

**Review of: Brughmans, T. & Peeples, M. A. (2023). *Network Science in Archaeology*. (Cambridge Manuals in Archaeology). Cambridge: Cambridge University Press. 362 pages. ISBN 978-1-009-17064-2. OA online version: <https://book.archnetworks.net/> [27.9.2023].**

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The application of network science in archaeology is rather new. As in other research fields, the study of network analysis was not originally developed for archaeological purposes. Recently, various authors have demonstrated its usefulness as a resource for working with large amounts of data, but also as a great tool for opening up new perspectives. Network science enables the analysis of complex relational data and thus offers great advantages for archaeologists. By applying network analysis, it is possible to answer old unsolved questions; at the same time, new interrogations arise that could not be dealt with previously. The application of network science implies the conceptualising of phenomena to be studied, with the result being represented in a model. The aim is 'to place relationships at the heart of the analytics techniques' (COLLAR ET AL., 2015). Before getting to this point, it is necessary to know the mechanism underlying this method of analysis. Network science makes it possible to analyse interconnected elements as edges or nodes. These elements can be measured following different criteria. Therefore, the application of network analysis does not only imply the creation of graphics, but also the understanding of the algorithms or indicators depending on the subject being studied and the reasons for the right choice between them.

The aim of this volume is to explain to the reader the possible applications of network analysis in archaeology, depending on research questions, the purpose and the type of data analysed. Tom Brughmans and Matthew A. Peeples, two of the most important specialists in the field of network science in archaeology and authors of several reference publications (e. g., BRUGHMANS, 2010, 2013; BRUGHMANS ET AL., 2016; PEEPLES, 2019), compile the entire knowledge and applicability of this field of research. Furthermore, this book is a handbook. It is structured to be useful for a wide range of readers, including people interested in the subject with no previous formation and up to trained researchers who wish to advance their skills. The book also contains multiple digital archives that can be accessed and downloaded and provides useful practical training. The authors

suggest exercises in some of the chapters (3-7) that can be used to work on the different aspects presented, guiding the reader to a better understanding of some concepts and applications. The exercises can be followed from beginning to end, as it is possible to consult the results in a final appendix (Appendix A). Another remarkable aspect is that each chapter contains a final section that provides some bibliographical recommendations to deepen the knowledge presented in the chapter. Finally, I would like to note that the volume is really didactic in structure; each chapter includes boxes discussing case studies, definitions or comparisons between concepts, and even a compelling summary of the topics is presented.

The book is divided into eight chapters, preceded by a list of tables, a list of boxes, acknowledgements, and the "Introduction to the Online Resources Associated with This Book". Chapter 1 (p. 1-25) serves as an introduction; it includes a brief presentation of the field of research with its history and its development and evolution. It contains some interesting reflections on the possibilities of network science in archaeology. In my opinion, this is a remarkable fact because the authors tend to go beyond a simple set of formulas and data, incorporating fundamental questions such as the limitations of this field or its future perspectives. Finally, this chapter concludes with a guide to reading the book, presenting different options according to the aims of the reader.

Chapter 2 (p. 26-63) is devoted to the application of network science in archaeology and presents the multiple broad issues to which this field of research has been applied, such as the movement and transport of people and objects, the networks of spatial proximity and networks of visibility. Case studies are presented from different geographical and chronological areas based on previous works (e. g. BRUGHMANS ET AL., 2015). The datasets associated with many of these case studies are accessible and can be downloaded, allowing the reader to follow the analytical steps presented by personally performing the given exercises at each stage of the research process.

Chapter 3 (p. 64-102) is dedicated to network data. This chapter explains network, it presents the different parts that conform a network, the way these elements relate to each other and introduces the multiple types of existing networks. The chapter concludes with some guidelines on how to create, develop and use a functional and correct network, pointing out the importance of preparation and practice related to the information presented in the previous two chapters.

Chapter 4 (p. 103-148) presents a view on exploratory network analysis. This presupposes the following step in network science. It allows to explore and understand the structure of networks. As it occurs with network data, there are several exploratory network analyses that make it possible to focus on the different parts of the network from diverse points of view. In this sense, the authors introduce three important parameters for measuring networks such as “centrality”, “importance” and “prominence”, also highlighting the possibility – and even the necessity – of pursuing new methods that better fit the different and new archaeological questions.

Chapter 5 (p. 149-192) introduces another fundamental aspect of the research: the evaluation of uncertainty of the data, i.e. the quality of the data that compound the sample. However, beside showing the different errors and their impact on the networks, their components and data, the authors suggest some tips that allow to implement a coherent and effective model that can cope with uncertainty.

Once the information has been processed and the network created, the next step is to present it. Chapter 6 (p. 196-236) verses on this aspect. The visualisation of a network – as with any data – is essential as it determines whether the information is received clearly and correctly by the receptor. The authors show the available options for the correct representation of networks, highlighting the layouts and attributes, but also other, non-network properties. This can be applied from small to large samples and even to other options involving parameters such as time.

The space in which the different phenomena analysed using networks is described in Chapter 7 (p. 237-262). The study of this variable allows archaeologists to add a new attribute to the network, especially in cases where phenomena such as transport or visibility are analysed. However, as the authors note in this chapter, it is important to know how to represent space according to the principle of planarity, which implies that no edges should intersect. The chapter presents multiple techniques and methods for developing a correct representation that incorporates the space in which the network analysed takes place.

Chapter 8 (p. 263-280) forms the conclusion of the volume. This chapter summarises the theoretical approach discussed in the initial part of the book by reflecting on the future possibilities of this field of research. The authors face this challenge with an integrative vision. They reflect on the connection between theory and method in the subdiscipline of network science. The aim is to explore

the phenomena resulting from human interaction in the past, which makes archaeological network research an appropriate method for this goal.

After the last chapter, the reader can consult Appendix A (p. 281-290), which compiles all the results for the proposed exercises, and Appendix B (p. 291-293), which lists some of the most important software programmes for working with network analysis, including their advantages and disadvantages. There is also a glossary (p. 294-310) that permits to clarify the possible doubts that may arise when reading the volume. Finally, the book ends with a complete reference section (p. 311-343) and an index (p. 344-348).

In summary, this book is a complete and well-structured volume and a very useful handbook. It is conceived almost as a “step by step” book that allows a first approach to network analysis, but also to bring it to perfection, considering practical and theoretical elements that conform this subdiscipline. The present volume is a fundamental work for all researchers and students of archaeology who are interested in this novel approach and who want to learn about and understand the enormous potential of network analysis to help expand our knowledge of past human societies. The authors clearly defend their position by featuring – in a realistic way – the manifold possibilities of network science in archaeology.

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