CAA2014
21st Century Archaeology
Concepts, methods and tools

Proceedings of the 42nd Annual Conference on Computer Applications and Quantitative Methods in Archaeology

Edited by
F. Giligny, F. Djindjian, L. Costa, P. Moscati and S. Robert
# Contents

Foreword......................................................................................................................................................... v

Computers and Mathematics in Archaeology, Anatomy of an Ineluctable Success! .............................................. 1
François DJINDJIAN

Chapter 1 Historiography

Towards a History of Archaeological Computing: An Introduction ................................................................. 9
Paola MOSCATI

A Retrospective on GIS and AIS Platforms for Public Archaeology in Italy Searching Backward for Roots and Looking
Onwards for new Methodological Road-Maps ..................................................................................................... 17
Mirella SERLORENZI, Ilaria JOVINE, Giorgia LEONI, Andrea DE TOMMASI, Andrea VARAVALLO

Art History of the Ancient Near East and Mathematical Models. An Overview .................................................... 29
Alessandro DI LUDOVICO and Sergio CAMIZ

Archaeology and Computer Applications: The Automatic Cataloging of Italian Archaeological Heritage ............ 35
Alessandra CARAVALE

Chapter 2 Field and Laboratory Data Recording

Practical Assessment of a Multi-Frequency Slingram EMI for Archaeological Prospection .................................. 43
François-Xavier SIMON, Alain TABBAGH, Apostolos SARRIS

Utilizing Magnetic Prospection and GIS to Examine Settlement Organization in Neolithic Southeastern Europe ...... 53
Alexis NIEKAMP, Apostolos SARRIS

Historic Forest Change: New Approaches to Land Use Land Cover .................................................................... 65
Charlotte E. STANCIOFF, Robert G. PONTIUS Jr, Scott MADRY, Elizabeth JONES

Challenges and Perspectives of Woodland Archaeology Across Europe ............................................................ 73
Hauke KENZLER, Karsten LAMBERS

Archaeological Mapping of Large Forested Areas, Using Semi-Automatic Detection and Visual Interpretation
of High-Resolution Lidar Data ........................................................................................................................... 81
Øivind Due TRIER, Lars Holger PILØ

Laser scanning and Automated Photogrammetry for Knowledge and Representation of the Rupestrian Architecture
in Cappadocia: Sahinefendi and the Open Air Museum of Goreme ..................................................................... 87
Marco CARPICECI, Carlo INGLESE

Advantages and Disadvantages of Digital Approach in Archaeological Fieldwork ........................................... 95
Carlo BIANCHINI, Francesco BORGOGNI, Alfonso IPPOLITO

From Survey to Representation of the Model. A Documentation of Typological and Chronological Sequences of
Archaeological Artefacts: Traditional and Innovative Approach ........................................................................... 107
Alfonso IPPOLITO, Luca J. SENATORE, Barbara BELELLI MARCHESINI, Gabriella CEROLI

Archaeology in the Third and Fourth Dimensions: A Case Study of 3D Data Collection and Analysis From Prince
Rupert, BC, Canada ............................................................................................................................................ 115
Alyssa PARKER, Morley ELDRIDGE

Integrated RTI Approaches for the Study of Painted Surfaces ............................................................................. 123
Eleni KOTOULA, Graeme EARL

Survey, Documentation and Analysis of the Archaeological Architecture: the House of the Knights of Rhodes in the
Forum of Augustus ................................................................................................................................................ 135
Carlo BIANCHINI, Gaia Lisa TACCHI

Digital Research Strategies for Ancient Papyri: A Case Study on Mounted Fragments of The Derveni Papyrus ...... 145
Eleni KOTOULA, Graeme EARL
<table>
<thead>
<tr>
<th>Chapter 3. Ontologies and Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Towards Linked-Data in Numismatics: How the DIANA Approach can Improve the Diachrony Integrating Heterogeneous Pieces of Data</td>
</tr>
<tr>
<td>Celtic Coins in Context, a New Database</td>
</tr>
<tr>
<td>Uncertainty Handling for Ancient Coinage</td>
</tr>
<tr>
<td>Interoperability of the ArSol (Archives du Sol) Database Based on the CIDOC-CRM Ontology</td>
</tr>
<tr>
<td>Find the Balance - Modelling Aspects in Archaeological Information Systems</td>
</tr>
<tr>
<td>Integration of Archaeological Datasets Through the Gradual Refinement of Models</td>
</tr>
<tr>
<td>Linked Open Greek Pottery</td>
</tr>
<tr>
<td>The Digital Archaeological Workflow: A Case Study from Sweden</td>
</tr>
<tr>
<td>Exploring Time and Space in the Annotation of Museum Catalogues: The Sloane Virtual Exhibition Experience</td>
</tr>
<tr>
<td>Building Comprehensive Management Systems for Cultural – Historical Information</td>
</tr>
<tr>
<td>Managing Time Dimension in the Archaeological Urban Information System of the Historical Heritage of Rome and Verona</td>
</tr>
<tr>
<td>Towards an Archaeological Information System: Improving the Core Data Model</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 4. Internet and Archaeology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archaeological Open Access Journals: The Case of ‘Archeologia e Calcolatori’</td>
</tr>
<tr>
<td>Massive Open Online Opportunity: MOOCs and Internet–Based Communities of Archaeological Practice</td>
</tr>
<tr>
<td>Moving Instruction Beyond the Museum’s Walls: Priorities in Online Public Education at the Oriental Institute</td>
</tr>
<tr>
<td>Crowd- and Community-Fuelled Archaeology. Early Results from the MicroPasts Project</td>
</tr>
<tr>
<td>The ACCORD Project: Archaeological Community Co-Production of Research Resources</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 5. Archaeological Information Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>12000 Years of Human Occupation, 3 Meters Deep Stratigraphy, 12 Hectares... A Geographical Information System (GIS) for the Preventive Archaeology Operation at Alizay (Normandie, France)</td>
</tr>
<tr>
<td>Records and Spatial Representations in the Context of a Rescue Excavation: The Case of Quincieux (Rhône-Alpes, France)</td>
</tr>
</tbody>
</table>
Chapter 6. GIS and Spatial Analysis

ArkeoGIS, Merging Geographical and Archaeological Datas Online ................................................................. 401
Loup BERNARD, Damien ERTLEN, Dominique SCHWARTZ

Counting Sheep Without Falling Asleep: Using GIS to Calculate the Minimum Number of Skeletal Elements (MNE) and Other Archaeozoological Measures at Schöningen 13ii-4 ‘Spear Horizon’ ..................................................... 407
Alejandro GARCÍA-MORENO, Jarod M. HUTSON, Aritza VILLALUENGA, Elaine TURNER, Sabine GAUDZINSKI-WINDHEUSER

Looking for the Best. A Comparison Between GIS and PageRank Based Algorithms for Preventive Archaeology in Urban Areas .............................................................. 413
Dubbini NEVIO, Gabriele GATTIGLIA, Augusto PALOMBINI

Analyses of Bone Modifications on Human Remains: A GIS Approach............................................................... 423
Elsa CIESIELSKI, Hervé BOHBOT

Territorial Organisation of the Terramare Culture (Bronze Age, Italy): Use of GIS Methodology to Tackle Societal Issues .................................................................................................................. 431
Julie BOUDRY

From the Excavation to the Territory: Contributions of GIS Tools to the Study of the Spatial Organization of the Archaeological Site of Argentomagus (France, Indre, Saint-Marcel/Argenton-sur-Creuse) ................................................................. 443
Emeline LE GOFF, Laure LAÛT, Yoann RABASTÉ, Françoise DUMASY

The Integration of Landscape Processes in Archaeological Site Prediction in the Mugello Basin (Tuscany/Italy) .... 451
Elmar SCHMALTZ, Michael MÄRKER, Hans-Joachim ROSNER, Adrew-Williams KANDEL

The Use of Burgundy Stone from Ancient Times to the Present Day ......................................................................... 459
Stéphane BÜTTNER, Delphine MONTANGE, Laure SALIGNY, Marion FOUCHER with the collaboration of Eric LECLERCQ, Marinette SAVONNET

Exploring Intervisibility Networks: A Case Study From Bronze and Iron Age Istria (Croatia and Slovenia) ............ 469
Zoran ČUČKOVIĆ
Chapter 7. Mathematics and Statistics in Archaeology

Intentional Process Modeling of Statistical Analysis Methods .......................................................... 481
Charlotte HUG, Rebecca DENECKÈRE, Ammar AYMEN

Ancient Mesopotamian Glyptic Products, Statistics and Data Mining: A Research Proposal ........................................... 489
Alessandro DI LUDOVICO, Sergio CAMIZ

Intrasite Spatial Analysis Applied to the Neolithic Sites of the Paris Basin: From the Archaeological Feature to Global Analysis ................................................................................................................. 497
François GILIGNY

Statistical and Mathematical Models for Archaeological Data Mining: A Comparison ........................................................... 509
Nevio DUBBINI, Adam LODOEN

Chapter 8. 3D Archaeology and Virtual Archaeology

Measuring and Describing 3D Texture ............................................................................................................. 519
Vera MOITINHO DE ALMEIDA, Juan Antonio BARCELÓ

Old Versus New – Introducing Image-Based 3D Modeling into the General Documentation Workflow of Archaeological Rescue Excavations. Case Studies: the Čachtice and Bratislava castles, Slovakia ........................................................................ 529
Jan ZACHER, Seta ŠTUHEC

Beyond Spreadsheets: Digitising the Archaeological Artefact Inventory Process .............................................. 541
Arianna TRAVIGLIA, Stephen WHITE, Andrew WILSON

Potentials of 3D Reconstruction in Maritime Archaeology .............................................................................. 549
Elisa COSTA, Carlo BELTRAME, Francesco GUERRA

Cultural Heritage Documentation in Cave Environment Using Low-Cost Means for Archaeologists. Case Study of the Largent Caves in the Fontainebleau Forest in France ........................................................................ 557
Aurelia LUREAU, Mehdi BELARBI, Pascal RAYMOND, Régis TOUQUET

Forum Romanum: A 3D Model for Self-Service Educational Purposes .......................................................... 569
Philippe FLEURY, Sophie MADELEINE, Nicolas LEFÈVRE

The Virtual Reconstruction of a Small Medieval Town: The Case of Briviesca (Spain) ............................................. 575
Mario ALAGUERO, Andres BUSTILLO, Blanca GUINEA, Lena IGLESIAS

25 Years of Experience in Virtual Reconstructions - Research Projects, Status Quo of Current Research and Visions for the Future ........................................................................................................ 585
Mieke PFARR-HARFST

The Archaeological Excavation of the Early Neolithic Site of Portonovo as a Case Study for Testing a 3D Documentation Pipeline ........................................................................................................ 593
Cecilia Conati BARBARO, Eva Savina MALINVERNI, Anna Nora TASSETTI, Chiara LA MARCA

Chapter 9. Multi-Agent Systems and Complex System Modelling

A Density-Based Simulation Approach for Evaluating Prehistoric Population Fluctuations in Finland .................. 605
Tarja SUNDELL, Juhana KAMMONEN

Multi-Agent Modelling of the Neolithic LBK .................................................................................................. 611
Jean-Pierre BOCUQUET-APPÉ, Richard MOUSSA, Jérôme DUBOULONGZ

Explaining the Adoption of ‘Innovations’ in Western Europe During Bronze Age: Towards an Agent-Based Simulation .............................................................................................................................. 623
Juan A. BARCELÓ, Florencia DEL CASTILLO BERNAL, Giacomo CAPUZZO, Berta MORELL, Joan NEGRE

Spatial Interaction Simulation Methods for Ancient Settlement Distributions in Central Italy .......................... 631
Taylor OSHAN, Carson FARMER, Eoin O’DONOGHUE

Interactions and Network Analysis of a Rock Art Site in Morro do Chapéu, Bahia, Brazil ...................................... 641
Carlos ETCHEVARNE, Grégoire VAN HAVRE
Foreword

This volume brings together a selection of papers proposed for the Proceedings of the 42th Computer Applications and Quantitative Methods in Archaeology conference (CAA), held in Paris (France) from 22nd to 25th April 2014.

The conference venue was Paris 1 Panthéon-Sorbonne University, in the main building next to the Panthéon. Workshops were held at the Institute of Art and Archaeology and the EHESS School. This was the first time in 42 years that the CAA had come to France, and we are proud to have hosted this important scientific event in Paris.

CAA2014 welcomed 477 participants from 39 countries. Altogether 397 papers were presented in 26 different sessions. The 5 round tables and 12 workshops also contributed to the success of the conference.

The program was divided into different themes and this structure has been maintained in the arrangement of articles in the various chapters of this book.

We are grateful to the following institutions which made the conference possible and supported it financially. Paris 1 Panthéon-Sorbonne University, the Mairie of Paris, the CNRS, the EHESS – Ecole des Hautes Etudes en Sciences Sociales, the INRAP – Institut national de Recherches Archéologiques Préventives, the research laboratories from the Maison de l’archéologie et de l’ethnologie, Nanterre – UMR Trajectoires & UMR Arscan. We would also like to thank the staff of the university and the student volunteers.

We hope that the congress participants, the contributors and all people interested in computing in archaeology will enjoy these proceedings.