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THE TOPOGRAPHY OF *COLONIA ULPIA TRAIANA AUGUSTA DACICA SARMIZEGETUSA* AND THE FIRST CENTURIATION IN DACIA

FIRST MAPS OF SARMIZEGETUSA

The colony at Sarmizegetusa (jud. Hunedoara/RO)[1] was founded as *colonia deducta*, immediately after the Dacian wars[2]. The location of the city in Hațeg area was not accidental, as it stood at the crossroads of two important Roman roads, one starting from Drobeta (modern Drobeta Turnu-Severin [jud. Mehedinți/RO]) and going up Jiu valley, and the other, from Dierna (modern Orşova [jud. Mehedinți/RO]) through the Timis-Cerna valley, towards Tibiscum (modern Jupa [jud. Caraş-Severin/RO]), at c. 8 km from the Iron Gates of Transylvania (probably ancient *Tapae*) and c. 30 km from the Dacian capital in the south-western part of modern Transylvania (**fig. 1**)[3].

Sarmizegetusa was first identified as an ancient city by Joannes Mezerzius, in the early 16th century, when a couple of inscription catalogues, which included Sarmizegetusa, were produced[4]. However, a map of the medieval settlement, at that time called Britonia (**fig. 2**), is published in 1367 and later on, including the Roman city wall, in the 17th century when the village would be named Grădiştea (**fig. 3**)[5].

The first Roman city plan basing only on land observations, with a graphic scale and a few buildings correctly located, is drawn by Luigi F. Marsigli (**fig. 4**)[6]. Another plan is subsequently published by Sylvester J. Hohenhausen (**fig. 5**)[7].

Excavations started sporadically in 1832, being systematically continued in 1881, when the Society of History and Archaeology of the Hunedoara County[8] was founded. Topographical plans were implemented, however not published in the 1970s, with scale of 1:2000, details and contours of the present village road network. Plans were publicized by Constantin Daicoviciu, Hadrian Daicoviciu[9] and Dorin Alicu, recording the main ancient elements[10]. Attempts were made to establish the colony *insulae*, and published in a plan by Robert Étienne, Ioan Piso and Alexandru Diaconescu[11]. The following general topographical plans were developed by a team from the Museum of London Archaeology Service (MoLAS) who worked over several years with modern and professional surveying instruments[12].

THE CITY

Shortly after the second Dacian war, probably in the summer of AD 106, *Colonia Ulpia Traiana Augusta Dacica* was founded, as the last *colonia deducta*, situated at a strategic position, at half-way between the two legionary fortresses of Trajanic Dacia, *IIII Flavia* and *XIII Gemina*, at Berzovia (jud. Caraş-Severin/RO) and Apulum (modern Alba Iulia [jud. Alba/RO]), and at a crossroad of two important commercial ways towards the Danube. Many of its colonists were veterans who had fought in the Dacian wars, with origins in Italy or the western provinces, as Hispania or Narbonensis[13]. *Colonia Sarmizegetusa* has replaced the Dacian *Sarmizegetusa Regia*, but besides the name, nothing else was preserved or transmitted, not even the geographical position[14]. The only element that dates from before the city's foundation in AD 106, and before

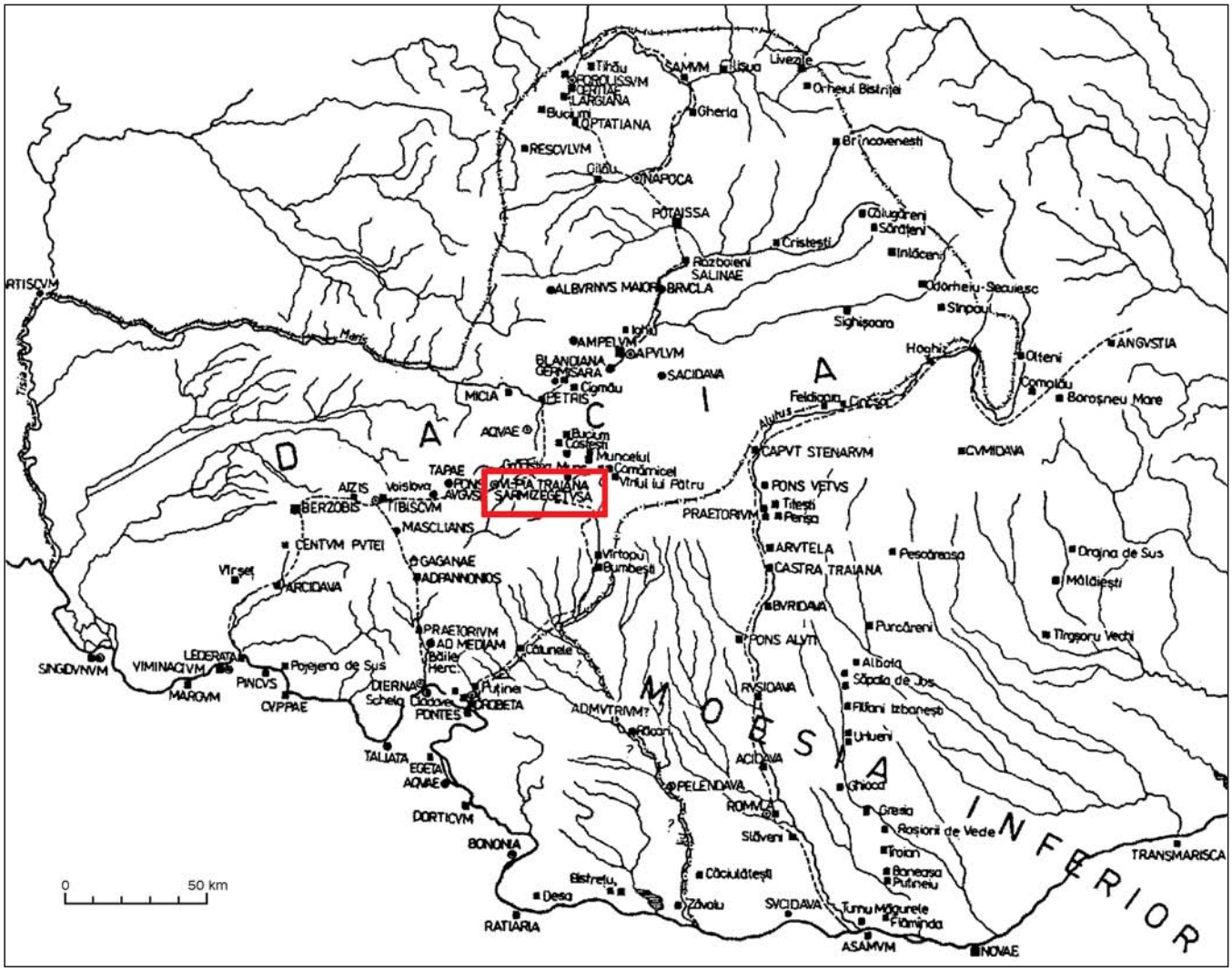

Fig. 1 Map of the Roman province Dacia (modern Romania). – (After Piso 1993, 7).

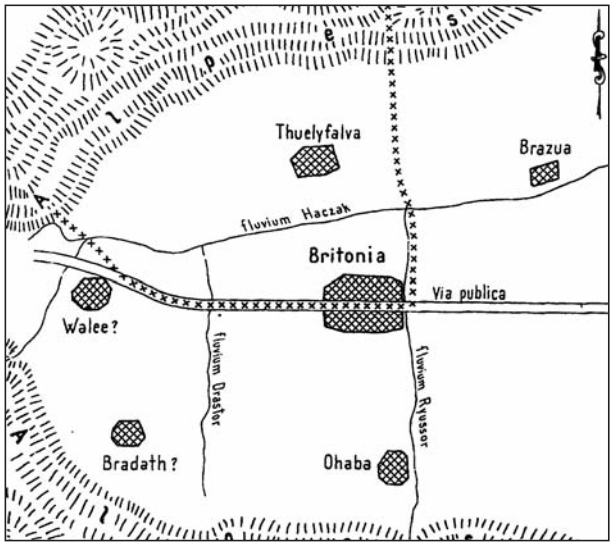

Fig. 2 Map from 1367 of the medieval settlement Britonia (Sarmizegetusa, jud. Hunedoara/RO). – (After Popa 1984, fig. 4).

any construction was erected, is an archaeological level on the placement of the future *forum vetus*, that contains lots of military finds, but its connection with the future city is only a symbolic one, and, in lack of other evidence, it is safer to assume that the colony was established upon a free and virgin land [15].

Here, the municipal *concilium* was convened, one of the reasons for the occurrence of the title *metro-*

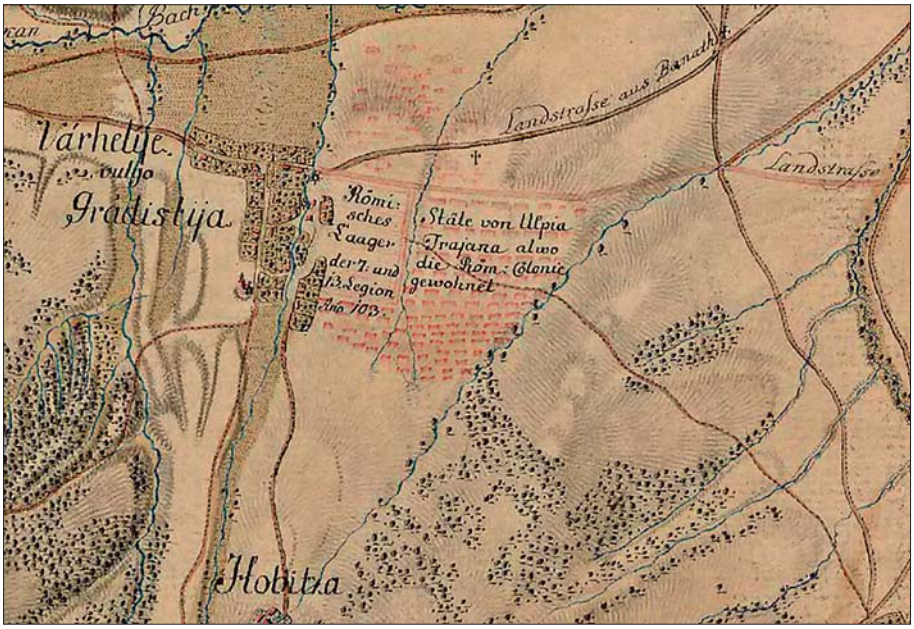

Fig. 3 Map from the 17th century of the medieval settlement Grădiştea (Sarmizegetusa, jud. Hunedoara/RO). – (After Popa 1988, fig. 9).

polis in the 3rd century. The economic and social evolution of the province has allowed a number of *pagi* in the territory of Sarmizegetusa to develop into cities: Apulum, Dierna, Tibiscum or Drobeta [16].

In front of the *forum* several fragments of the founding inscription of Sarmizegetusa have been discovered. On the analogy of CIL VIII 17842, 17843, Thamugadi, the name and date of the founding of the city were established, in AD 106, immediately after the conclusion of the second Dacian war [17]. The full name of the city was *Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa* and was awarded *ius italicum* [18]. Therefore, according to Roman civil law, land could be privately owned, claimed or sold, according to *ius Quiritum* [19], considering that *ius italicum* involved *immunitas*, thus the main tax exemption: *tributum capitis*, personal tax and *tributum soli*, the land tax. Therefore, the land had to be divided *ex iure Quiritum* to the settlers, based on a *lex* [20]. The importance of land allocation for the Romans was obvious. It was a centralized procedure and a matter of public concern for local communities [21].

Sarmizegetusa had all the political institutions of Republican Rome, the magistrates, the senate (*ordo decurionum*) and the people. It was led by two *Ilviri iure dicundo*, *aediles* and *quaestores*. The municipal

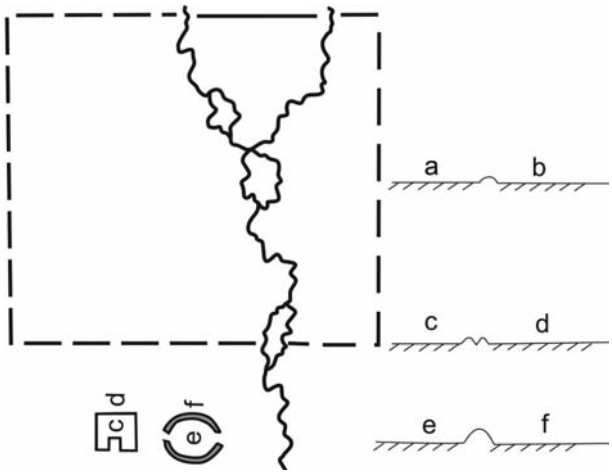

Fig. 4 Map of Sarmizegetusa (jud. Hunedoara/RO) published by L. F. Marsigli early in 1726. – (After Marsigli 1726, 64).

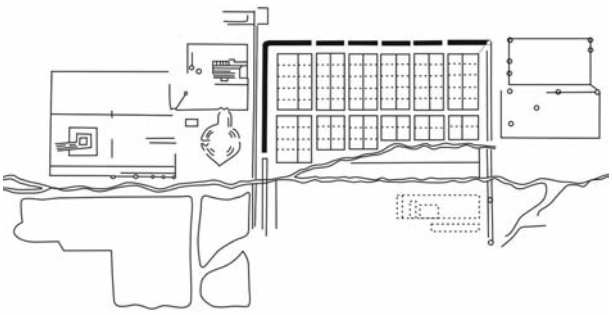

Fig. 5 Map of Sarmizegetusa (jud. Hunedoara/RO) published by S. J. Hohenhausen at the end of 18th century. – (After Hohenhausen 1773, 23-24).

priests were the *sacerdos*, the *augur* and the *flamen*. More than once, the emperor accepted the function of supreme magistrate of Sarmizegetusa, and then delegated a citizen as a *praefectus pro imperatore*. The city also held the *praetorium* of the financial procurator of the province: the consular governor had his *praetorium* in Apulum, but his tight connection with Sarmizegetusa is attested by numerous evidence of official high patronage. Also, Sarmizegetusa was the gathering place of the *concilium III Daciarum*, which marked the official celebration of the Imperial cult, and expressed the loyalty of the province towards Rome. All these merits have led to the occurrence of the title *metropolis* in the 3rd century [22].

Sarmizegetusa's territory is stretching up to the Mureş valley, including areas in the Western Carpathians and the Banat, until the Danube [23]. It is obvious that the land had to be divided among the settlers through the *limitatio* or centuriation method. The Romans have their system implanted everywhere, from the western provinces of the empire to urbanized Greece and the provinces in North Africa or the Middle East [24]. Ideological division of the land was needed, but the organization of urban space and particularly the countryside was made for practical reasons; the centuriation is useful for determining the legal status of the territory, of the population, and its relationship with the colony [25]. The *limitatio* was proposed to develop a cadastre for taxable income, and the land left, was divided, sold and, ultimately, taxed, or remained *subsecivum*. There are two kinds of *subseciva*: one is whatever land falls outside allocated *centuriae*, because it is cut off by the line of the survey, the other is what is left over [26]. Not all space would have been centuriated from the beginning, as a part could remain for further development according to Vitruvius [27].

TOPOGRAPHY OF SARMIZEGETUSA

At Sarmizegetusa (**fig. 6**), as in many other cases, the criteria followed in establishing the orientation were primarily topographical and hygienic, not religious. Here, the most important factor was the slope, from south to north, used to facilitate drainage. The colony had originally an area of 24 ha, being widened at one time up to 32.40 ha [28]. The western enclosure in the first archaeological phase of the city has not been identified, thought to be c. 430 m east of the enclosure used in both phases. Following the topographic measurements of the team from MoLAS [29] in 1999 and 2000, the areas are of 22.90 and 32.90 ha, the enclosure being extended westwards a further 190 m [30]. It was undoubtedly the most accurate topographic plan of Sarmizegetusa so far.

The western enclosure was originally built at 430 m to the eastern one, because the Rausor valley must have had in ancient times the same alignment. Therefore, the north-western corner of the enclosure near the valley followed a path almost parallel to it. The enclosure will be stretched up westwards by c. 190 m, therefore, the Rausor valley will cross the city from south to north. We do not know why the city was not extended to the east, but perhaps because the land in this area was higher. Our measurements are similar to those of the British team, with minor differences: in the first phase the colony area measured 430×530 m (c. 23.20 ha) and in the second 620×530 m (33.90 ha). Our terminals have a deviation of c. 25 cm, but this may be due to the translation of the topography of the WGS system to the ST70 system used in Romania. Initially, the parameters are slightly different, but new measurements can be done in accordance with the modern cadastral system of Romania.

The east enclosure and the south one, also the north and west ones are only partially conserved. The gates of north, east and south can be distinguished on the ground. Topographic measurements have covered almost all the buildings unveiled to date in the Roman period, both inside and outside of the enclosure. The central *insulae* were occupied by public edifices, which included the *forum* and later the two *fora*. The

western adjacent *insulae* were also occupied by public buildings, especially temples[31]. Of course, as in the Pompeian model, not all of the main or public edifices would have been placed in the central area. The procurator's residence is located, for instance, close to the northern gate.
The built-up area of the city, in the early 2nd century seems already to have stretched beyond the enclosure, with an amphitheatre situated at 10 *actus* from the *groma*, and an area *sacra* with at least six temples, east of the amphitheatre.
Probably, some 13,000 people lived within the city area and 40,000 in the entire *territorium*[32], at its largest in the 3rd century when the city flourished.

THE *LIMITATIO*

During the new topographical measurements of all of the remains of Sarmizegetusa and the analysis of the old maps and orthophotoplans we observed traces of a systematic planning of the town and adjacent area. We will try to further identify the relationship between the regularity of orthogonal habitat and the urban and rural cadastral spine of Sarmizegetusa. Sarmizegetusa's territory must have been defined from the beginning[33], marking each plot, with the *groma* surveying the principal axes of the city, *limites*, etc. The granting of lots to veterans had a long cadastral experience, the parcels being coded according to some predetermined rules, and there were quite a lot of legal constraints[34]. So we wonder if there are any signs of the existence of regular Roman land allotment for Sarmizegetusa[35]. The centuriation is in general not well-preserved and visible. In other places there is an abundance of different orientations of land divisions, so that no certain identification of lands is easy to detect[36]. This is partially the case at Sarmizegetusa as well.
As a result of new excavations and of the analysis of maps or orthophotoplans, we have some indications that suggest the position of the *insulae* within the *colonia* and traces of a centuriation outside the colony, on a broader area north, east and south. Nobody doubted that Sarmizegetusa would probably have had a centuriation, as any other Roman settlement, but no remains were observed on the ground in the vicinity of the colony. The uncertainty of the archaeologists came mainly from the fact that too few traces of Roman cadastre have been identified in the provinces of the empire, much less in Dacia. However, the accuracy of Roman *agrimensores* must have been exquisite everywhere[37].
Agrimensores were famous for their precision in the laying out the forts, urban and agricultural grids, some authors referred to an *ars agrimensoria*[38]. Centuriation usually takes the form of large squares or rectangles of land that are subdivided into smaller squares or rectangles[39]. The centuriation was made according to the laws for *limites* or *limes*, as access roads, described by Siculus Flaccus (T 122.21-3) and Hyginus II[40]. This system should also be applied in Dacia, but so far there have been no reports of a centuriation. The only attempt to identify a plotting, but within the city, was made by R. Étienne, I. Piso and A. Diaconescu, depending on the *locus gromae*, the *forum* and the *domus procuratoris*, probably[41]. It is visible in the plan that the first phase of the colony had 4 *insulae*, the east-west direction, measuring approximately 80×80 m, and 5 *insulae*, the north-south direction, each divided in other 4 *insulae*. In the second phase, of the enlarged enclosure, we are dealing with another row of 2 *insulae* westwards. However, we have no archaeological or other evidence to be sure of the division of the city in this form, although the *forum* position with regard to this division was possible. It had been assumed another row of *insulae* east of the city, but without further detailed information[42].
In Sarmizegetusa, as in the cities of Britannia or Gaul[43], the first impression is that of uniformity. A key theme for the towns in Britain is the varied social backgrounds of the people who built the urban centres[44].

Fig. 6 Orthophoto of Sarmizegetusa (jud. Hunedoara/RO). – (Illustration Agentia Nationala de Cadastru si Publicitate Imobiliana).

Fig. 7 Orthophoto of Sarmizegetusa (jud. Hunedoara/RO) with visible and supposed lines of centuriation. – (Illustration F. Marcu / G. Cupcea).

Sarmizegetusa's design represents veterans as well, so it must have been more homogeneous. We know from Siculus Flaccus that land was not distributed equally to everyone, but it was granted according to military rank. Therefore, rank and file soldiers will receive a single allocation, some ranks one and a half allocations, some ranks double allocations[45]. For instance, the *domus procuratoris* inside of the *colonia* would take 3 *insulae* of 2×1 *actus,* then the adjacent *horreum* another 3 *insulae* of 1×1 *actus.* Nonetheless, it is impossible to know how much have been distributed to everyone.

The modern village overlaps only a part of the western half of the Roman city. The usage of the Roman road network by the 13th-14th centuries, indicates an important habitat in this area before the medieval village has been mentioned in written sources. An official act from 1377 shows that the Romanian village Gradişte, then named Britonia, lays on top of the Roman ruins in the north-western corner of the former city, with households located on both sides of a main road that divides the settlement into two equal halves[46]. Initially, C. Daicoviciu observed the partial overlap of modern roads over *cardo maximus* and *decumanus maximus*, without discussing other details[47]. Eventually, archaeological surveys have shown that the streets in this part of the village strictly overlay the main streets of the Roman city[48]. Indeed, there is a modern way, but meandering, in front of the Roman *forum*, which seems to overlap *decumanus maximus*, and another road from south to north, appears to be contiguous to the *cardo maximus*, making a loop to bypass the *forum* to the east and continuing to the south over another *cardo* II east. Undoubtedly, there must have been a Roman road west of the Roman city enclosure and this is evidenced by the current road from the southern exit of the present village towards Hobița, an extension that is practically over the Roman road. Later, with the widening of the Roman city enclosure, the road is shut down, another one being built, now superimposed by the existing village road, which bypasses the village today, but

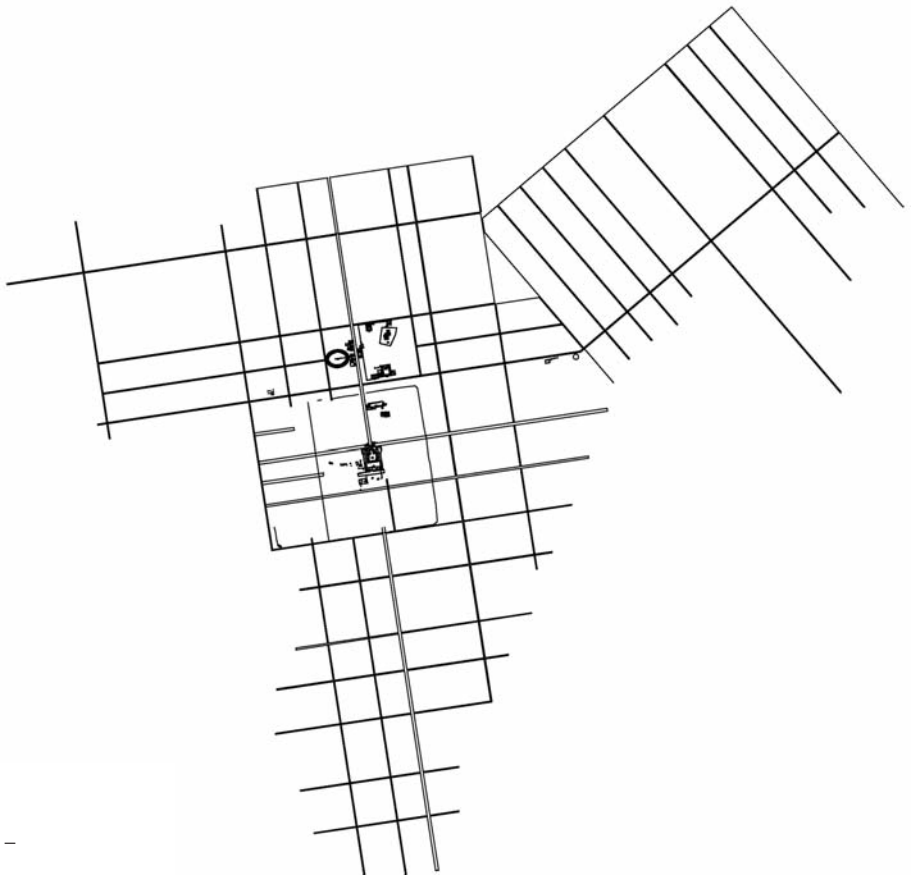

Fig. 8 The centuriation of Sarmizegetusa (jud. Hunedoara/RO). – (Illustration F. Marcu / G. Cupcea).

connects with the road previously mentioned. Road orientation is similar to the enclosure sides, therefore, perpendicular to the *decumanus maximus*, and C. Daicoviciu actually observed, that the pattern is partially kept in the current road network. However, south of this road can be identified at approximately regular intervals, of c. 70 m, two almost parallel paths, which must have partially overlapped two south *decumani* II and III. The second artery to the south, appears to be a *decumanus* extension that ran behind the timber *forum*, still on east-west direction [49]. A third artery is at a distance of 70 m, therefore, it can be another *decumanus* between it and the one behind the *forum* being possible to exist 2 *insulae*, the north-south direction, 120 *pedes* each. Another road, perpendicular to the road leading to Hobița village, south of Sarmizegetusa, which again may be a *decumanus* that separates 2 *insulae* and lays at c. 35 m from the first road described, is the one near the northern enclosure. Given the reusage of Roman roads in principle every 70 m (240 *pedes*), it is possible that these roads were larger in antiquity, the main module for *limitatio* within a colony being 1 *iugerum* or 1 *heredium* [50]. Also, in the plans of modern cities in Gallia cisalpina the ancient planimetry is largely preserved, as evidenced by Guido Mansuelli with reference to Cremona: overlapping and intersecting streets at right angles, the dimensions corresponding to those of *decumani* [51]. The same is partially valid also for Orange (Gallia Narbonensis; today dép. Vaucluse/F), as the latest analysis proves [52].

In Sarmizegetusa it is clear that the centuriation started with the *locus gromae*, after the position of the *forum*, located at the intersection of *cardo maximus* with *decumanus maximus* in front of the *forum vetus* [53]. The streets were oriented according to the compass points and the perimeter consists of a regular polygon. The *forum* is on the axis of the first enclosure, of the northern and southern gates [54]. We find numerous examples of civil settlements with the *fora* lying on the axis, both in Gaul and Germany, pointing here Ticinum, Vicetia and Novara [55], except Britain where the *fora* often were not axially aligned [56].

The first timber *forum* measures 46.30×42.00 m, and is described in detail by the excavators [57]. It has a *principia*-like plan, this being the main argument for those scholars who claim that there was a fortress at Sarmizegetusa (see above). The situation is quite complicated and has been cleared by R. Étienne, I. Piso and A. Diaconescu, with all the arguments in favour of a civil settlement from the outset [58]. In this representation, at about 19 m south of the southern *forum* edge, appears another *decumanus*, called *decumanus* I south (actually II south). South to this was discovered »d'une moitié d'*insula* divisée en quatre maisons« [59]. As it appears in the topographic analysis, this is likely to be the *decumanus*, the extension of which is found in the road westwards the *forum* and identified for the later phase [60], but also in the modern roads described above [61]. So, this is another proof that the centuriation was made at the outset, not inside a legionary camp, but in an urban-type settlement. As in Greece, the rural network orientation was identical to that described by the city limits and the enclosure [62]. This is similar at Sarmizegetusa, at least near the enclosure.

Regarding the building of the city by soldiers, the apparent homogeneity of design should not surprise us, similar to cities in Britannia or to Orange, and it shows that also here »the military ordered ethic was being replicated« [63].

There is mixed evidence, primarily archaeological, to prove a *limitatio* of Sarmizegetusa's land. It appears from the archaeological evidence that the urban colony was designed to be of a certain size and shape initially, and when the town was enlarged the same units and proportions were kept. The Roman preference for square *insulae* is obvious, but elongated blocks in the Hellenistic manner did continue to be used, as in the case of Carthage in 35-15 BC [64]. This could have been the situation at Sarmizegetusa as well.

We have been able to measure starting from *cardo maximus, decumanus maximus* and *groma* to a road identified along the western edge of the *forum novum*, *cardo* II west, and then to *cardo* III, IV and V west [65]. The surveyed length in between these *cardines* is of 35.50 m (1 *actus*). The distance between *decumanus*

maximus and the only other known *decumanus*, II south, is of 71 m (2 *actus*). Accordingly, it results a unit of 2×1 *actus.* The other modern evidence are the four modern village roads which tend to overlay Roman *decumani*, not perfectly all of them, but neither the modern road which overlaps *cardo maximus*, nor the one corresponding *cardo* II east seem to completely overlay Roman *limites.* The *insula* interval has been identified to be constant throughout the entire urban settlement, also within the area of the enlarged town. Therefore, at first sight, the evidence supports that the overall urban grid design is based on a *per strigas* plan with a total of 10 *cardines* and 6 *decumani* in the first phase of the town, and 14 *cardines* and 6 *decumani* when the town was enlarged westwards. Consequently, there should have been at first 60 *insulae* of 2×1 *actus* plus a row in the northern part of another 10 *insulae* of 1×1 *actus*, with a total of 70 *insulae.* In the second phase there will be another 30 *insulae* of 2×1 *actus* and 5 *insulae* of 1×1 *actus*, a grand total of 105 *insulae.* The existence of rectangular *insulae*, with the ratio of 1/2 are recently supposed at Orange, Aix-en-Provence (dép. Bouches-du-Rhône/F) and Fréjus (dép. Var/F) in a grid composed of *insulae* of 1×2 *actus*[66]. A similar grid, with *insulae* and streets located on intervals of 1 *iugerum*, but on larger scale, has been lately found at Corinth[67]. However, there are only suggestions that this is true (**fig. 7**).

The *cardines* and *decumani* between the *insulae* would not have been included in the 1 *actus* wide *insulae*, because the Roman legal term *iter populo non debetur* was in use and important in the urban land division system. It meant that the streets are measured outside the *insula* blocks, as in Corinth and other places mentioned in the *Libri Coloniarum*[68]. If in Sarmizegetusa we had *insulae* of 1 *actus quadratus*[69], then the rectangles imagined by us should be divided in two halves, and the streets should be narrowed. In general, we agreed on a road wideness of at least 3.5 m, although they could have been wider[70]. Theoretically, every fifth main street was made wider than the intermediate ones, to ensure that it would be a usable road. The main streets could have been of about 12 *pedes* (3.50 m), a *quintarius* (20 *pedes*), with a minimum width of *limites* of 8 *pedes* (2.40 m), as prescribed by Hyginus II[71]. For *decumanus maximus* and *cardo maximus* Hyginus I recommends a wideness of 12-30 *pedes*, though it was at the discretion of the founder[72]. In Sarmizegetusa *cardo maximus* is 11 m wide, and *decumanus maximus* 12 m wide, therefore 40 *pedes*[73]. The main buildings occupied more than 1 *insula*, but it was Roman practice that whenever needed, some streets were suppressed[74]. The dimension of *limites* inside the Roman town can only be speculative since it is impossible to know for certain the original width of a street that may have been modified many times over the centuries.

The internal planning at Sarmizegetusa reveals buildings oriented with reference to the *forum* in all phases. The location of the edifices suggests that the architects of the second phase of the colony were fully aware of the Trajanic system of centuriation in and near the city, and the buildings orientation was invariable. Regarding the first phase the only uncertainty is why the internal space was not organized with two axes to divide the *colonia* in four equal parts, on every side of the central point, comparable to the most of the colonies[75]. But this is, however, insufficient to prove an initial fortress. Or, there are examples of civil settlements of the 2nd century with a plan similar to a fortress, i.e. a card shape plan, to mention here only Timgad (prov. Batna/DZ) founded in AD 100 for veterans of *III Augusta*. The similarity is traced by Brian Campbell to a common origin of sources and methods of the military and civilian surveyors[76]. Plus, at Sarmizegetusa and Timgad the soldiers were the builders of the settlement. Rectangular planning, with two main streets and *insulae* divisions can also be found at Ostia in the 4th century BC, or in other two early coast cities in Italy, namely Minturnae and Pyrgi, important for the evolution of the Roman orthogonal planning, and in Verona and Milan as well[77]. The military character of early colonies was obvious, even if, fortresses as we know them did not exist[78]. Frontinus (IV, I) tells us specifically that it was only after overrunning the camp of Phyrrus, in 275 BC, that the Roman armies began to adopt the sort of a formal

encampment which was been developed and standardized[79]. The plan of the first colonies reflects the contemporary encampments of the Roman armies in the field. The relation between the internal planning of a fortress and that of a city becomes very tight. Similarities are distinguished in the military provinces, where soldiers and veterans were often the best available source of surveying and building skills, as in Sarmizegetusa. The social background of the founders was essential. The implication of the military surveyors in civilian projects is obvious. They are even involved in the settlement of boundary disputes, and in land division[80].

Evidence suggests that the *limitatio* also included the urban and rural elements. Outside the *colonia,* the orientation of the land divisions into units of multiple of an *actus* at the orientation of 9° west of north direction, is attested north, east and south of the city[81]. It is possible, as we shall see below, that a more appropriate module for the Sarmizegetusa centuriation could have been 10 *actus* (with a value of 355 m). Overall, the centuriation started from modules of 20×20 *actus*, but there are many examples of other types of grid[82].

Therefore, roads or borders of agricultural parcels today, the west-east direction, are evident in maps[83], but especially in the orthophotomap, and seem to be a product of the same project of a cadastral strategy. *Cardo maximus* intersects with the imperial road out of the city. Today, the imperial road is only partially preserved, on a portion to the east, towards the village of Ostrov, being called »Trajan's way« (*Trajansweg*) (figs 7-8)[84].

Road orientation is the same like that of the streets that start in the Roman city, all with the direction of the main city axes. Moreover, one can distinguish a distance equal to a module or a multiple of an *actus* between these roads, clearly indicating a cadastre. The orientation takes into account the axes of the Roman city, so this clearly proves that we are dealing with traces of Roman centuriation, sometimes preserved until today.

If the Sarmizegetusa centuriation existed since the beginning, as it seems, then, obviously, it was founded as a colony, and the territory was divided accordingly[85].

The relationship between the *colonia* and the area outside the walls is evident. In principle, the distance between roads is maintained at 120 *pedes* or multiples of an *actus* (1 *actus* = 35.48 m) that is the chief measurement of length used by Roman land surveyors for plots. This is the distance oxen yoked to a plough were driven before they were turned[86]. The first signs of land division on 20×20 *actus* come from the 3rd century BC, however, the division of land into squares constructed on a smaller scale may have existed from much earlier[87]. The distance of 10 *actus* from the *groma* to the entry in the amphitheatre is further evidence that the centuriation was implemented at Sarmizegetusa from the beginning. The space dedicated to the games had an important symbolism in the Roman world, therefore, the position of the amphitheatres (sometimes theatres) was not by chance. The structures are essential in articulating the Roman cadastre and urban space as one of the most important elements in the city's development, a real spacial and temporal pattern, necessary for the surveying of the main axis[88].

The 10 *actus* module is an essential unit in the genesis of the Roman cadastre[89]. Originally designated as *decumanus*, it means the axis drawn every 10 *actus*. This length, equal to 5 *iugera*, is the so-called *modus triumviralis* that the triumvirs used in the distribution of land in Italy (Frontin. 30.20 – Hyg. 170.19) as a way to subdivide the *centuriae* in 200 *iugera*, as both Hyginus (170.19) and Siculus Flaccus (159.14) witness. It is how the land was allotted in the first *coloniae deductae,* as Bononia (Bologna), Aquileia, Terracina or Cures[90]. Traces of Roman centuriation have been further identified in Italy, France, Britannia, Dalmatia and Tunisia (the most spectacular and extensive signs of Roman land division)[91], at Augusta Emerita in Lusitania, Corduba and Carmo in Baetica, also in Tarraconensis, and in the same province near Basti, at Murcia and possibly near Castellón de la Plana[92].

All ancient authors, especially Hyginus II, emphasize the importance of land division based on the *limites*[93]. It is how the Romans defined the world they conquered and a conceptualization of space. Land was pledged and divided among the soldiers, in Sarmizegetusa, a common practice at the time, also mentioned by Horace who asks about the land allocations (*praedia*) that the emperor (Augustus) promised to the soldiers[94]. Hyginus I talks about the allocation of land to the soldiers in Pannonia during the reign of Trajan[95]. A centuriation as evident as in Sarmizegetusa and the relationship between the *groma* (*forum*), *cardines*, *decumani* and the amphitheatre outside the walls can only indicate the Roman cadastre implemented from the beginning of a settlement, which must have been an urban one, not a fortress. The orientation of Sarmizegetusa's rural centuriation started at the city limits, the route beginning even at the city enclosure[96]. Undoubtedly, the measurements started at the centre of the *colonia* and the *forum* was designed as the topographical centre of the urban colony, precisely like in Corinth[97]. Sometimes, even if the *limitatio* was an operation theoretically independent of the laying out of the town itself, the city and the *territorium* had a common base point, and Hyginus II speaks about a *centuriatio* initiated in the same point, either for the town or for the territory[98], but in other places the *locus gromae* was offset, however, as Siculus Flaccus wrote, the orientation of the *limites* could have been similar[99].

As in other colonies of veterans, agricultural land was divided, allocated partly in *iugera*, and the rest remained as strips, or unsurveyed. Maybe that is why we distinguish the traces of *limites* in Sarmizegetusa surviving only in the north, east and south, because this land is suitable for agriculture. In the west only a small portion is flat, but then the land becomes hilly.

The connecting roads outside of the *colonia* have the same orientation as the streets in the settlement. We have observed an area of 6×11 km (almost the entire modern communal area, except the hilly land), in order to see which features of the modern landscape fitted in a grid.

The village roads which border the agricultural fields at present time, on the east-west direction, are obvious on the maps, but especially on the orthophotomap, they seem to be the product of the same project of a cadastral strategy. *Cardo maximus* intersects, when exiting the city, the imperial road. At present day only a part of the imperial road is preserved, eastwards, to Ostrov, called, even since the 19th century »Trajan's Road« (*Trajansweg*). This road lies at about 220 m, meaning 6 *actus* from *decumanus maximus*. However, we have insufficient information to establish here the imperial road. This could have entered the town through the western and eastern gates as in many other Roman towns being thus *decumanus maximus*.

The modern road orientation is identical to that of the Roman main axes of the city. Moreover, an equal distance is observable, a module, equal or multiple of an *actus*, between these roads, indicating a cadastral regularity. The fact that they follow the orientation of the Roman city axes tells us that they are the traces of the ancient centuriation, preserved in some places until present day.

Parallel with the road going towards east from the amphitheatre, the most northern sector can be seen in the same direction, where the modern path may indicate the direction of a Roman road, at about 695 m, i.e. almost 20 *actus*. There would have been the northern limit of the *cadastre* as here it starts the abrupt hills and the forest[100].

Roman roads do not always overlap perfectly with modern utilities, as evidence found in archaeological excavations shows, e.g. in the case of the eastern cemetery, where the ancient way is adjacent to the road today[101]. Modern roads are not really roads, but only earth pathways, sometimes reinforced with stone and used today as field lines or property lines. After the demarcations kept until today, nobody doubts about the Roman *limites*, the distances between them are 3, 4, 5, 6 or 7 *actus*, which does not mean that the properties were unequally divided. The clearest modern way, adjacent to the Roman road, can be distinguished from the eastern gate of the amphitheatre on a length of 327.47 m, also indicating the module

used in Sarmizegetusa. From the entry into the amphitheatre to *locus gromae*, there are exactly 10 *actus*, as mentioned above. Starting from the amphitheatre limit to the south, at about 4 *actus* the Roman imperial road is partially overlapped by a modern communal way. From it, to the road that exits the city through the eastern gate, there are about 6 *actus*, c. 10 *actus* resulting from the road in front of the amphitheatre to the road that extended *decumanus maximus*. For the latter, there are again 10 *actus* to the road *extra muros* adjacent to the southern enclosure corresponding to a modern communal road a few meters to the north. Midway between these roads a modern way overlaps the extension of *decumanus* III south to the east. South of the way located along the southern enclosure six other modern roads are visible, all parallel. The first is 14 *actus*, the next 20 *actus*, 24 *actus*, 29 *actus*, 35 *actus*, and 39 *actus*, respectively to *decumanus maximus*.

Unfortunately, *cardines* and roads parallel to the *cardo maximus*, in the space *extra muros* are less visible on the orthophotomap, probably because the properties today are oriented north-south, on the direction of *cardines*. The clearest is one that must have continued a *cardo* VIII west, to the south, and overlapped today a communal road that leads from Sarmizegetusa to Hobița, the southern village, located at 8 *actus* from the *locus gromae*. At 390 m from the southern enclosure, a short portion of a field road parallel to the way to Hobița, is visible in the orthophotomap, 4 *actus* eastwards, probably corresponding to the extension of *cardo* IV west. At 8 *actus* east of the *cardo maximus* extension to the north, there is a portion of 300 m field line leading to the current motel in the area. In the same direction, at 15 *actus*, the rural road leading to the village Breazova can be distinguished, probably also overlapping a Roman *limes*. Along the western Roman enclosure stands the way to the village Hobița, located at 12 *actus* of the *groma*, the road which now connects to the one described above as overlaying the extension to the south of the *cardo* VIII west.

The only form of *limites* we have identified are the roads and paths – no other type of lines were observed [102]. It is clear that the function of the roads did not change much; as early as in antiquity the *limites* were mainly used for the transport of the harvests.

Scamna seems to be the dominant pattern for the sudivision of *centuria,* however, there are quite a number of *strigae* also identified. The *centuria* at Sarmizegetusa would have been also divided or subdivided in 6/8 *scamna* (*strigae*), a model also used for the plain of the Rhone indicating »la massivité des distributions …« [103]

How the *limitatio* looked like in the other parts of Sarmizegetusa's land is difficult to establish. However, the similar orientation of the *limites* inside and outside of the town indicates, as at Augusta Tricastinorum, contemporaneous action [104]. The discovery from Sarmizegetusa is suggestive, as the pattern is typical for the colonies of the 1st century until the Flavians, and it shows an organized and strong colonization.

LEGAL STATUS

As in any other places of Gaul, Italy or Greece we can observe at Sarmizegetusa signs of a *scamnatio* and *strigatio in centuriis* [105]. The cadastre is modulated in relation to the ratio *scamnatio/strigatio* [106]. Soldiers and veterans were granted parcels in equal amount in proportion to the unit [107]. These were measured and aligned using the *ferramentum.* Not all properties were equal, as Hyginus II emphasized the flexibility of the land surveyors' measurement, each field having its own statute [108]. In Sarmizegetusa only a few traces of this centuriation have been preserved, the usage of the *actus* as a module being important, and the orientation of the centuriation according to the city enclosures, and then to the imperial road. Why only here these *limites* were conserved, we do not know, but the marks of the properties could have been executed

in many ways, visible in the centuries following the abandonment of the province. There were many methods of dividing the land: *centuriatio*, *strigatio* or *scamnatio*. The first was used when large amounts of land had to be distributed. For this the drawing of lines on the ground was essential in order to delimit territorial boundaries. The *centuriae* were divided by *limites intercisivi* or *mensurae intercisivae* to provide lots or other subdivisions by means of: balks, roadways, small trenches, trees, streams, or anything else that could mark a limitation.

Sarmizegetusa, as any other Roman city, had regular street patterns enclosed and framed new types of buildings in which one can dispense justice, sacrifice or bathe. The layout shows more centralized design than organic growth, normal for a colony of veterans, where the military ordered ethic was being replicated [109]. There are several significant aspects to this discovery. First, this is primary evidence of the work of the Roman *agrimensores* in this area. How much of the total territory of Sarmizegetusa was included in this *limitatio*, as a part of a *lex agraria*, it is not clear, but what we have seen is definitely part of a regular and organized Roman division of land in the area immediately to the north, east and south of the former city. Maybe not all of the *territorium* of Sarmizegetusa was divided from the very beginning, and this would lead to a different orientation of the *limites* in the eastern area of the city. Anyway, here the orientation of the lines are aligned or perpendicular to the Roman imperial road which turns left exactly where the *limites* are more westwards inclined. The elements of the Trajanic plan are still being utilized as modern streets or field lines and property lines.

The accuracy of the Roman *agrimensores* is comparable to ours, disregarding their instruments, not as sophisticated as our modern electronic survey instruments. On balance, variations and mistakes in survey sometimes happened. The *centuriatio* is a mixture of traditionalism and flexibility, that explains the many differentiations between similar towns, with no two towns identical in design. Nevertheless, the mathematical relationships between the actual roads of Sarmizegetusa indicate that the links were planned, and suggest that a centuriated cadastre existed. That is the first step for a coherent municipalized or urbanized Sarmizegetusa from the beginning. The linkage unlikely occurred by chance, and seems to have been related with the Roman units of measurements and a unified vision of the future.

Acknowledgements

The research that also included the geophysical survey and topographical study of the Roman city and its immediate environs was initiated for a better understanding of the organisation and development of the remains of Sarmizegetusa and for a most accurate record of the known antiquities in the area. This is part of a large-scale project, PN II, no. 91-033, financed by the National Centre for Programme Management (nowadays Romania) which takes in surveys in other fortresses and settlements of Dacia. The project is called »The geophysical map of the Roman sites from Dacia« with Prof. I. Piso as manager and is financed by the Romanian Ministry of Education, Research, Youth and Sport in the Programme Partnerships in Priority Domains. The method and aim was to measure by means of most sophisticated modern electronic survey instruments and to draw the plan of the most important sites of Dacia.

Notes

1) For a history of research see: Daicoviciu 1924; 1933; 1938; 1974. – Daicoviciu / Daicoviciu 1962. – Daicoviciu / Alicu 1984. – Étienne / Piso / Diaconescu 1990; 1994; 2004. – Piso 1993; 1995; 2006. – Piso / Diaconescu 1999. – Rusu-Pescaru / Alicu 2000.

2) For the founding date see Piso 2005, 436-438. The start date of the Roman settlement at Sarmizegetusa is still debated. Several scholars have argued in favour of a legionary fortress, built after the first Dacian war: Daicoviciu 1974, 612. – Daicoviciu 1975. – Rusu 1979. – Alicu 1980, 25-26. – Bărbulescu 1987. – Benea 1983,156. – Alicu 1993, 29-30. – Alicu / Opreanu 2000, 116. 146. – Lobüscher 2002, 98-99. – Contra: Étienne / Piso / Diaconescu 2004. – Piso 2006.

3) Daicoviciu 1974, 611. – Piso 1993, 9.

4) After Mezerzius, St. Zamosius; Analecta lapidum vetustorum et nonnullarum in Dacia antiquitatum (Padova 1593).

5) Popa 1984, passim. Sherds discovered in the village territory indicate a cemetery of 8th-9th centuries, still unidentified (Popa 1988, 47-48).

6) Marsigli 1726.

7) Hohenhausen 1773.

8) Ibidem.

9) Daicoviciu 1924. – Daicoviciu 1974, 615.

10) Daicoviciu / Alicu 1984, passim.

11) Étienne / Piso / Diaconescu 2004, fig. 1.

12) General plan published by Eck / Lobüscher 2001. Short survey was also made by Dorin Ursuț, in the eastern cemetery, and Dan Ștefan in the central area of the town.

13) Piso 2003, 294.

14) Piso 2005, 436.

15) Ibidem 437.

16) Piso 2003, 294.

17) Piso 2005, 439-440.

18) Ulp. dig. 50, 15, 1, 8-9.

19) About *ius italicum* see in detail Bleicken 1974, 367-391. – Hinrichs 1974, 147-157.

20) See Bleicken 1974. As confirmed by Thulin 1913, passim. – Campbell 2000.

21) See Campbell 1996, 90.

22) See Piso 2005, 448-449.

23) Piso 1995.

24) Campbell 1996. – Chouquer / Favory 1991. – Clavel-Lévêque / Jouffroy / Vignot 1994. – Clavel-Lévêque / Vignot 1998/2002. – Doukellis 1988. – Doukellis / Fouache 1992. – Hinrichs 1974, 136-146. – Mansuelli 1971. – Peterson 1988. – Romano 2003. – Romano 2006.

25) On ancient landscape organization and the mental role of the individual in this, on the agrarian morphology, which is »organic and profound orthogonal«, see Chouquer / Favory 1991, 69ff.

26) See Jung 2009, 90. The last would have been any public area or any infertile ground, see Siculus Flaccus, T 119.15.

27) Ward-Perkins 1974, 30. – Vitr. I.7, VI.6-7.

28) Daicoviciu 1974, 612.

29) Team of Peter Rauxloh, David Bentley, David Mackie, Sophie Lamb and Duncan Lees.

30) Eck / Lobüscher 2001, 263.

31) Daicoviciu 1944, 28 pl. I. – Piso / Țentea 2009.

32) See Daicoviciu 1974, 613. – Piso 2005, 447.

33) Traces of a centuriation are still presumed in Dacia at Micia and Sarmizegetusa in Oltean 2007, 180.

34) See Chouquer / Favory 1991, 139-152.

35) In Britannia, against all odds, John Peterson managed, in 1988, to prove the existence, in all the provinces of the empire (by reference to Britannia) of a genuine Roman cadastre (Peterson 1988, 168. – Peterson 1992, passim).

36) See Dilke 1974, 576.

37) For a short introduction to the Roman laws concerning land allotment to veterans, and »une nouvelle phase de turbulences agraires«, see Chouquer / Favory 1991, 133ff.

38) Ibidem 139. For building features of the forts of Dacia and their internal planning see Marcu 2009.

39) The *agrimensores*' accuracy is comparable to ours (Romano 2006, 65). However, surveyors' experience was based on express rules established in compliance with laws, records and registers, maps, edicts, letters or other imperial decisions, definitions of territorial area and jurisdiction, lists of *subseciva* and the book of *beneficia*, as are the examples of Agennius Urbicus, Hyginus I, Siculus Flaccus and Hyginus II, see Campbell 1996, 88 n. 55. For the history of *agrimensores,* see Hinrichs 1974, 76-92. 158-170.

40) See Campbell 1996, 74.

41) Étienne / Piso / Diaconescu 1990, fig. 2.

42) »Vers l'est, au-delà d'une rangée d'*insulae,* s'étend, au long de la route romaine vers Ostrov« (Piso 2005, 438).

43) *Insula* blocks and the public buildings seem to be organized on homogeneous basis, see Creighton 2006, 70.

44) Ibidem.

45) Siculus Flaccus, T 119.26-27.

46) Popa 1984, passim. – Popa 1988, 48.

47) In the given plan, the two roads exiting the city by the eastern and northern gates, are called *via romana,* without any apparent archaeological evidence, but claiming that »der Strassenzug dieser beiden Haupt-*viae* kann noch heute bei den jetzigen Wegen und Strassen des modernen Dorfes verfolgt werden« (Daicoviciu 1974, 613. 615).

48) Chicideanu et al. 1979, 316.

49) Étienne / Piso / Diaconescu 2004, pls II-III, 73.

50) *Heredium* is the unity of landscape and property in an orthogonal structure, as described by Frontinus, see Chouquer / Favory 1991, 72.

51) Mansuelli 1971, 67 pl. II. In the plans it can be noticed that in many other cases of modern cities, the Roman roads are used: Rimini (Ariminum) pl. I; Piacenza (Placentia) pls III-IV; Aquileia pl. V; Aosta (Augusta Praetoria) pls VII-VIII; Torino (Augusta Taurinorum) pl. IX; Vicenza (Vicetia) pl. XII; Como (Nouum Comum) pl. XIII; Albenga (Albingaunum) pl. XIV; Brescia (Brixia) pl. XV; Milano (Mediolanium) pl. XX. For late Republican colonies see Aristot. pol. 7.11.1330.

52) Mignon 2009, 107-114 figs 39-41.

53) For *locus gromae* at Sarmizegetusa see Piso 2005, 439.

54) For its position, but considered deviated from the axis, see also Eck / Lobüscher 2001, 263-264.

55) Mansuelli 1971, 72.

56) Nevertheless, in Britannia, all the colonies, except York, were erected on top of former legionary fortresses (Creighton 2006, 72. 76).

57) Étienne / Piso / Diaconescu 2004, 60-69.

58) Ibidem 86-94. The main arguments for a fortress before cities are based on the shape of the enclosure and *forum*, with analogies in Britannia: Daicoviciu 1974, 612. – Rusu 1979, 49-50. – Alicu 1980, 25-26. – Benea 1983, 156. – Bărbulescu 1987, 156-157 n. 105. – Alicu 1993, 29-30. – Alicu / Opreanu 2000, 116. 146. Not always the internal planning of the former fortress is preserved in the city, the *fora* of Britain, unlike most of them in Gaul and Germany, often are not axially aligned: in Silchester what seems like a *principia* it is an

older *forum*, and in Colchester the old *principia* is demolished, and *via praetoria* unites with *via decumana* , but the barracks are kept, like in Gloucester and Wroxeter. See Creighton 2006, 67. 73ff. – Blagg 1984, 253.

59) Étienne / Piso / Diaconescu 2004, 91 n. 64.

60) Daicoviciu 1944, 28 pl. I. – Piso / Țentea 2009.

61) Apparently, the dimensions of the first *forum* are not harmonized with the proposed length for the *insulae*, as it in the similar situation at Orange (Mignon 2009, 116), but the larger *forum* in stone would fit much more in the general plan, with the *decumanus* through the basilica.

62) Doukellis 1988, 164.

63) On the urban ideal of the people who lived inside and their interpretation of *humanitas*: Creighton 2006, 121. The first cadaster of Orange is connected with the veterans of *legio II Gallica* (Chouquer 1994a, 54).

64) Ward-Perkins 1974, 28.

65) Alicu / Băeștean / Delinescu 2009, no. 67.

66) Mignon 2009, 115 fig. 36.

67) Romano 2003, passim.

68) See ibidem 288 n. 53.

69) Varro (Ling. 5.34) mentions that this is the base unit in surveying the civil rectangular grid system, based on around orthogonal axial streets.

70) Minimal recommended wideness of *subruncivi* was 8 *pedes* (Campbell 1996, 85). At Orange was established a module of 8.90 m (30 *pedes*) for each road, see Mignon 2009, 115.

71) Also called *actuarius*, wider than the other streets, with a recommended width of 12 *pedes*, see Campbell 1996, 85. 93 fig. 28. – Hyg. II, T 155.14.25-31. – Siculus Flaccus T 121.38-41.

72) Hyg. I, T 71.6-7.

73) Étienne / Piso / Diaconescu 2004, 120. 126.

74) See for instance the example of the baths at Augusta Raurica (Ward-Perkins 1974, 35 fig. 75).

75) Campbell 1996, 82-83.

76) Ibidem n. 15.

77) Millett 1991, 278 underlines the existence of a model for a Roman fort.

78) The same idea in Dobson 2008, 72: »The camp system was substantially based upon the civil scheme, if not actually directly inherited from it«.

79) Stratagemata IV, 1,14.

80) Campbell 2000, LI.

81) In Corinth the orientation of land divisions north of the city was of 3°, but in other places it was over 20°, see Romano 2003, 281. – Chouquer / Favory 1991, 11-13. 19. In the regions of northern Italy and southern France there seems to be a pattern in the angle orientation of the land division of 11° (Chevallier 1958, 636).

82) See also Dilke 1971, passim. – Chouquer / Favory 1991, 142ff. In Corinth the grid was based on units of 16×24 *actus* subdivided in units of 8×12 *actus* (Romano 2003, 282).

83) A pattern of parallel roads east of the city was previously observed, supposedly an indication of »an earlier (Roman) pattern« (Oltean 2007, 180).

84) The lines were prolonged based on the fig. 6.

85) There is no proof that there were laws on the internal planning of the fort, as were for urban settlements where centuriation was made according to the laws for *limites* or *limes*, as access roads, described by Siculus Flaccus (T 122.21-3).

86) Dilke 1971, 82. – Chouquer / Favory 1991, 72 after Columella and Pliny the Elder.

87) Campbell 2000, LX.

88) »… véritable élément de jonction spatiale et temporelle« (Chouquer 1985, 17-18).

89) Chouquer / Favory 1991, 72-73.

90) Other types of modules are of 12, 13 or 14 *actus*, in Privernum, Cales, Interamna Lirenas or Alba Fucens (Chouquer / Favory 1991, 73. 104. 108-109).

91) Caillemer / Chevallier 1959.

92) Campbell 2000, LVIII.

93) See Campbell 1996, passim. – Campbell 2000, passim.

94) Hor. serm. II.6.51-8.

95) Campbell 1996, 77.

96) Similar situations have been identified in many other places, see Doukellis 1988, 164.

97) Romano 2003, 287.

98) See Ward-Perkins 1974, 28. – Hyg. II, T 142.3.43-45.

99) This is the case, for instance, at Orange (Jung 2009, 95).

100) Similar with the limit identified at Valdaine (Chouquer 1994b, 57).

101) Marcu / Rădeanu / Țentea 2002.

102) There were quite a lot of types of *limites* described by Jung 2009, 97-98 in detail.

103) Chouquer 1994b, 67-71.

104) The Augustan town is one of the best examples of a rural cadastre surveyed considering the enclosure of the city, see Chouquer 1994a, 52.

105) See for details ibidem 52.

106) Chouquer 1994b, 68-71.

107) However, the land was granted according to military rank (Siculus Flaccus T 117.39-40; T 119.27).

108) Regarding divided and alloted land: Campbell 1996, 79. – Campbell 2000, LX.

109) In all cases, inside the towns, the inhabitants were formulating what for them was their urban ideal, their version of *humanitas*, after Creighton 2006, 120-121.

References

Alicu 1980: D. Alicu, Le camp legionnaire de Sarmizegetusa. Potaissa 2, 1980, 23-28.

1993: D. Alicu, Urbanisme et architecture dans la Dacie romaine. In: D. Alicu / H. Bögli (eds), La politique édilitaire dans les provinces de l'Empire romain IIème-IVème siècles après J.-C. Actes du Ier colloque roumano-suisse, Deva, 21.-26.10.1991 (Cluj-Napoca 1993) 29-36.

Alicu / Opreanu 2000: D. Alicu / C. H. Opreanu, Les amphithéâtres de la Dacie romaine (Cluj-Napoca 2000).

Alicu / Băeştean / Delinescu 2009: D. Alicu / G. Băeştean / C. Delinescu, Sarmizegetusa. Insula 3. Cronica Cercet rilor Arheologice 2008, 269-270.

Bărbulescu 1987: M. Bărbulescu, Din istoria militară a Daciei romane. Legiunea V Macedonica şi castrul de la Potaissa (Cluj-Napoca 1987).

Benea 1983: D. Benea, Din istoria militară a Moesiei Superior şi a Daciei. Legiunea a VII-a Claudia şi legiunea a III-a Flavia (Cluj-Napoca 1983).

Blagg 1984: T. F. C. Blagg, An examination of the connexions between military and civilian architecture in Roman Britain. In: T. F. C. Blagg / A. C. King (eds), Military and Civilian in Roman Britain. Cultural Relationships in a frontier province. BAR British Series 136 (Oxford 1984) 249-263.

Bleicken 1974: J. Bleicken, In provinciali solo dominium populi Romani est vel Caesaris. Zur Kolonisationspolitik der ausgehenden Republik und der frühen Kaiserzeit. Chiron 4, 1974, 359-414.

Caillemer / Chevallier 1959: A. Caillemer / R. Chevallier, Atlas des centuriations romaines de Tunisie (Paris 1959).

Campbell 1996: B. Campbell, Shaping the rural environment: surveyors in ancient Rome. The Journal of Roman Studies 86, 1996, 74-99.

2000: B. Campbell, The writings of the Roman Land Surveyors: introduction, text, translation and commentary. The Journal of Roman Studies Monographs 9 (London 2000).

Chevallier 1958: R. Chevallier, Pour une interprétation archéologique de la couverture aérienne grècque: Note sur les centuriations romaines de Grèce. Bulletin de Correspondance Hellénique 82, 1958, 635-636.

Chicideanu et al. 1979: I. Chicideanu / V. Eskenasy / G. M. Juga / Şt. Matei / R. Popa, Şantierul arheologic Sarmizegetusa – jud. Hunedoara (epoca post-romană). Raport privind rezultatele cercetărilor campaniei 1978. In: S. Dumitraşcu (ed.), Materiale şi Cercetări Arheologice: a XIII. sesiuna anuală de rapoarte; Muzeul Tării Crişurilor, 9.-11. III. 1979, Oradea (Oradea 1979) 315-318.

Chouquer 1985: G. Chouquer, Théâtres et amphithéâtres. Codes de l'Espace romanisé. Dialogues d'Histoire Ancienne 11, 1985, 13-22.

1994a: G. Chouquer, Cadastre d'Orange et archéologie: résultats et hypothèses. In: F. Favory / J.-L. Fiches (eds), Les campagnes de la France méditerranéenne dans l'Antiquité et le haut Moyen Age. Études microrégionales. Documents d'Archéologie Française 42 (Paris 1994) 51-55.

1994b: G. Chouquer, Étude morphologique du cadastre B d'Orange. In: F. Favory / J.-L. Fiches (eds), Les campagnes de la France méditerranéenne dans l'Antiquité et le haut Moyen Age. Études microrégionales. Documents d'Archéologie Française 42 (Paris 1994) 56-72.

Chouquer / Favory 1991: G. Chouquer / F. Favory, Les paysages de l'antiquité. Terres et cadastres de l'Occident romain (IVe s. avant J.-C./IIIe s. après J.-C.) (Paris 1991).

Clavel-Lévêque / Vignot 1998/2002: M. Clavel-Lévêque / A. Vignot, Atlas historique des cadastres d'Europe 1-2. Publications of the Action COST G2 »Paysages ancienes et structures rurales« (Luxemburg 1998/2002).

Clavel-Lévêque / Jouffroy / Vignot 1994: M. Clavel-Lévêque / I. Jouffroy / A. Vignot (eds), De la terre au ciel. I: Paysages et cadastres antiques. XIIe Stage international – Besançon, 29-31 mars 1993. Centre de Recherches d'Histoire Ancienne 136 (Paris 1994).

Creighton 2006: J. Creighton, Britannia. The creation of a Roman province (New York 2006).

Daicoviciu 1924: C. Daicoviciu, Fouilles et recherches à Sarmizegetusa. Ier compte-rendu. Dacia 1, 1924, 224-263.

1927-1933: C. Daicoviciu, Fouilles de Sarmizegetusa. IIeme compte-rendu (1925-1928). Dacia 3-4, 1927-1933, 516-556.

1938: C. Daicoviciu, Sarmizegetusa (Ulpia Traiana) în lumina săpăturilor. Anuarul Comisiunii Monumentelor Istorice, Secția Pentru Transilvania 4, 1938, 353-410.

1944: C. Daicoviciu, Sarmizegetusa et ses environs (Bucurest 1944).

1974: RE Suppl. XIV (1974) Sp. 599-655 s.v. Sarmizegetusa (C. Daicoviciu).

Daicoviciu / Daicoviciu 1962: C. Daicoviciu / H. Daicoviciu, Ulpia Traiana (Sarmizegetusa romană) (Bucureşti 1962).

Daicoviciu 1975: H. Daicoviciu, Dio Cassius et Sarmizegetusa. In: Actes de la XIIe Conférence Internationale d'Études Classiques »Eirene«, Cluj-Napoca, 2-7 oct. 1972 (Bucureşti 1975) 453-454.

Daicoviciu / Alicu 1984: H. Daicoviciu / D. Alicu, Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa (Bucureşti 1984).

Dilke 1971: O. A. W. Dilke, The Roman Land Surveyors. An introduction to the agrimensores (Newton Abbot 1971).

1974: O. A. W. Dilke, Archaeological and Epigraphic Evidence of Roman Land Surveys. In: Aufstieg und Niedergang der römischen Welt II, 1 (Berlin u.a. 1974) 564-592.

Dobson 2008: M. Dobson, The Army of the Roman Republic: The Second Century BC, Polybius and the Camps at Numantia, Spain (Oxford 2008).

Doukellis 1988: P. N. Doukellis, Cadastres romains en Grèce. Traces d'un réseau rural à Actia Nicopolis. Dialogues d'Histoire Ancienne 14, 1988, 159-166.

Doukellis / Fouache 1992: P. N. Doukellis / E. Fouache, La centuriation romaine de la plaine d'Arta replacée dans le contexte de l'evolution morphologique récente des deltas de L'Arachtos et du Louros. Bulletin de Correspondance Hellénique 116, 1992, 375-382.

Eck / Lobüscher 2001: W. Eck / Th. Lobüscher, Ein neuer Stadtplan der Colonia Ulpia Traiana Dacica Sarmizegetusa. Zeitschrift für Papyrologie und Epigraphik 137, 2001, 263-269.

Étienne / Piso / Diaconescu 1990: R. Étienne / I. Piso / A. Diaconescu, Les deux forums de la Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa. Revue des Études Anciennes 92/3-4, 1990, 273-297.

1994: R. Étienne / I. Piso / A. Diaconescu, Le forum en bois de Sarmizegetusa (Roumaine). Comptes Rendus des Académie des Inscriptions et Belles-Lettres 1, 1994, 147-164.

2004: R. Étienne / I. Piso / A. Diaconescu, Les fouilles de forum vetus de Sarmizegetusa. Rapport général. Acta Musei Napocensis 39-40/1, 2004, 59-154.

Hinrichs 1974: F. T. Hinrichs, Die Geschichte der gromatischen Institutionen. Untersuchungen zu Landverteilung, Landvermessung, Bodenverwaltung und Bodenrecht im römischen Reich (Wiesbaden 1974).

Hohenhausen 1773: S. J. Hohenhausen, Die Alterthümer Daciens im heutigen Siebenbürgen. Aus den Zeiten, als dieses schöne Land die Römer regierten (Wien 1773).

Jung 2009: C. Jung, Les plans cadastraux d'Orange et les vestiges archéologiques de la centuriation B. In: A. Roumégous, Orange et sa région. Carte Archéologique de la Gaule 84, 3 (Paris 2009) 88-100.

Lobüscher 2002: Th. Lobüscher, Neue Untersuchungen zur Umwehrung und Stadtentwicklung von Sarmizegetusa. Archäologisches Korrespondenzblatt 32, 2002, 91-100.

Mansuelli 1971: G. A. Mansuelli, Urbanistica e architettura della Cisalpina romana fino al III sec. e. n. Latomus Collection 111 (Bruxelles 1971).

Marcu 2009: F. Marcu, The internal planning of Roman forts of Dacia. Bibliotheca Musei Napocensis 30 (Cluj-Napoca 2009).

Marcu / Rădeanu / Țentea 2002: F. Marcu / V. Rădeanu / O. Țentea, Colonia Ulpia Traiana Sarmizegetusa. Necropola Estică. Cronica Cercetărilor Arheologice 2002, no. 169.

Marsigli 1726: L. F. Marsigli, Danubius Pannonico-Mysicus. Observationibus geographicis, astronomicis, hydrographicis, historicis, physicis perlustratus et in sex tomos digestus II (Hague, Amsterdam 1726).

Mignon 2009: J.-M. Mignon, Orange antique. 1. L'urbanisme. In: A. Roumégous, Orange et sa région. Carte Archéologique de la Gaule 84, 3 (Paris 2009) 104-116.

Millett 1991: M. Millett, The Romanization of Britain. An essay in archaeological interpretation (Cambridge 1991).

Oltean 2007: I. A. Oltean, Dacia. Landscape, colonisation and romanisation (London, New York 2007).

Peterson 1988: J. W. M. Peterson, Roman Cadastres in Britain. 1. South Norfolk A. Dialogues d'Histoire Ancienne 14, 1988, 167-199.

1992: J. W. M. Peterson, Trigonometry in Roman cadastres. In: J.-Y. Guillaumin (ed.), Mathématiques dans l'Antiquité. Centre Jean Palerne: Mémoires 11 (Saint Étienne 1992) 185-203.

Piso 1993: I. Piso, Fasti Provinciae Daciae. 1: Die senatorischen Amtsträger. Antiquitas 1, 43 (Bonn 1993).

1995: I. Piso, Le territoire de la Colonia Sarmizegetusa. Ephemeris Napocensis 5, 1995, 63-82.

2003: I. Piso, L'urbanisation des provinces Danubiennes. In: M. Reddé / L. Dubois / D. Briquel / H. Lavagne / F. Queyrel (eds), La naissance de la ville dans l'antiquité (Paris 2003) 285-298 = Heidelberger Althistorische Beiträge und Epigraphische Studien 41 (Stuttgart 2005) 487-506.

2005: I. Piso, Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa. Brève présentation et état de la recherché. In: I. Piso (ed.), An der Nordgrenze des Römischen Reiches. Ausgewählte Studien (1972-2003). Heidelberger Althistorische Beiträge und Epigraphische Studien 41 (Stuttgart 2005) 435-457.

2006: I. Piso, Le forum vetus de Sarmizegetusa I. Colonia Dacia Sarmizegetusa 1 (București 2006).

Piso / Diaconescu 1999: I. Piso / A. Diaconescu, Testo epigrafico, supporto architettonico e contesto archeologico nei fori di Sarmizegetusa. In: Atti del XI Congresso Internazionale di Epigrafia Greca e Latina, Roma 18-24 settembre 1997 (Roma 1999) 125-137.

Piso / Țentea 2008-2009: I. Piso / O. Țentea, Templul lui Yarhibol. Valachica 21-22, 2008-2009, 190-191.

Popa 1984: R. Popa, Ulpia Traiana Sarmizegetusa Britonia. Zeitschrift für Archäologie des Mittelalters 12, 1984, 7-25.

1988: R. Popa, La începuturile evului mediu românesc. Țara Hategului (București 1988).

Romano 2003: D. H. Romano, City planning, centuriation, and land division in Roman Corinth. In: C. K. Williams II / N. Bookidis (eds), Corinth, the Centenary: 1896-1996. Corinth 20 (Athens 2003) 279-301.

2006: D. H. Romano, Roman Surveyors in Corinth. Proceedings of the American Philosophical Society 150, 2006, 62-85.

Rusu 1979: M. Rusu, Castrul roman Apulum şi cetatea feudală Alba Iulia. Anuarul Institutului de Istorie şi Arheologie din Cluj-Napoca 22, 1979, 47-70.

Rusu-Pescaru / Alicu 2000: A. Rusu-Pescaru / D. Alicu, Templele romane din Dacia 1 (Deva 2000).

Thulin 1913: C. Thulin, Corpus Agrimensorum Romanorum (Leipzig 1913).

Ward-Perkins 1974: J. B. Ward-Perkins, Cities of Ancient Greece and Italy: planning in classical antiquity (New York 1974).

Zusammenfassung / Abstract / Résumé / Rezumat

Die Topographie der *Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa* und die erste Centuriation in Dakien

Die vorliegende Untersuchung behandelt aktuelle topographische Arbeiten und Studien zur antiken Landschaft in der *Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa*, der Hauptstadt der römischen Provinz Dakien. Obwohl dort bereits seit dem 16. und 18. Jahrhundert Vermessungen durchgeführt wurden, haben Ausgrabungen erst im 19. Jahrhundert begonnen. Ab der Mitte des 20. Jahrhunderts fanden wissenschaftliche Forschungen statt. So wurden topographische Pläne ausgearbeitet und in den 1970er- und 1990er-Jahren publiziert. Die jüngsten topographischen Untersuchungen mit modernem Gerät wurden von den Autoren dieses Beitrages zwischen 2008 und 2010 durchgeführt, wobei durch den Abgleich von topographischen Daten und Satellitenbildern interessante Relikte einer alten Landschaft und eines Katastersystems ans Tageslicht kamen. Diese sind nun die ersten Spuren einer römischen Centuriation in der Provinz Dakien.

The topography of *Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa* and the first centuriation in Dacia
The paper deals with advanced topographical and ancient landscape research at the *Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa*, the capital of the Roman province of Dacia. Even if topographical surveys had been conducted previously as early as in the 16th and 18th centuries, excavations here were not undertaken until the 19th century. In the mid-20th century, scientific research was established at the site. Subsequently, topographical plans were elaborated and published in the 1970s and 1990s. However, the latest topographical survey was led between 2008 and 2010 by the authors of this paper, with state-of-the-art equipments, and overlapping the measurements on the satellite photography, revealed interesting features of the ancient landscape and cadastre. It is now sure that these are the first traces of Roman centuriation in the province of Dacia.

La topographie de la *Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa* et la première centuriation en Dacie
L'étude concerne une recherche avancée de topographie et de paysage ancien à *Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa*, la capitale de la province romaine de Dacie. Même si des relevés topographiques ont été faits précedemment, au cours des 16e et 18e siècles, les fouilles n'ont débuté qu' au 19ème siècle. Des recherches scientifiques ont eu lieu sur le site au milieu du 20e siècle. Par la suite, des plans topographiques ont été réalisés et publiés dans les années 1970 et 1990. Toutefois, la dernière étude topographique a été menée entre 2008 et 2010 par les auteurs de ce document, à l'aide d'équipements modernes, et par recoupement des relevés sur la photographie satellitaire. Des caractéristiques intéressantes du paysage ancien et du cadastre ont été mis au jour. Il est maintenant sûr que ce sont les premières traces de centuriation romaine dans la province de Dacie.

Topografia *Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa* şi prima centuriaţie din Dacia
Studiul priveşte cercetări avansate de topografie şi peisaj antic la *Colonia Ulpia Traiana Augusta Dacica Sarmizegetusa*, capitala provinciei romane Dacia. Chiar dacă ridicări topografice au mai fost făcute, în mod repetat în secolele al XVI-lea şi al XVIII-lea, săpăturile arheologice au debutat doar în secolul al XIX-lea. La jumătatea secolului al XX-lea a fost stabilită cercetarea ştiin ifică sistematică pe acest sit. Ulterior au fost publicate planuri topografice în anii 1970 şi 1990. Cu toate acestea, cele mai recente cercetări topografice au fost conduse de autori, între anii 2008 şi 2010, cu aparate de ultimă genera ie, şi, prin suprapunerea măsurătorilor pe fotografiile satelitare, au ieşit la iveală o serie de caracteristici interesante ale peisajului şi cadastrului antic. Este sigur că avem de-a face cu primele urme alte centuria iei în provincia romană Dacia.

Schlüsselwörter / Keywords / Mots clés / Cuvinte-cheie

Rumänien / römische Kaiserzeit / Landschaftarchäologie / Kataster / Centuriation
Romania / Roman Principate / landscape archaeology / cadastre / centuriation
Roumanie / époque romaine / archéologie du paysage / cadastre / centuriation
România / Imperiul Roman / topografie aheologică / cadastru antic / centuriaţie

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3/08