Abstract: The project addresses the historical monuments comprised in the longest Roman 'linear defence' structure present on the Romanian territory. Despite it being the longest, this historic structure is the least protected and the least known in its technical details. Was indeed *Limes Transalutanus* an incomplete *limes* (lacking civilian settlements, for example), an odd construction (a *vallum* without *fossa*), an early-alarm line rather than a proper defensive line? Taking on these historical and archaeological challenges, the team attempts to develop an investigation technology applicable to large scale archaeological landscapes - a full evaluation chain, involving aerial survey, surface survey, geophysical investigation, multispectral images analysis, statistic evaluation and archaeological diggings. This technological chain will be systematically applied on the whole length of the objective, that is, on a 155 km distance. The attempt to find answers to issues related to the earth works' functionality, layout, structure, chronology and relation with adjacent sites will be grounded on exploring the relations of the monument with the surrounding environment, by focussing on finding methods to reconstruct the features of the ancient landscapes, like systematic drilling, palynological tests and toponymical studies.

**Keywords**: Roman frontier, UAV, geophysics, viewsheds, toponymy

**THE OPPORTUNITY**

Beginning with July 2014 a new research project will unfold, for the next two years, under the UEFSCDI Partnerships Programme for Joint Applied Research 2013: 'Interdisciplinary technology for archaeological field survey. Case Study – *Limes Transalutanus* south of Argeș River’. Being a complex project, mainly due to its technological aims, it was designed as a partnership between three competent entities: Romanian National History Museum, Romanian Academy Institute of Archaeology 'V. Pârvan', and Vector Studio Bucharest – a private enterprise active in the field of interdisciplinary services for archaeological research.

The project, initially proposed for competition in the area of *Novel practices for heritage investigation*, was developed on a double axis – a methodological experiment and a historical issue, the state of art for the Roman frontier known as *Limes Transalutanus* being seen as suitable example to test the limits of various methods and establish meaningful investigation sequences. The quest for relevancy of investigations, beyond their rather common (and disappointing) implementation as merely fashionable scientific embellishments or prestige testimonials, and the acknowledgement of the overall financial difficulties in the national research departments, has determined the involved interdisciplinary team to look for
realistic, alternative and non-costly solutions, like assessing toponymy dynamics in GIS analyses, extensive use of highly-customized UAVs, airborne geophysics and systematic surface surveys, permanently accompanied by geodetic and geophysical control. Focusing on data integration, efficiency and methodological complementarity, the activities were generally designed to respond to the need of finding efficient ways to document large scale archaeological landscapes, especially in relation with lane-like projects (motorways, for example), as the limes was, essentially, a linear set of sites.

As an opportunity to calibrate technologies, Limes Transalutanus represents a truly provoking case study, by both its historical complexity and nature of its preservation state, if considering that the targeted sector stretches along altered agricultural lands. Pertinent formulation of historical and archaeological questions and honest challenging of traditional interpretations will support methodologies to gain relevancy and become objective instruments for testing and exploring historical scenarios.

Limes Transalutanus is a modern age concept, showing exactly the way it has been scientifically perceived - an advanced frontier beyond the River Olt (Alutus in Antiquity), aimed to defend the main border of the Empire, and apparently mandatory to relate to its counterpart, the Limes Alutanus - itself a modern day construct. From the association of names to the emergence of the ‘double limes’ concept it was just a small step. Unfortunately, analogies for a ‘double frontier’ (which is just another expression for ‘double limes’) remain difficult to establish, either as facts or theory, reason for which we acknowledge the necessity to reconsider it.

In a very recent occasion, we advocated that the main reason for making Limes Transalutanus was not to attain an improved defence of the lower parts of Dacia Malvensis (southern Oltenia of our days), but to shorten the length from Danube to Râşnov; according to our calculations was not less than 426 km, stretching from Drobeta to Porolissum, via Apulum. During the second century, the Romans tried to solve this problem by bringing the logistic caravans either from south (via Pietroasele-Drajna-Tabla Buţii-Boroşneu), either from east (from Barboşi, via Piroboridava-Troţuţ Valley-Outuz Pass). The first route was abandoned as a consequence of the peace made by Hadrianus in 118, with Roxolani, when all Roman troops between Lower Olt and Lower Siret were withdrawn. The second route, although theoretically located outside the Roman borders, survived miraculously for about seven decades, until around 180-190 AD, as shown by the ceasing of monetary circulation in that major hub of communication which was Piroboridava. In these conditions, the single route left for communication followed the Olt Valley, its major drawback being its length: from the Olt mouth to the fort from Comalău there are no less than 426 km; for comparison, the route along Limes Transalutanus has 312 km, which is still much, but still only 73% of the previous one, or about 5 days of travel less for heavy caravans.

Travelling by it, not once or twice, but all the time, for about another half a century, could have made this difference to matter.

A good reason to speak about lengths is to explain why our project did not encompass all the border known as Limes Transalutanus: in a two years project, at the level of the usual financial support for this kind of projects, would be not only impossible, but ridiculous, as well, to try to understand (map it, describe it, etc.) such a huge linear target. There is also a second reason: the type of border at the stake. North of the Argeş River the Roman frontier is mainly a strategic road and not much else, being protected by forested mountains and with almost no side corridors to drive the barbarians into the Empire. South of Argeş River the situation is strikingly different: that is a frontier crossing a plain, much of the time without the minimum protection of a high terrace (ripe). Earthworks were those marking here the Frontier.
Fig. 1. Map of Limes Alutanus and Limes Transalutanus.
The first scientific approach of *Limes Transalutanus* was made by the German archaeologist Carl Schuchardt (1885, 228-229)\(^\text{11}\); in short, he considered the southern part of *Limes Transalutanus* as being a Roman road, not a military dyke. Let’s say only that in the same volume Schuchardt dealt with all the *valla* from the Lower Danube, not only with this one, but only this was considered ‘just a road’\(^\text{12}\).

A completely different resolution gave, a decade later, Grigore Tocilescu\(^\text{13}\) and Pamfil Polonic\(^\text{14}\) (Tocilescu’s topographer), which described a dyke made of burned clay, but also without ditches. They made the crucial observation that all the forts they saw – 9 at that time – were located west of the monument, qualifying it as a dyke, and not a road. If the Tocilescu’s book has some notoriety, even in our days, the work of Polonic is rather unknown, being not published. His notebooks, preserved in the archives of the Romanian Academy, contained also sketches for the location of the forts, which even if not very accurate, are vital for understanding the monument’s state of preservation at the late 19\(^\text{th}\) century\(^\text{15}\).

The archaeological contributions made between the world wars were rather poor, although some diggings were done, in Băneasa\(^\text{16}\), Urlueni\(^\text{17}\) and Săpâta de Jos\(^\text{18}\) – resting here south of Argeş! Although they tried, the authors failed to understand the stratigraphy and some relevant phases of the forts’ construction (for instance, the two halves of the ‘double fort’ from Băneasa are still not explained). Among achievements one could count the recovery of a monetary hoard in Săpâta\(^\text{19}\) – still critical for establishing the *limes* chronology – and the Roman baths, on the same site – the first sign of a ‘normal *limes*’.

The post-war period, although generally defined as a ‘golden age’ of the Romanian archaeology, brought no news on *Limes Transalutanus*. The only relevant diggings in the first three decades were rescue ones, on the occasion of building irrigation channels by cutting the dyke in many places\(^\text{20}\), however, the only published drawing\(^\text{21}\) was recently considered at least debateable\(^\text{22}\). ‘New’ was only the historical synthesis made by D. Tudor (1978)\(^\text{23}\), containing also data for *Limes Transalutanus*, first account passing the state of an ‘introduction’; this is, probably, one of the most read and most cited work in Romanian archaeology. Nevertheless, the personal contributions brought by D. Tudor for this segment of *limes*, south of Arges River, were very limited.

The only archaeologist working along *Limes Transalutanus* longer than three campaigns was I. Bogdan Cătănicu. She published relatively numerous works on the subject, including in foreign languages\(^\text{24}\), concluded by a book in 1997. She dug a tower, three sections on the wall (in different locations, near Danube, between Valea Uralui and Roşiori, and east of Urlueni), and made diggings in several forts, Flămânda (the large fort), Putineiu and Urlueni (both forts). She understood the key position at the confluence of the rivers Cotmeana and Veda, searched after a new fort, but did not find it (yes, it is there...). Her contribution is important, but undermined by a too determined conviction that the *limes* was founded in the time of Hadrianus\(^\text{25}\). In addition, the inability to work with maps and aerial snapshots concluded in a rather difficult to use illustration.

There is also worth mentioning the excavation campaign initiated by Romeo Avram, concluded in short dig tests – less than one month for each – in the forts from Gresia\(^\text{26}\), Crâmpoia\(^\text{27}\) and Izbâşeni\(^\text{28}\). As a result, we have today only two forts with known location, but without any diggings, Valea Uralui and Albota, and a third fort, Roşiori, drawn by Polonic but never seen since.

Instead of an overall diagnostic of the state of art, we would stress one single fact: none of the forts south of the River Argeş, along *Limes Transalutanus*, has a proper topographic survey; as about their exact geographical coordinates, they were established just recently\(^\text{29}\).

\(^{11}\) That was a common opinion in the late 19\(^\text{th}\) century; for instance, Marele Dicţionar Geografic al României (The Great Geographical Dictionary of Romania), vol. 5, 1902, s.v. Telernaim, subtitlu ‘drumuri vechi’ (old roads, 586-587), was writing that the so-called ‘croasne’ (a popular word for ancient *valla*) ‘they still keep their old names and are still used as roads; here and there they also count as landmarks for property boundaries’ (authors’ translation).

\(^{12}\) The reasons are multiple. First of all, the local tradition considers it a road (‘Calea lui Traian’, meaning the Road of Traian), and used it like one (a common fact on all European former *limes*). This tradition is inclusively reflected in some maps of the time, like the Third Austrian Survey (published entirely in 1910, with older data after 1868); such military productions were available for top archaeologists of the time, even if not ‘public’ yet – and with a better scale than we know them today, 1:20,000, ten times more detailed – as witnessed by R. Netzhammer (NETZHAMMER 2010, 104-165, esp. 118) in a text dated January 1907. A second reason is the apparent profile of the monument, relatively symmetrical on the both sides of the ridge, as a Roman road. What he did not understand is that the mass of a road is not in the same class with a dyke, and cannot have, after 16 centuries, 15 cubic metres for each linear metre (or more) above the ground. We are looking, then, after a dyke with a structure similar with a road, having two ditches...\(^\text{13}\)

\(^{13}\) TOCIULESCU 1900, 121-133.

\(^{14}\) Pamfil Polonic was a topographer (of Austrian military school), being the right hand of the Professor Tocilescu, the Head of the National Museum of Antiquities – the former name of the Institute of Archaeology from our times. Although his main opus – granted with a prize by the Romanian Academy in 1917 – has remained unpublished, is available for study in the Library of the Romanian Academy. Some of these manuscripts, being just his working notebooks, are hold in copy at the Institute of Archaeology from Bucharest. The notebook pages regarding *Limes Transalutanus* were recently published, TEODOR 2013, 205-212, along some of his sketches. For the life and work of Pamfil Polonic, see IUGA 1942.

\(^{15}\) And crucial, sometimes, for the location of the monuments. It is the case, for instance, of the fort from Albota, it was retrieved – with difficulties – in 2012, only after an attentive study of the positioning sketch.

\(^{16}\) CANTACUZINO 1945.

\(^{17}\) V. Cristescu, but his diggings were published much later, merged with the research conducted by I. Bogdan-Cătănicu, BOGDAN-CĂTĂNICU 1997, 96-104.

\(^{18}\) CĂTĂNICU 1938.

\(^{19}\) That is, the monument was founded in the time of Claudius.

\(^{20}\) No less than 12, TUDOR 1978, 254; BOGDAN-CĂTĂNICU 1997, 87.


\(^{22}\) TEODOR 2013, 107

\(^{23}\) This is the year of the fourth edition (revised); the first edition was published in 1942.

\(^{24}\) BOGDAN-CĂTĂNICU 1974; BOGDAN-CĂTĂNICU 1981; BOGDAN-CĂTĂNICU 1993; BOGDAN-CĂTĂNICU 1995. BOGDAN-CĂTĂNICU 1997 has also a large English summary.

\(^{25}\) BOGDAN-CĂTĂNICU 1997, esp. p. 100.

\(^{26}\) AVRAM 2000.

\(^{27}\) AVRAM 1999. For this campaign there are no notes, but a few artefacts in the repository of the National Military Museum, along with some drawings (a general plan with the location of the trenches and profiles of *valla* and *fosae*).

\(^{28}\) AVRAM 1996, PETOLESCU et al. 1995.

\(^{29}\) TEODOR 2013, 213-216.
AIMS AND MEANS

The already cited book from the past year is nothing more than an inventory of facts collected from the literature and filtered/integrated through a typical set of landscape archaeology analyses: a GIS file, various historical maps, orthophotographs coming from several sources and with different time spans (three complete covers of the national territory made by ANCP[31] and the well-known international sources), for elevation data, vector files (for routes, administrative boundaries of several ages, others)[35]. The book made clear lot of facts, but left open many questions.

Although we already rejected the thesis of a dyke without a ditch, this should be tested on the field, by all means – geophysics and geological drilling, or even by an archaeological digging, if necessary. The layout of the Roman earthworks presents obvious outgrowths in several places, as west of Roşiorii de Vede, around Movila Șarpeului (see Fig. 1) and east of Săpăta de Jos; some of them – but not all of them – could be explained as a consequence of the route being firstly used during the Dacian wars and in the first years of the Province, with slight location variations in some places. An intersection of roads near Valea Mocanului (between the forts from Valea Urlui and Roşiorii[36]) might be, very well, a result of that history. There is no doubt that the defensive positions had been redrawn in certain points, although the limes was used only for about half a century. First of all, still, we need detailed plans of its design, before proposing more grounded interpretations.

The research project should reveal the spatial and strategic relationships between the main elements of the military facilities: the forts, fortlets, signalling towers, the dyke, the watching towers and the roads between them.

30 The military map of Romania issued in late 1970s and early 1980, usually referred to under the acronym DTM (from Direcția Topografică Militară, the publisher of the set), at the scale 1:25,000; the military maps known as Planurile Director de Tragere (acronym PDT), made (and remade) between 1916 and 1968, at the scale 1:200,000 (http://earth.unibuc.ro/download/planurile-directoire-de-tragere); the Third Austrian Survey, made after 1868, but printed in 1910, at the scale 1:200,000 (re-projected in Stereo70, see Geospatial http://earth.unibuc.ro/download/harile-austriece-1910-reproiectate-in-stereo70); after closing the Romanian version of the book, it became available the so-called Szathmári Map (http://charta1884.ro/charta.html), at the scale 1:28,000. The first set in the list is used by many GIS practitioners, from several years, but a formal agreement of DTM for the civilian use is no older than 27 May 2011 (the document is yet not public). From April 2014 it has become available the Second Austrian Survey (made between 1806-1869, see http://mapire.eu/en/earth/collection/secondsurvey/), but without notable news for Walachia, being made in the same period (1855-59) and from the same military team, the only differences being in the graphic design. All web-links from above were checked in 16 Sept. 2014.


32 Mainly SRTM (Shuttle Radar Topography Mission), from several web sites (as srtm.cgiar.org/ or srtm.usgs.gov/) with 90 m resolution. From October 2013 there is also available an European DEM (http://www.eea.europa.eu/data-and-maps/data/eu-dem), apparently much better (at a resolution of 30 m, see also http://www.eea.europa.eu/data-and-maps/data/eu-dem#tab-metadata), very large and difficult to use, and still far from the expected accuracy.

33 Many of them are resources shared by the Geospatial community from Bucharest (http://earth.unibuc.ro/).

34 TEODOR/ŞTEFAN 2014, fig. 4.


36 This was possible thanks to a protocol between the Defence Ministry and the Culture Ministry (no. 4096/ 13 Sept. 2013).
an important emendation to our knowledge, showing a strong turn to south-southeast, leaving thus the ‘classical’ route Pitești-Albota supposed earlier (the fort from Albota is located southwest of the village), and proposing a new route, heading the town of Costești, but the continuation is still to be found.

We made the first UAV’s tests in 11 August 2014, as part of an experiment of ‘lucrativeness’ (aiming to answer the question ‘when we should fly?’), projected to take place in four distinctive moments of the year (early November, early April, June and August) and above locations of special interest; one of them is the great turn of the dyke, east of the village Albota, near the toponym Poiana Roșie (The Red Glade...; of course, no forest around...). The results – unexpected good for the worst period of time elected within the experiment – are resumed in the Figure 2. August is not the best option to fly, of course; we had to deal with sunflower crops, two metres high, and vigorous cultures of corn (it has been an unusual rainy year in this part of the country, habitually with dry summers). Worse than the growing cultures were the former cultures, as a plot of land covering the northern route of the dyke (as represented in the Fig.2), a harvested barley area, with a thick layer of straw abandoned on the field, obviously ‘blurring’ the image.

The topographical render of data acquired from UAV and processed by photogrammetric algorithms made yet the miracle, revealing back the searched dyke (Fig. 2, right-down).

![Fig. 2. The big turn of the dyke near the spot Poiana Roșie – Albota. Above – the military orthophotos (2012) with elements of localization (white arrows for the dyke); left – orthophotography acquired from UAV (XX August 2014); right – the digital surface model of the UAV picture.](image_url)
An interesting and very expected test will be the geophysical prospection from UAV, namely magnetometry – the first implement of this technology at international scale, as we know it. The great challenges of balancing the equipment in relation to the carried exterior magnetic sensor and ensuring a constant and low flying altitude (ceiling) will require considerable amount of testing and manufacturing. However, the linear aspect of the investigated monument and the existence of burnt sectors along the dyke – with an expected highly magnetic response, make Limes Transalutanus the perfect archaeological target for this type of technological and instrumental experiment.

The greatest hopes, however, in terms of efficient geophysical prospection with archaeological significance are those for magnetic susceptibility – by far the cheapest, easiest to apply and process, and rapid, even if almost unknown at international scale\textsuperscript{38}. It has a great productivity (about 5 square kilometres a day), its main applicability being the identification, by contrast, of human occupation sites in relation to non-site areas and to establish, inside sites, areas of increased human activity. Magnetic susceptibility measurements will accompany in real time the surface surveys, being enough relevant even if georeferenced by GPS.

As much as possible, the aerial reconnaissance will anticipate and prepare the missions on soil. The last are of several types. First of all – what we called ‘linear survey’, along the limes, for a terrestrial reconnaissance, searching for any signs of landscape alteration. All these will prepare a decision about the areas were systematic surveys will be done. The collection of artefacts and the observations about the soil surface will be doubled by a complete investigation of the area (topographical and geophysical survey).

Previous surveys on the limes warn about the eclectic kind of pottery sherds possibly to be found, especially on the spot of the former watch towers. In order to be able to correctly identify the artefacts, we planned a preceding pottery study on inventories collected in regular diggings, on both Roman sites from the area (Gresia, Crâmpoia, Izbășeni)\textsuperscript{39} and sites classified within the cultural group Chilia-Militari (as Alexandria, Dulceana, Mătășaru, Chilia, Scornicești)\textsuperscript{40}. The area of this cultural group is laying on the both sides of the Roman border, being considered a product of a Getic population on the way of Romanisation – a fact clearly visible on pottery.

Separate missions will be dedicated to geologic drills and collecting soil samples for reconstruction of the stratigraphy and for palynological and pedological analyses. If the first is aimed to collect stratigraphic data without having to make a slow and expensive excavation, the next are part of an effort to reconstruct the environment of the former ages. Understanding the old environment is a key of the research project, because the Romanian Plain has changed dramatically, especially in the last two centuries. Once covered with dark and fearful forests – as proved by the name of a river in the area, Teleorman, meaning ‘The Mad Forest’ – today it is a huge agricultural field, almost completely devoid of the trees’ shadow.

The Roman border south of Argeș River can be

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure3.png}
\caption{Newly discovered segment of dyke, near the toponymic Pădurea Grozeasca (coordinates for the middle arrow: 44.68402462° N, 24.79593692° E). Black dashed lines are suggesting the direction of the main natural draining grooves in the area. Military orthophotography, 2012.}
\end{figure}

\begin{itemize}
\item \textsuperscript{38} TITE/MULLINS 1971.
\item \textsuperscript{39} A selection of the digging inventories is preserved in the National Military Museum; happily, the management of the museum allowed us to study this collection resulted from Romeo Avram’s diggings, because he has retired from both army and archaeology.
\item \textsuperscript{40} These are some of the most relevant excavated sites of the Chilia-Militari Culture (we are mainly interested in the western – Chilia – area of the culture); see DOLINESCU-FERCHE 1974 for Dulceana; BICHR 1986 for Scornicești; BICHR/POPESCU 1970 for Mătășaru; MORINTZ 1962 for Chilia; BICHR 1980 for the concept of Chilia-Militari culture; the diggings from Alexandria (the ring route of the city, preventive works, 2012) are recent and not published, but we have the agreement of the field archaeologists (Christian Schuster, Mihaela Simion, Constantin Băjenaru) to study the pottery of what already seems to be the main reference as a settlement of the Chilia-Militari Culture.
\end{itemize}
divided in at least three separate parts: the southern one, 55 km long, made by a continuous dyke, because the frontier was crossing several valleys, in the flat plain; the central one, 40 km long, in which the border was made by a 20 m high terrace, almost vertical, of the rivers Vedea and Cotmeana (from south to north); a last segment – near the Argeș Valley – 55 km long, being again a route across plains and valleys. This time the dyke is not complete: we know a southern dyke of 8 km, documented by Polonic, and a northern one, described also by Pamfil Polonic, for about 5.4 km, from a position east of the village Albota up to the railway station from Pitești, and a middle segment, of only 2.5 km, near the toponymic Pădurea Grozească (‘pădure’ means a forest, but the forest was cut), in a point which looks like an interesting crossroad. In the Figure 3 one can see the unmistakable mark of a dyke, between two draining grooves. The route is marked on all detailed maps (Szathmári, PDT and DTM) as a mud road (today out of use), but it cannot be just a road, from two very good reasons: it has an extruded profile (see Fig. 3), which is not a feature of a mud road, at least not in this corner of the world; and it is far too wide. Our measurements on orthophotos, as relative as they are, show that the width of the elevated part measures around 13 m, three times larger than a casual country road. An intriguing fact is that the image suggests, as well, the presence of a ditch on the western part, but this isn’t quite a surprise anymore, similar features being already observed in other parts of the monument. We can thus expect a bilateral ditch, which would explain the symmetric profile of the ruined embankment, as rightly observed by Schuchardt or Polonic.

One of the biggest questions the project has to provide answers to is if the dyke was completely made by Romans, from Urlueni to Pitești (which is unlikely), or, if not – why not?

**TOWARDS A TOPOYMYICAL LANDSCAPE ARCHAEOLOGY**

As everybody knows, arguments coming from toponymy are rather common in the archaeological discourse; nevertheless, the recourse to toponymy has never benefited from a systematic approach. The reason is plain: there are no available toponymic datasets, at least not in Romania. A second reason is that in the cases of the developed countries (and archaeologies!) the historical archives are good enough and old enough to allow a ‘reconstruction’ of the landscape, of course, with the blessed assistance of the biological laboratories... This is not our case, most of the time. As already mentioned, the oldest reliable, detailed and accessible map was made at the middle of the 19th century. The alteration

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41 But in the 1970's Ioana Bogdan-Cătăniciu (BOGDAN-CĂTĂNICIU 1997, 84) was able to find only about 5 km, from Urlueni to the Hârsești Forest (where she made a test digging). Today, on the best orthophotos, one can see only 2.5 km.

42 Today, on orthophotos, one can see only about 2 km, and other small segments with great difficulty; at the soil level the dyke is completely gone.

43 In this orthography in PDT, ‘Grozasca’ in DTM, a form more archaic, although the source is more recent.

44 Although the light of the sun is coming from south-southwest (see the shadow of the pole, in the Fig. 3), the darker side of the dyke is the western one.

45 We already mentioned that the Second Austrian survey has become available since several months ago, for public use (it has a Google Earth

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**Fig. 4. Forests on the southern segment of Limes Transalutanus, from Danube to Gresia. Projection Stereo70, geographical coordinates. Note: Toponymic data from DTM map (1980s)**
of the landscape, in the meantime, was consistent. In a short paper sent for publication almost in the same time with this one\textsuperscript{47} we have illustrated the deforestation exactly on the segment discussed above, between Urlueni and Alboata. For this occasion we prepared a complementary illustration, highlighting the same facts for the comparative segment between Danube and the fort from Gresia, where one can see a continuous dyke (Fig. 4). What we did not do for Antiquity (missing the necessary space) was to give the statistics; we can do this now, for both segments.

Looking at both figures\textsuperscript{47} and the subsequent statistics, we can draw some provisional conclusions: the deforestation in the mentioned interval evolved in a similar way in both areas, although the figures are suggesting a worst situation in the south; in fact, the almost complete lack of forests is characteristic only for a segment beginning with the half way between the forts Băneasa and Valea Urlui, where the village and the railway station Trojan can be found, which is also the place where \textit{Limes Transalutanus} is intersected by the southern Bzada lui Novac\textsuperscript{48}. This situation could hardly be due to a more intense agricultural exploitation, mainly looking at the mediaeval history of Walachia, born around the towns at the mountains’ foot, like Cămpulung, Curtea de Argeş and Tărgovişte, the Middle Age villages spreading slowly from north to south, thus from the mountains’ depressions and hills to the plains\textsuperscript{49} (a process crossing mainly the 15\textsuperscript{th} and 16\textsuperscript{th} centuries) and not vice-versa. This could be a solid hint that the lack of forests along the Danube’s terrace could be a natural fact of some age.

The problem is that the modern maps we have at hand cannot do more; we can presume that two or three centuries earlier the forests were spread on about half of the territory interface), but also the fact that it is very similar with Szathmári Map and probably did not change much. The single ‘surprise’ we can – hopefully – expect is a similar event about the so-called Specht Map from 1791, considered a part of the First Austrian Survey (although not available for Walachia at the web-link dedicated for the First survey - http://mapire.eu/en/map/collection/firstsurvey/?zoom=6&lat=47.89035&lon=14.76556), according to BARTOS-ELEKES et alii, 2013, (1). An enthusiastic paper of V. Mihăilescu was stressing the major importance of the Specht Map, being the earlier detailed map of known toponyms is decreasing from the village centre to the border of its lands; second – the forests, of course, need water. Beyond these, the situation of our days, with clustering forests along the main rivers, could be, very well, a structural landscape very similar with the antique one, but at a completely different scale. The consequence of this sketchy reconstruction of the landscape would be an unexpected explanation: the apparently very odd decision\textsuperscript{51} made by Romans to cross the river Cotmeana and to build a dyke 3.5 km east of the river, and almost parallel with it, tends now to make sense: the Romans took the good place, in the shadow of the forest, but at its eastern limits, leaving the flat and uncovered plain to the visitors...

The toponymic enquiry – now at the very beginning – has many folds to search in, beyond the forestry terminology. Also interesting for the landscape restitution is the hydronymy – in its widest sense, as all the words referring the water (wells, lakes, etc.). A word caught our attention, due to a certain frequency: ‘găvan’, having probably the closest translation in ‘aimple’. On the DTM map one can find that the plain east of Vedea and Cotmeana rivers is named ‘Găvanu-Burdea’\textsuperscript{52}, containing the key-word ‘găvan’ (of obscure origin). This is a dish-like shape of the terrain, occurring on the flat plains, where the rain water is gathered, having no drainage. But the folk choices to name those natural dishes are different, as ‘lac’ (lake, from lat. \textit{lacus}), ‘balta’ (puddle, of uncertain origin, arguably an old Slavic ‘blato’, or ‘baltos’), or even ‘heleșteu’ (from the Hungarian word ‘halastó’), meaning more specific a fishing pool. ‘Găvan’ occurs frequently, yet not where expected, on the middle course of Teleorman River, where Găvan Plains

<table>
<thead>
<tr>
<th>Area</th>
<th>Surface</th>
<th>Northern area (Urlueni-Albota)</th>
<th>Southern area (Danube-Gresia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>forest extent in Szathmári Map</td>
<td>469 km²</td>
<td>19.80%</td>
<td>10.92%</td>
</tr>
<tr>
<td>forest extent in orthophotos 2012</td>
<td>1044.5 km²</td>
<td>7.37%</td>
<td>3.27%</td>
</tr>
<tr>
<td>ratio 2012 versus 1860</td>
<td>37.22%</td>
<td>29.94%</td>
<td>20.79%</td>
</tr>
</tbody>
</table>

We are still in the very beginning of the project, and we collected, so far, only the toponyms from the latest map – DTM (1980s), which are more than 2100, for an area about 20 km west and east of the former \textit{limes}.

More comments on this in TEODOR 2013, 65-66.

In a more detailed classification (as that made by Bogdan Candrea, as a downloadable vector files of the relief units, see http://earth.unibuc.ro/download/harta-unitati-relief-romania), Găvan Plain is east of Teleorman River, and Burdea Plain is west of Teleorman. The relief on the both sides of the middle Teleorman Valley is the same.

\textsuperscript{47} We are still in the very beginning of the project, and we collected, so far, only the toponyms from the latest map – DTM (1980s), which are more than 2100, for an area about 20 km west and east of the former \textit{limes}.

\textsuperscript{48} More comments on this in TEODOR 2013, 65-66.

\textsuperscript{49} \textbf{Dicționarul etimologic român, 1958-1966.}
lays, but in the lower Basin of Călmățui River. The high rate of occurrence made us curious to see if there are, in the field, other ‘dishes’ than the named one; of course, there are plenty of them. The Figure 5 makes clear a fact: the flat plains between the valleys and ravines are full of depressions able to turn a half-desert in a huge marsh. This is a specific of the area well known for locals, turning the dust in dirt, as the authors of the Great Geographical Dictionary of Romania were writing in the late 19th century, about Burdea Plain:

‘when rains too much, the waters stand (on the field), but on dry weather the land is cracked’.

The altogether picture resulted from this short analysis is a plain cut by relatively deep valleys, with forests developed along the main rivers, and flat ridge areas, between the rivers, where vegetation is lower (bush-like, very likely), with many poodles turned sometimes in more or less permanent swamps (for which there is toponymic evidence, too). This does not sound very friendly. Although we do not have an antique description of the area, we know some circumstances at the end of the Antiquity that might be quite descriptive. One of them is Novella XIII emitted by Justinian I (535) against officers guilty of insubordination, threatened to being sent north of the Danube, to defend the Empire’s borders, as an alternative to death. Nice comparison! The issue of troops sent beyond Danube, to gain their food on barbarians’ expenses, especially on winter, remained recurrent for the rest of the sixth century, a never ending nightmare of the Roman troops (and barbarians also). The military handbook written at the end of the century, Strategicon was recommending winter camping north of the Danube, as a solution for shortage of victuals and for avoiding the looting of their own citizens. That this wasn’t just theory was proved by several instances accounted by Theophylact Simocatta. One of them (Histories, VI, 8-10) – referring probably to the winter 593-94 – is after the first Roman victory north of the Danube, after more than half a century, against the ‘kings’ Ardagastus and Musocius, in the lower basins of Ialomița, Buzău and Siret, more than 200 km east of the former Limes Transalutanus, but in the same tricky Romanian Plain.

The army received an imperial order to stay beyond Danube over the winter; although victorious and – theoretically at least – self trusting, the soldiers were very close to a revolt, fearing the freezing cold and the number of enemies, but they were settled down by the ability of the general Priscus. A similar order, eight years later, brought the end of the emperor Mauricius and of the Roman rule in northern Balkans; an uprise led the centurion Phocas, initiated by the troops sent north of the Danube, swept the loyal troops from their way to the capital, ending a glorious chapter of the history. The place where the revolt started is not very clear, but probably it is a sector of

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Fig. 5 Forests and dimples between Danube and Lower Călmățui River.

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14 Marele Dicționar Geografic al României, vol. 2, 1899, 77. Burdea is a river immediately east of the Middle Vedea Valley, or, simpler, east of the Roman frontier.

15 TEODOR 2013, 82.

16 CURTA 2001, 77.
the frontier in front of Palatiolum, near Oescus, where the mouth of Olt River is located; if so – in the very location of the former Limes Transalutanus, the ‘friendly frontier’.

There are also other hints for the changing landscape in the area of interest for our project. Small details, as you will see. One of them is the occurrence of the word ‘piatră’ (stone), in an area completely devoid of stone. Figure 6 shows the most southern toponyms related to ‘piatra’ (stone) and its derivatives. The fact is intriguing because, looking at the geological map of the area, all there is to see, for one hundred kilometres around, are deposits of clay (50 m thick or more!) on the plain, and alluvionary sands on the valleys. A stone in this plain is exceptional, and this is exactly why it had been recorded in the toponymy. The toponyms showed in the Fig. 6 fall in two different cases: the first is Valea Pietrei (Stone’s Valley), on a tributary of Bratcov Valley, which is a singular form and might suggest a single – amazing, like Kaaba... – stone. It could have any origin, including meteoritic; it is unlikely that it is revealing a reliable source of stone, at less than 10 km behind the fort from Gresia, not known and not used by the Romans. The situation should stay anyway in the attention of our geologists.

A different situation is presented in the north-eastern corner of Fig. 6, where three toponyms stands along the same – also secondary and small – valley, all containing the same word, ‘pietris’, meaning gravel. Such a material is equally abnormal, or at least odd, in the middle of that plain; being on a small and relatively short valley, it is odder. The gravel could be a remanence of geological ages and a proof of a former strong stream – as Argeș, coming from the mountains – because rivers from the area changed a lot their courses.

The occurrence of toponyms related to stones is also present northward, in a perfectly identical geological environment: ‘Valea de la Piatră’ (The Valley from the Stone), located only 5 km west of the fort from Izbașești (another timber and earth fort), being again a singular form and in the close rear of the limes. But the most frequent occurrences of stone-related names are located near the valley of Pârâul Câinelui (Dog’s Creek) and along the Teleorman Valley: La Piatra Oancea (18 km east of the forts from Urlueli); a pair of names, Valea Pietroasa (Rocky Valley) and Valea Pietroasa Mică (The Small Rocky Valley), located 7 km east-northeast of the forts from Săpata, near Teleorman River, but on the route of a suspected variant of road between Săpata Argeș River, bypassing Albota fort.

Of course, the toponymic inquiry cannot grant anything by itself; it can yet give clues and themes of research, and can suggest hot-areas for the landscaper investigator. The isolated stone could be natural accidents, meteoritic activity, but also – especially in areas located in the rear of the limes – possible sites of archaeological interest. On the other part, looking at the ‘meridian’ made by the Valea Pietroasa (Mică), La Piatra Oancea and three times Pietrișul, it could suggest a completely different kind of rivers that those we know today, several times larger and faster. If so, the vegetation associated with this new picture would be several times stronger, isn’t that so? ‘The Mad Forest’ (Teleorman) would deserve its name.

FINAL REMARKS
We tried to advertise here a new research project and its profile, as we see it at its beginnings. What will exactly come up – we shall see together after a moderate length of time. We acknowledged that the way to the hell is paved with good intentions and great plans. Of course, more or less, the success of the project stands in our hands; not entirely, because the financial fluxes in Romanian research are not as predictable as one could wish.

The results of the project will became public through our web-site (expected in early 2015, search for www.limes-
Having in mind that the available... into both cases, following the rule ‘first come – first served’.

**ACKNOWLEDGEMENTS**

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**NOTE:**

42) Thus trying to develop the interest for the subject in southern Romania, where a systematic research of the Roman limitis is newer, compared to Transylvania. The first symposium in the line was held in Brăila, in 2013, the second was held September 2014 in Cumpăna (organised by the County Museum Argeş from Piteşti).

43) This one has already a name: ‘Old Frontiers, New Technologies. An evaluation of costs and opportunities in field archaeology’.

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