Andrei Asăndulesei, *GIS (Geographic Information System), fotogrametrie și geofizică în arheologie. Investigații non-invazive în așezări Cucuteni din România,* Colecție: Bibliotheca Archaeologica Moldaviae, Editura Universității "Al. I. Cuza", Iași, 2018, 274 p., ISBN 978-606-714-215-0.

Adrian ȘERBĂNESCU*

The volume presented here uses an interdisciplinary and multimethodological aproach to study part of what is probably the most famous prehistoric culture within the Eastern European areal – the Cucuteni culture (also known as Trypolie in the ex-sovietic countries). The innovative aspect of this volume (for Romanian archaeology) is the integration of archaeological geophysics in the research strategy as one of the main methods of analysis along with spatial analysis using GIS and aerial prospection means. The author specializes in archaeological geophysics and it is a breadth of fresh air to see it used in this context as scientific methods of study tend to takeover archaeological research in the last decades and the above mentioned is core to almost every relevant wide-scale study.

Studies using different aerial prospection methods such as LiDAR or photography have been published in Romania since early 2000s if not earlier (see I. Oltean 2007, S. Berecki 2015 among others) but employing shallow geophysics alongside a wide range of methods is a premiere for large publications in Romanian archaeology.

The study focuses on a clearly defined area, Valley of Bahluieț River, which was also focused during Dr. Asăndulesei PhD research (Asăndulesei 2017; Asăndulesei *et alii* 2018).

The whole methodology of analysing spatially the paleolandscape and the positioning of Cucuteni settlements belonging to all three phases of the Eneolithic culture uses a wide range of means, from geomorphological and pedological methods to aerial photographs and LiDAR and back down to soil surface using non-invasive geophysical techniques to map the settlements and their archaeological structures.

The results are stunning and it is a good example of how interdisciplinary studies in archaeology produce valuable insights and overturn previously known "facts". Spatial analysis using different methods and indicators leads to the conclusion that altitudes of 1- 200 m were favoured but generally, higher elevation compared with the overall altitude of the area were preferred, with low slopes, favourable for both human access and activities as well as for agricultural purposes, orientated towards the sun for more solar exposure and relatively close to water sources. LiDAR and aerial photographs as well as geophysics have helped create a more accurate picture of those settlements in terms of positioning within the landscape and their internal layout as well as different expansion phases (see the case of Razboieni, Dealu Mare where a subsequent phase of expansion has been determined beyond the first set of defensive structures).

Overall, the book contains five chapters over 240 pages, written in Romanian with an extensive abstract in English at the end, is well structured and contains a chapter for each

* ArchaeoScience#RO - ICUB, Universitatea din București, Bd. Regina Elisabeta 4-12, Sector 5, cod 030018, București, România; adrian.serbanescu@icub.unibuc.ro.

different method employed preceded by a necessary introduction at the beginning and the mandatory conclusions at the end.

The introduction chapter of the book defines different concepts and terms which are used further ahead in the book and are important to understand what the aims and objectives are and how are they achieved. Debates on terms such as *landscape archaeology* or *environmental archaeology* are approached in an objective manner to establish how these terms are used and how they will be further considered.

The next 3 chapters use more or less the same structure. First, a theoretical part with an introduction into GIS spatial analysis, aerial photogrammetry and Lidar and, respectively archaeological geophysics followed by the factual content with a few case studies relevant for the method used.

Chapter two, focuses on GIS and offers theoretical information on GIS and its usage within the archaeology field and how it is used for spatial analysis. A spatial analysis for Cucuteni settlements on Bahluieț valley follows shortly after describing the indicators and methodologies to be employed. Using also specialist geographical information (geomorphological and pedological indicators) conclusions regarding altitude and positioning are drawn among others.

Chapter three, aerial photography and photogrammetry intends to offer more wide-scale, archaeological landscape type information to be used within GIS environment for particular case studies where it can offer key data regarding the layout of the site in terms of nearby geographical context and resources. Newest technology available, LiDAR is also used on the main sites of the chapter like *Războieni* and *Fedeleșeni.*

Chapter four begins with a thorough introduction into shallow geophysics from its beginnings at Oxford University, detailing its purposes and the techniques that have developed over time and how they are used in today's archaeological research. Out of the three case studies presented here, all of them showing impressive results from magnetometry data, mainly due to termoremance of archaeological complexes of the Cucuteni settlements. The survey strategy at the first site, Războieni/Dealul Mare shows how different surveying techniques (earth resistance and magnetometry) are to be used considering all external factors that impact the collection of data. This is also a great example of how geophysics can successfully map the internal layout of a settlement and even detect subsequent phases of expansion of the settlement. From the top of the hill towards the slopes beyond an initial two set ditch and bank type of fortification spreads another alignment of houses and a further defensive fortification system.

Last chapter, the conclusions, takes a look back at the aims and objectives and how the book manage to achieve them. They are outlined on two main directions, one regarding the methodology of such an interdisciplinary study starting with available archaeological data and going through the whole process of obtaining and analysing data in a logical order from topographical and aerial data to geophysics and how each of them brings something new to the table. Second direction is given by the scientific relevance, how successful was this strategy in studying the Cucuteni settlements in the Bahluieț basin. The answer the author gives is: it was successful but the answer is there is no criteria on which the Cucuteni settlements in the area can be classified which was the main goal of the scientific inquiry to begin with.

◈ References

A. Asăndulesei 2017 — Inside a Cucuteni Settlement: Remote Sensing Techniques for Documenting an Unexplored Eneolithic Site from Northeastern Romania, *Remote Sensing* 9(1), 41. Available at https://doi.org/10.3390/rs9010041

A. Asăndulesei *et alii* 2018 — M. Vornicu, A. Asandulesei, G. Bodi and F.-A. Tencariu, Recent investigations in the Chalcolithic settlement of Războieni – Dealul Boghiu, *Materiality and Identity in the Pre- and Protohistoric Europe*, S. Țurcanu and C.-E. Ursu (eds.), Karl A. Romstorfer Publishing House, Suceava, p. 367-395.

S. Berecki 2015 — *Iron Age settlement patterns and funerary landscapes in Transylvania (4th-2nd century BC)*, Mega Publishing House, Târgu Mureș.

I. Oltean 2007 — *Dacia. Landscape, colonisation, Romanisation*, Routledge, London, New York.