is indeed a valuable complementary method to magnetometry at this site, and permits identification of further features pertinent to ancient architectural remains.

Graphic interpretation of the results of both methods combined is displayed on Figure 31. The topographic base (DEM) was produced by Emeri Farinetti based on 2000/2001 surveying by herself and Lefteris Sigalos. It should be noted that the interpretation is purely geophysical at this point and that only the most obvious linear features (of both 2000 and 2001 campaigns) are represented here. Further analysis of the results is planned for field inspection during August 2002: geophysical results will be compared with surface micromorphology, architectural survey and surface survey results to come to reliable identification of architectural units within city blocks, and eventually propose their typological affiliations.

Magnetic methods (Geometrics G-858)

Magnetometry by Geometrics G-858 (Figure 23) was done by transects at 1 m, compared to 0.5 m in 2000. In terms of detectability of typical anomalies, the results are comparable, but the resolution of readings is lower. The decision was taken based on our calculations of time and manpower needed to cover the totality of the site: We thus expect to get adequate overview results at half labour input.

[23] see Bintliff *et al.* 2000a.

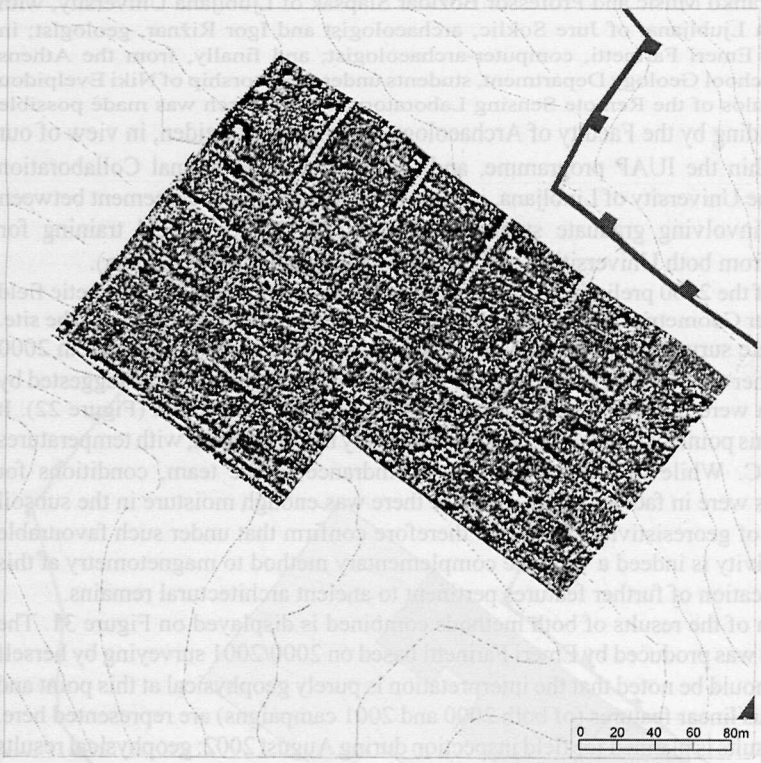

Figure 23: Vertical gradient of magnetic field (Geometrics G-858).

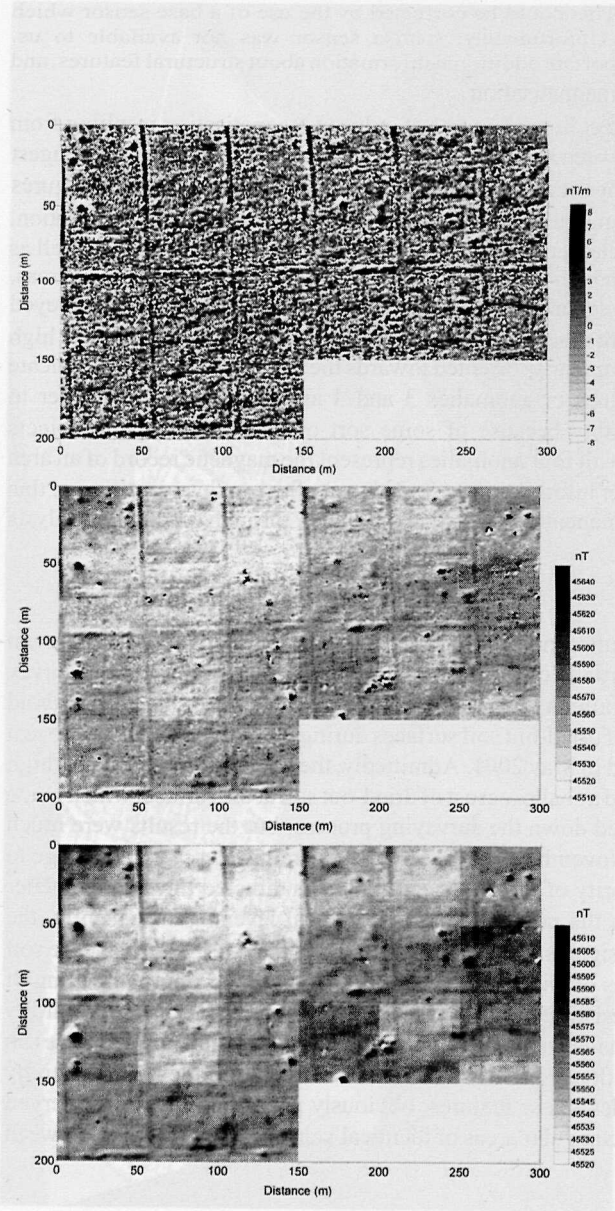

Figure 24: Vertical gradient (above), bottom sensor (middle) and top sensor results (below).

The procedure applied and the precision of the positioning of the grid, will permit a subsequent densening of the grid at 0.5 m wherever needed. For interpretation of architectural features it is important to consider, besides changes in vertical gradient, also the values for total magnetic field (separate readings on both sensors) (Figure 24). A mosaic-like structure of the the magnetograms of the total magnetic field reflects units of measurement by days as well as changes in the Earth's magnetic field in the course of the day. This could be corrected by the use of a base sensor which measures change throughout the day. Unfortunately, such a sensor was not available to us. Nevertheless, the magnetograms give important additional information about structural features, and notably about areas of thermoremanent magnetisation.

The Magnetic methods allow us to detect linear features of induced magnetisation resulting from difference in magnetic susceptibility between soil and stone used for building walls. The strongest of these linear features are those caused by the alignment of the streets between city blocks (Figures 23, 24 and 25). In Figures 24 and 26 we can see a number of areas of thermoremanent magnetisation, which would normally indicate larger architectural features which include tile/burnt clay, as well as industrial areas which involve activities at high temperatures (pottery kilns, furnaces, smithing areas, slag dumps). On Figure 27, a 25 x 25 m square is shown in the south-western part of the surveyed area, with predominantly thermoremanent magnetisation. Magnetic anomalies 1 and 2 display high positive and negative values and a clear bipolarity oriented towards the North, and therefore indicate well preserved objects in situ. The values of anomalies 3 and 4 are comparable, but differ in orientation of the above features, possibly because of some sort of destruction of the objects involved. We can therefore conclude that all four anomalies represent the magnetic record of an area connected with industrial activity. Further information is needed to confirm our interpretation of this and a number of other areas of thermoremanent magnetisation, possibly through functional analysis of surface material.

Geoelectric resistivity methods

Our expectations concerning the difficult conditions for geoelectric resistivity survey (Geoscan RM15) (Figures 22, 28-30) were only partially confirmed. While in 2000, by carrying out our survey in November-December when first rains after a long period of drought soaked the site, we did avoid high contact resistivity which is typical of dried-out soil surfaces during the summer months, the real value of the method could only be judged in May 2001. Admittedly, the extreme, unseasonably high temperatures and constant wind produced a shallow crust of dried-out soil at the surface, which made reading of resistivity difficult and slowed down the surveying process, but the results were much better than those of the first season. In November/December 2000 the rain water did not manage to penetrate the deeper layers, so the majority of the electric current was directed through the better soaked surface layer and did not reach the underlying archaeological layers. Consequently, the amplitudes of archaeologically relevant signals were weak compared to the noise of the surface soil and rubble. In May, after several months of winter rains, the site was ready for optimal reading of archaologically pertinent geoelectric resistivity anomalies (provided the electrodes successfully penetrated the surface crust). The contact resistivity does contribute to background noise, but we can recognize this noise and eliminate it with adequate use of filters, and enhance the high resistivity signal of archaeological remains. Besides linear features, obviously pertaining to well preserved undersurface walls, there are roughly rectangular areas of identical values, possibly rubble between

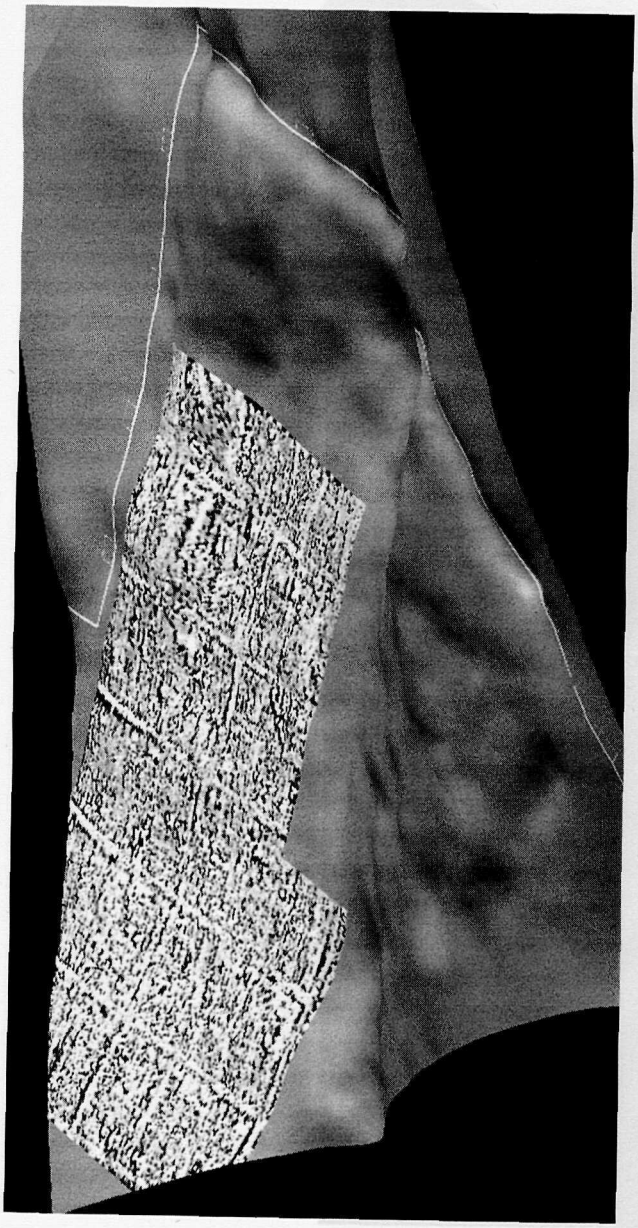

Figure 25: Vertical gradient of magnetic field against DEM.

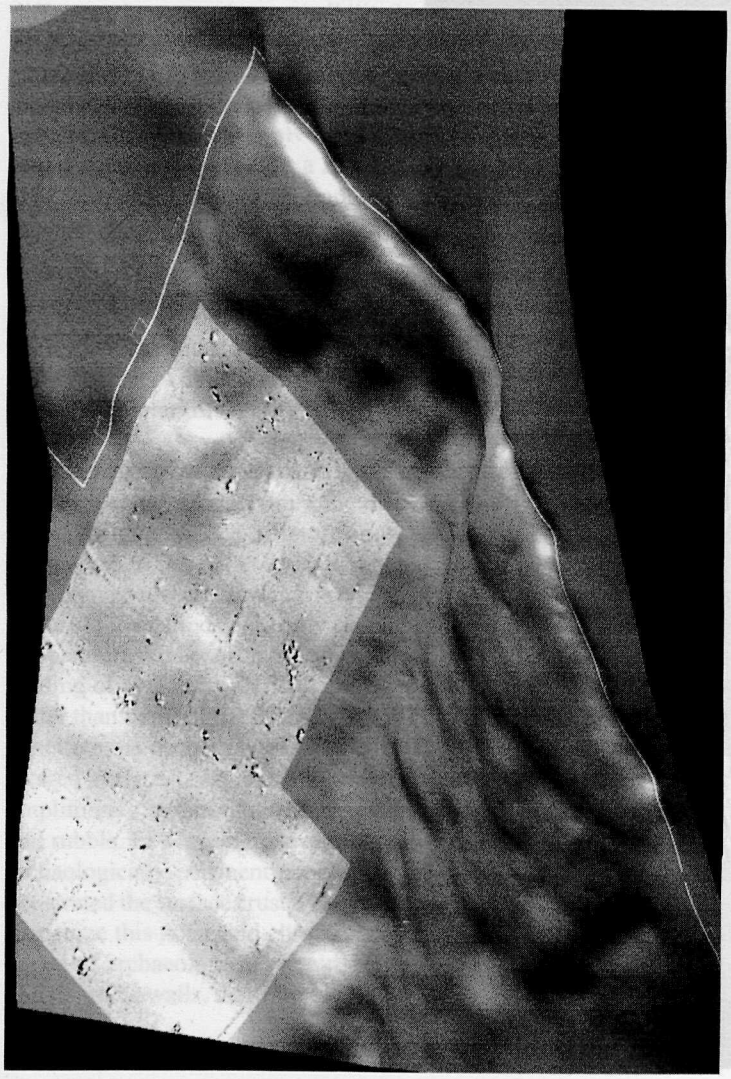

Figure 26: Areas of thermoremanent magnetisation against DEM.

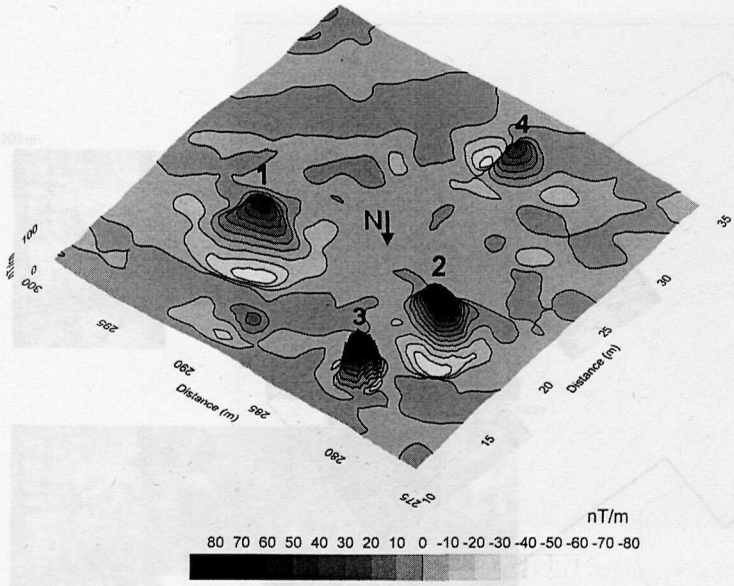

Figure 27: Sample area of thermoremanent magnetisation in the south-western part of the area surveyed; 1, 2 – well preserved object with thermoremanent magnetization in situ; 3, 4 – remains with thermoremanent magnetisation in secondary position (dumping area or destroyed object).

Figure 28: Geoelectric resistivity mapped (Geoscan RM15).

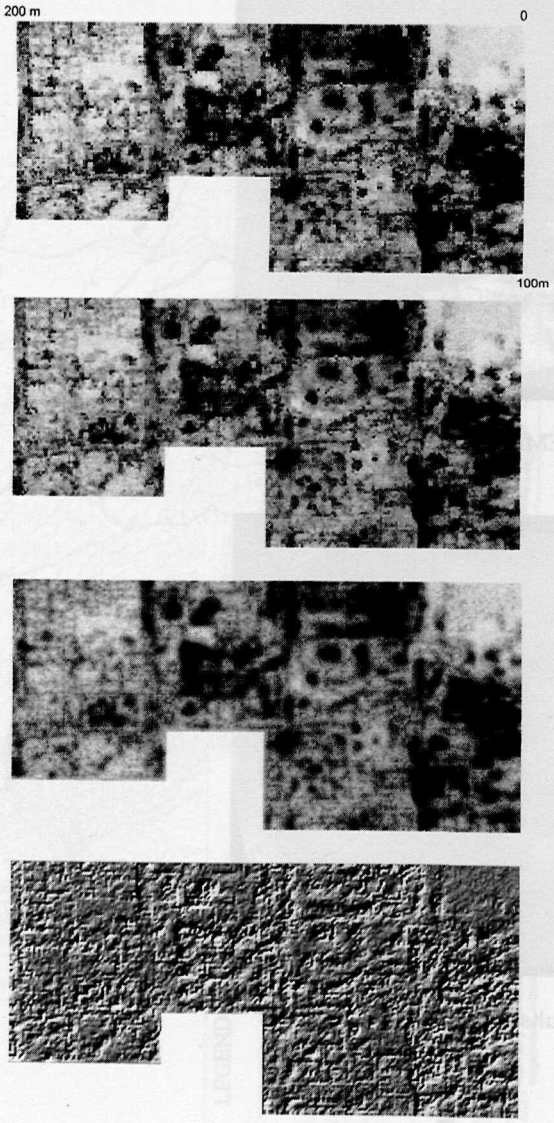

Figure 29: Phases in filtering of geoelectric resistivity results.

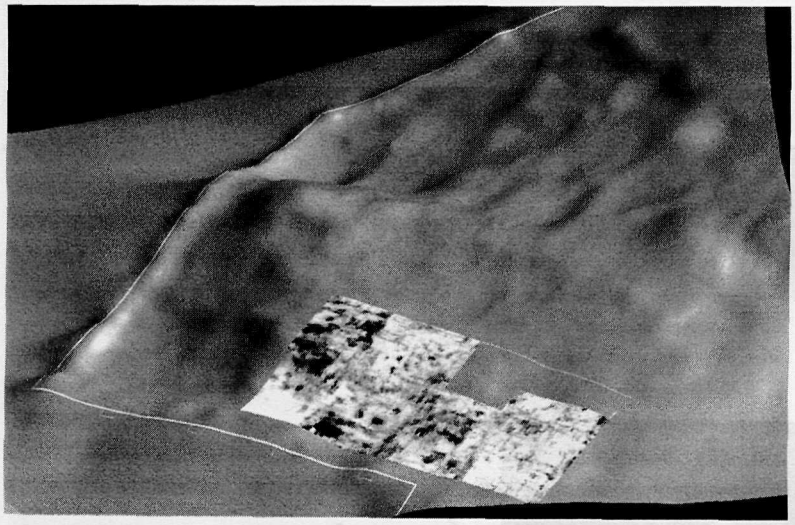

Figure 30: Geoelectric resistivity against DEM.

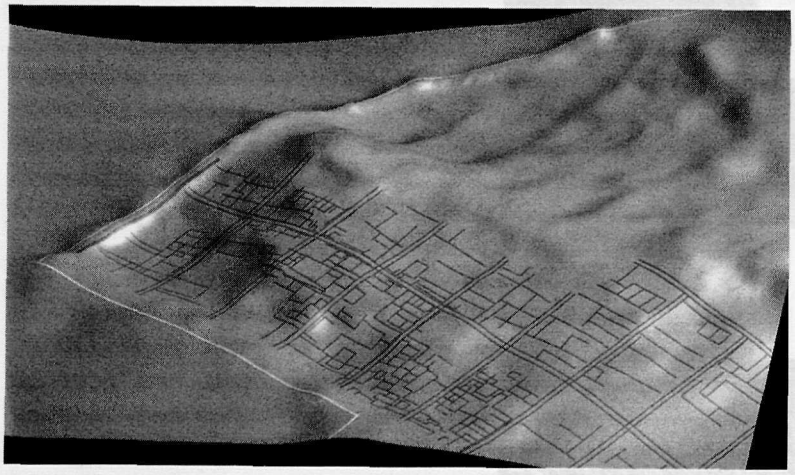

Figure 31: Interpretation of geophysical results against DEM.

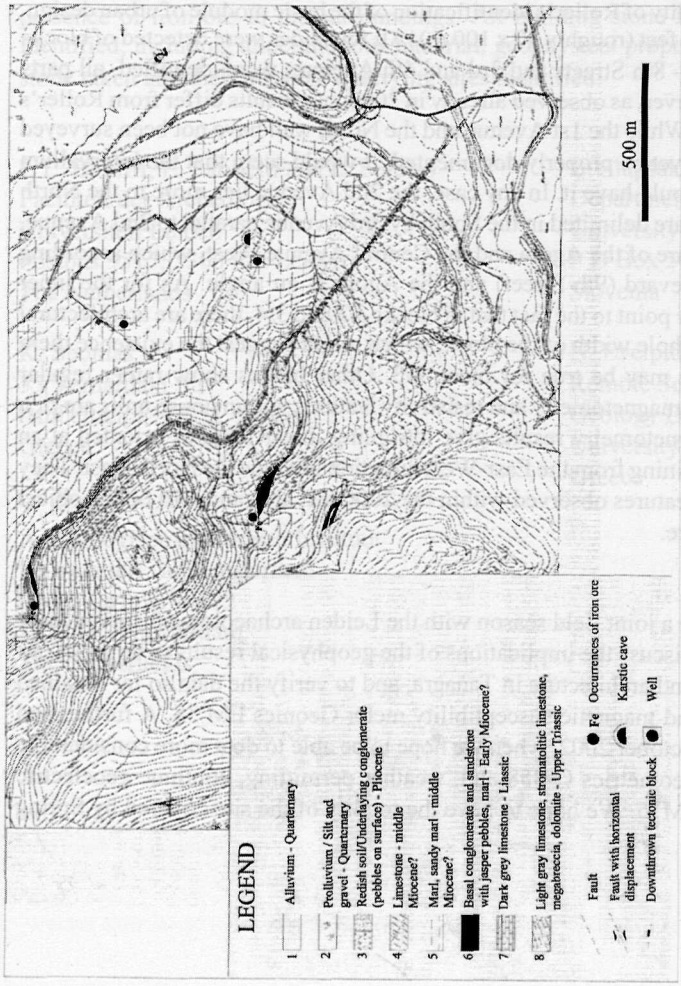

Figure 32: Geological map of the site and its environs.

walls or, more likely, preserved pavements. Comparison of geoelectric mapping and magnetometry should permit even better interpretation of such areas. This is true also of the spatial context of the objects with high thermoremanent magnetisation, either structures built of brick (including pavement and collapsed tile covered roofs) or nuclei of industrial activity areas (kilns, furnaces and similar) (Figures 24, 26 and 27). Therefore a further step needed for information building would now be the introduction of statistical procedures for evaluation of composite images of independently applied prospection methods.

Archaeological implications

Clearly, the team would wish to avoid hasty interpretation before detailed comparative analysis of the results of geophysics, surface mapping, architectural survey, archaeological surface survey and aerial photography, such as is planned to start in Summer 2002. We will therefore limit our comments to the most obvious observations (Figure 31).

The results show clearly the validity of Roller's identification of the basic module of urban design, which is the city block of 150 x 300 feet (roughly 50 x 100 m). All four sides were detected of blocks 6/4, 7/4, 8/4 and 8/3 in 2001. 3rd – 8th Streets and 3rd and 4th Avenues were identified, all parts fitting into the grid perfectly. However, as observed already in 2000, our results differ from Roller's in the positioning of the Avenues. While the 1st Avenue and the North wall have not been surveyed and our observations there cannot yet be properly documented, it would seem that the Intervallum North was narrower than Roller would have it. In any case, the 2nd Avenue lies more to the North and the blocks 6/4-9/4 are full and are delimited in the South by 3rd Avenue parallel to 2nd Avenue, not by the Northern support structure of the Agora and the Central Avenue West, which according to Roller connects the Main Boulevard (9th Street) and the Agora at an angle. As for the inner structure of the blocks, we will only point to the fact that in blocks 3/3 and 3/4, there are architectural features which stretch across the whole width of the block, which might suggest the existence there of public buildings, and the same may be true for block 8/3. Other blocks show rather regular division by house units. Combined magnetometry and resistivity features within house units are rich in detail and very promising. Magnetometry results give intriguing linear features oriented at an angle to the main grid, slightly declining from the East-West direction towards the North-East. They seem to correspond to the feeble features observed within the 2000 test area and will be the object of our special attention in the future.

Further work planned

In August 2002, the team will have a joint field season with the Leiden archaeological survey team and with architectural experts, to discuss the implications of the geophysical results in terms of our understanding of urban structure and architecture in Tanagra, and to verify the data so far obtained through the use of conductivity and magnetic susceptibility meter Geonics EM.38. A further and longer field season is planned in October 2002, when we hope to be able to do a more considerable area by caesium magnetometer Geometrics G-858 and, weather permitting, continue geoelectric resistivity mapping by Geoscan RM15. We hope to have the totality of the site covered by Spring 2003.

The geoarchaeological survey (Igor Rižnar, Niki Evelpidou, Andreas Vassilopoulos and Božidar Slapšak)

Detailed understanding of geological context is crucial to any research which involves archaeological geophysics. Geological survey of the site and its environs was conducted by Igor Rižnar, in collaboration with Niki Evelpidou and Andreas Vassilopoulos of the Remote Sensing Laboratory of the Geology Department at the Polytechnic School, University of Athens. Among the students who participated, Kostas Theofilis was involved more intensely and must be mentioned at this point.

On Figure 32, we present the resulting geological map of the area of roughly three square kilometres around the site. Besides geological mapping, geomorphological and geological observations were made which were potentially relevant to the archaeology of the site, such as concerning the Agora ridge and the valley within the walled area, the terrace on which the northern wall was constructed, the karstic cave within the site, the natural setting for the theatre, and the presence of iron ore in the surroundings. All building stone found within the walled area was identified, including allochthonous material, geophysical properties of the main types of building stone taken and their possible quarrying sites identified.

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