VANESSA BIGOT JULOUX, AMY REBECCA GANSELL, ALESSANDRO DI LUDOVICO (EDS.), *CYBERRESEARCH ON THE ANCIENT NEAR EAST AND NEIGHBORING REGIONS. CASE STUDIES ON ARCHAEOLOGICAL DATA, OBJECTS, TEXTS AND DIGITAL ARCHIVING*, LEIDEN–BOSTON, BRILL 2018 (DIGITAL BIBLICAL STUDIES, 2), XVIII + 458 PP., ISBN 9789004346741 (PBK) – 9789004375086 (EBK)

MARÍA LUISA RODRÍGUEZ
UNIVERSITY OF CÓRDOBA

In the wake of the first issue by Claire Clivaz, Paul Dilley and David Hamidović, in which the coeditors of the *Digital Biblical Studies* series took part, this second volume is dedicated to cyber-research applied to the investigation of ancient Near Eastern and surrounding areas from the Chalcolithic to Iron Age within the context of humanities. In a very uniform tone, most of the projects presented were first introduced in the annual meetings of the American Oriental Society (AOS), the American Society for Oriental Research (ASOR), and Computer Applications and Quantitative Methods in Archaeology (CAA).

In the introduction, the editors Vanessa Bigot Juloux, Amy Rebecca Gansell and Alessandro Di Ludovico replicate the previous issue's approach by pointing out the unquestionable aspects of DH research as well as the concepts that are still unstable or epistemologically difficult to settle in a certain domain. As regards the clear premises, digital research has two main purposes as in this volume: firstly, to shed light on information that has been omitted or discarded by the human eye for many years; and secondly, to supply data that can support old and new hypotheses made by experts from all branches of the humanities (archaeology, anthropology, art history, history, philology and literary studies) and to make it possible to interpret them from a interdisciplinary viewpoint.

As Clivaz, Dilley and Hamidović have already suggested, the use of a wide variety of new technologies is still very limited, which could lead to an academic gap between digital and non-digital researchers. That is why this whole series aims to prevent and remove the pernicious effects caused by such a split by providing very descriptive information to clarify concepts and terminological confusion. Therefore, each and every one of the eleven chapters that make up this issue starts with theoretical sections in which the basic concepts are defined for novices, the method is given in profuse detail and complex aspects are illustrated with examples. Moreover, several supplementary annexes are incorporated: Maps, Glossaries (CyberResearch/General), Index of Authors and

Researchers, Index of CyberResearch, and General Index (including terms associated with archaeology, history, geography, literature, philology and their methods).

Another goal set by Juloux, Gansell and Di Ludovico is to promote interdisciplinarity, blurring the Manichaean dividing line between sciences and the arts: « we hope that a computer scientist would be able to appreciate archaeological discussions and issues, an archaeologist would be able to follow philological analyses, and a humanities student would understand the logic and mechanisms of computer science techniques » (p. 2).

Among the hazy subjects to be illustrated in this issue, the editors underline the concept of DH itself: Aurélien Berra posed the question about its nature; Christine Borgman considered it to be the application of a set of technologies to deal with certain problems in humanities; Frederic Darbellay saw it as a junction between new information technologies and humanities disciplines; Matthew Krischenbaum together with Eileen Gardiner and Ronald Musto conceived digital humanities as a method but humanities computing as a field; while David Berry defined digital humanities as technical support for the work of the « 'real' humanities scholars » (p. 8).

Although the epistemological limits are still to be laid down, by selecting a more specific sub-matter to deal with, the authors have been able to establish a common thread and define the concept of cyber-research as the « investigations that rely on programming languages and/or mathematical formulas to relay data and instructions to a computer ». In humanities, the computer generates results that can be used to reassert or refute a hypothesis or illuminate new research topics.

From the macrostructural viewpoint, this volume is very well organized, which helps data retrieval in a very specific subject. It consists of four large sections: « Archaeology », « Objects », « Texts », and « Online Publishing, Digital Archiving and Preservation ». The strict division into sub-sections of content is also noteworthy (mainly theoretical framework, method, analysis and results that are graphically shown), enabling quick access to a sub-topic.

The first section, « Archaeology », deals with data coming from fieldwork activities, entire sites and landscape archaeology. It has two chapters: the first one is by Sveta Matskevich and Ilan Sharon with the title « Conceptual Framework for Archaeological Data Encoding » and the second by Marco Ramazzotti, Paolo Massimo Buscema and Giulia Massini, who present « Landscape Archaeology and Artificial Intelligence: the Neural Hypersurface of the Mesopotamian Urban Revolution ».

The first chapter focuses on the excavation records from Tel Dor, Israel, and reflects upon the conceptual basis of archaeological data recording. The study aims to obtain better digitalization, longer preservation and interoperability

through graph databases. For that purpose, the authors re-treat pen-and-paper data, sketch plans, detail drawings, ancient photographs and the first rudimentary site grid taken during the 1920s by great scholars in the field such as John Garstang, Joseph Leibowitz, Claudine Dauphin, Avner Raban, Ephraim Stern and others. Their project was launched in 2003 to bring together, register and broaden the available information with the « Southern Phoenicia Initiative » ontologies or thesauruses to be constructed. Both authors consider that the challenges they faced in the DOR PROJECT can be extrapolated to DH as a whole:

> How can digital data be curated for the long term? Can meta-databases (for archaeology as well as for other disciplines and interdisciplinary projects) be constructed on a national or transnational scale? [...] What, if any, are the common denominators of all excavation-recording systems, or at least those of roughly compatible complexes, such as Near Eastern tell excavations? What should be the logical structure of a database that might accommodate all the permutations of such systems? (p. 29).

Taking into account that a post-processual field manual is still a chimera, the authors propose a meta-model that supports an 'agnostic' approach to field recording, starting by 'stripping' archaeological recording systems down to their basics and examining their elementary components.

In the second paper, Ramazzotti, in collaboration with Buscema and Massini, proposes using Artificial Adaptive Systems (AAS) on the Mesopotamian Urban Revolution Landscape (MURL) to create new analytical hypersurfaces that can reveal complex or unseen interrelations between settlement distributions and cultural, technological and economic variables between the Ubaid and Uruk periods of Babylonia, while exploring the possible connections between the high spatial variability of settlement organization and human mobility as well as inferences from settlement morphologies, distributions and dynamics. The authors point to a combination of Biological Modeling of the MURL (graph-algorithms were applied on a matrix generated by ANNs to predict the possible spatial localization of the Ebla Royal Mausoleums) and topological modeling (through a new data-mining procedure of the spatial semantics of the settlement distributions in the region between Ur and Uruk). The paper incorporates two very useful appendices: one for experimental and simulation procedures and another for topological weighted centroid basic definitions.

The second main section of this monograph, « Objects », shows a corpus of material culture. Like the first one, it is also made up of two parts: a contrastive one on the description of cylinder seal imagery and another that describes a productive synergy between programmers and archaeologists to determine the common attributes of figurines and ceramics from Turkey.

With respect to the potential of cylinder seals, the author of the third chapter, di Ludovico, « advocates for the contextualized interpretation of materials, since the lives and possible meanings of ancient artifacts are very dynamic, and their interpretation is equally dynamic and complex » (p. 86). He chooses cylinder seals as the axis of his research because these artifacts have a social and cultural purpose as testimonies to important administrative documents and events, and they establish a close relation to the user's body. After presenting former related projects, the *Repertoire analytique des cilindres orientaux* (Gardin, 1955) and the Cuneiform Digital Library Initiative (CDLI), the author offers a 425 specimen corpus of Mesopotamian cylinder seals dating from the Akkadian to the Ur III periods. The study's entire method is delicately described: from the imagery splitting into units with ANNs to the current use of statistical algorithms. Di Ludovico's « analysis of correspondence » surpasses the iconographic vision and incorporates the specific function for which the seal was designed, an approach that represents a turning point in the study of these artifacts and other material findings in general.

Later, in the fourth work, Shannon Martino and Matthew Martino apply a quantitative method to create typologies of qualitatively described objects. This standpoint is also found in other chapters of this volume (Chapters 6, 7 and 8). Taking nothing for granted, these two authors justify their study by proving that cultural differences deducted from typologies come from a subjective previous taxonomy. To do so, they compare Late Chalcolithic and Early Bronze Age clay anthropomorphic figurines from Bulgaria, Romania and Turkey by creating a FileMaker database, and ceramic data from the Early Bronze Age. In terms of method, they avoid previous impositions and develop a series of independent attributes. For this purpose, they use a hierarchical clustering algorithm that guarantees accuracy and a more realistic treatment by each scholar that can measure the significance of both the unique and universal aspects of any piece. At the end of the chapter, a list of attributes is generously shared and explained.

The third section of the book, « Texts », is dedicated to Ugaritic, Sumerian and Akkadian as primary sources for information discovery. This is the longest one, spanning four chapters.

In Chapter 5, Juloux makes the case for the tremendous relevance of DH applied to the study of Ugaritic literature. To prove this, she selects the narrative stories in alphabetic cuneiform from the thirteenth century BCE where 50% of the text is missing in order to study the role of each character, examine how this hermeneutics of action works and insert empirical testimonies (annals and chronicles) into the study. From a very pragmatic viewpoint, her « actantial event » becomes very relevant as she considers that an analysis cannot be carried out by a text-oriented approach alone. She uses three analytical taxonomies to examine an actantial event (primary events, objective variables, and subjective

variables) and formulates them with TEI (Text Encoding Initiative) and data mining. In this paper, the author introduces an explanation of TEI-XML for novices, which gives the article a didactic application in spite of the complexity of using so many categories in this analysis: objective levels of study such as context, result, sphere, role and biological sex, and subjective ones such as consequence, emotion and its strength, and the degree of desire and voluntary intentionality with its degree of motivation.

In the next chapter, Émilie Pagé-Perron extrapolates network analysis, a method well established in life and social sciences, to her study of a large number of unannotated cuneiform texts in order to detect and visually represent patterns that could not be easily perceived using old methods. This proposal can be applied to teaching and disseminating information about Mesopotamian social history as the whole process (transcription, standardization, tokenization, lemmatization and information extraction) is explained to identify individuals of interest and group cores, then quantitatively isolate meaningful groups. According to Pagé-Perron, the main advantage of using quantitative analyses in Assyriological studies is the multiplicity of approaches and inquiries, the reproducibility and the strong evidence with which to provide the researcher to support an argument.

In Chapter 7, Saana Svärd, Heidi Jauhiainen, Aleksi Sahala and Krister Lindén examine two possible language technology methods for analyzing the semantic field in Akkadian. To do so, they use the Oracc (Annotated Cuneiform Corpus). These authors coincide with Martino and Martino and Pagé-Perron in encouraging a quantitative perspective for studying Ancient Near Eastern History, as they consider it broadens the possibilities for semantic and linguistic research. They propose a genuine 'emic' approach; that is, a native vision very close to Lakoff's 'experimental realism' (1987) that suggests that cognitive categories are embodied and have a strong link to a particular context. They used two types of software: Pointwise Mutual Information (PMI), a statistical method with which collocations can be identified and that is used to suggest syntagmatic semantic fields, and Word2vec, Natural Language Processing (NLP) software to align lexical units with numeric vectors to establish paradigmatic groups of words. By combining both, the interpretation of archaeological data is more reliable. This study is especially relevant as it opens the door to obtaining conclusive evidence of the existence of standardized contextual semantic frames for all languages.

Chapter 8, « Using Quantitative Methods for Measuring Inter-Textual Relations in Cuneiform » by M. Willis Monroe, shares with the former papers the importance of quantitative methods applied to digital humanities to « test intuition and assumptions about a body of textual material quickly and efficiently » (p. 257). The case study of this paper consists of a smaller cuneiform

corpus from Late Babylonia of astrological material from which the author aims to link ingredients used in medical treatment and the signs of zodiac. As it is damaged and incomplete, the quantitative method allows for a better understanding and depiction of the organization of the text. Much of the theory behind the methods employed in this chapter and in the field of digital humanities was first concretely laid out by Franco Moretti (2007), who advocated a form of « distant reading ».

This is the most informative paper of the volume as it includes a lot of explanations on techniques and the method of processing and textual analysis (everything from text objects, philological work, digital coding and analysis up to the final visualization) and a data subset that serves as an illustration. The variety of software used in the experiment is huge and the patterns discoverable here are applicable to other corpora: Language Python, Pandas and NumPy libraries for data processing, Matplotlib and Seaborn libraries, CountVectorizer, Gephi, SciPy library and the Unweighted Pair Group Method with arithmetic Mean (UPGMA).

The final touch to a very meticulous volume is the miscellaneous section entitled « Online Publishing. Digital Archiving and Preservation », in which the authors consider the possibility of making cyber-research data, methods and results freely accessible online.

Chapter 9, for instance, focuses on the problems of the « Epigraphic Interoperability of Digitized Texts of the Mediterranean and Near Eastern Regions for the First Millennium BCE ». The author, Doğu Kaan Eraslan, points out that although great efforts have been made with ancient texts, there have been very few initiatives to make them interact. For him, it is essential to understand the history of international relations in the ancient Mediterranean region from a holistic viewpoint that takes into account multilingualism in the area and the problem of multilingualism in data encoding (p. 283–284). Thus, he proposes a radical shift in the encoding schemes but taking what is seen as the encoding unit instead of what is read. This new premise can facilitate the compatibility of 2D forms. Eraslan also presents tools for digital epigraphers to solve the lack of multilingual interoperability. The author also recommends SVG (Scalable Vector Graphics) as an XML-based language for describing 2D graphics and having experts in OCR technologies in DH projects. From his viewpoint, the perfect combination would be: EpiDoc, SVGs, Unicode, relative encoding schemes, and LD technologies.

In Chapter 10, Miller C. Prosser seeks to integrate archaeological data from the excavations by using the Online Cultural and Historical Research Environment (OCHRE), which allows the linear transcription to be broken down into individual signs or letters and to use analytical wizards to find words in project dictionaries, add grammatical properties to the words and identify people and places in the

texts. Another advantage it offers is that it leads researchers all around the world to access data in real time to recompose, import and analyze texts. Prosser wants RSTI to become a digital publication platform for all text editions (including information about the location where the tablets containing texts were found, their dimensions and other physical characteristics; text transliteration; a translation; specific epigraphic commentary; commentary on structure and interpretation; and bibliographic references). He recommends using a semi-structured item-based data model to make it possible for each individual unit to have a universally unique key. In this way, the data are more broken down, organized and described, so they can be accessed and recombined quite easily. In fact, Prosser's paper is a « model of modeling » texts in a database for the researcher and the interested general public.

In the final chapter, Terhi Nurmikko-Fuller examines the adequacy of three ontologies to represent and capture data from the Electronic Text Corpus of Sumerian Literature (ETCSL). The ones studied in this chapter are: CIDOC CRM (cultural heritage), FRBROO (bibliographic information) and ONtoMedia (OM) (narrative in multi-media). Assyriologists face terrible problems in accessing heritage. Apart from the armed conflict itself, not all of the interesting data are stored online. That is why the author suggests that the Internet publication of object metadata and high-resolution images with translations and transliterations can contribute to amalgamating partial information silos and surmounting the difficulties of distance. These new technologies shed light on patterns and unnoticed details of the ancient Sumerian literary compositions (p. 361).

As a conclusion, the new applications of all the technologies discussed in this volume are very promising since long-term storage of information, re-use and the discovery of new patterns are guaranteed. Of course there is still a need for better coordination and standardization of encoding processes to permit interoperability. Nevertheless, enriching interdisciplinarity and new didactic possibilities for general audiences could be possible by recycling the results coming from the « slow orthodox method » of humanities that will be put together in more democratic platforms for the transfer of knowledge thanks to works such as those presented in Digital Biblical Studies.