



## Summary

Andreina Ricci, <i>Archaeology, Landscape, Contemporary Places</i>	pag. 4
<b>SMART LANDSCAPE</b>	<b>» 11</b>
Carlos Smaniotto Costa, Ina Šuklje Erjavec, Roberto Pierdicca, Eva Savina Malinverni, Anna Khromova, Ernesto Marcheggiani, Andrea Galli, <i>The use of ICT in Public Open Spaces: some insights</i>	» 11
Dario Aureli, <i>Resiliency units. Circular metabolisms in urban areas. The case of Colombes, Paris</i>	» 14
Emanuela Farano, <i>Conservation and management of landscape as protection and enhancement</i>	» 18
Giuseppe Caridi, <i>The design of the peri-urban settlement context</i>	» 23
M. Bocci, E. Marcheggiani, A. Galli, C. Smaniotto, <i>Smart Landscapes: From Landscapes to Advanced Cultural Districts. Marche Region Case Study</i>	» 27
Maurilio Cipparone, Ilaria Trizio, <i>From Rome Charter To Heritage Interpretation: Innovative Tools For The Conservation, Use and Promotion of Natural and Cultural Italian Heritage</i>	» 33
<b>ARCHAEOLOGY AND DIGITAL DOCUMENTATION</b>	<b>» 38</b>
Ugo Comollo, Giuseppe Roccasalva, Ursula Zich, <i>3E-Rural: Towards a Learning Approach of Rural Landscape Heritage</i>	» 38
Alessio Cardaci, Antonella Versaci, Luca Renato Fauzia, <i>Between Archaeology and Landscape. Analysis, Conservation and Valorisation of Early Christian Hypogean Complexes of The South-Eastern Sicily</i>	» 40
Andrea Marraffa, <i>The Theater 'delle Feste' by Mariano Fortuny: New Frontiers of The Edutainment For The Cultural Heritage</i>	» 49
Carlo Battini, Elena Sorge, <i>The Amphitheatre of Volterra: Integrated Survey and Data Representation</i>	» 55
Carlo Bianchini, Carlo Inglese, Alfonso Ippolito, <i>Dynamic Archives: The Documentation of Six Mediterranean Theatres</i>	» 58
Carmela Crescenzi, <i>A Promenade in Rupestrian Landscapes of Cappadocia. Survey, Notes and New Technologies</i>	» 62
Claudia Forin, <i>New Perspectives for the Understanding of Extra-Urban Architecture in the Roman Cisalpine Area</i>	» 73
Danila Artizzu, Vincenzo Bagnolo, Antonio Maria Corda, Andrea Pirinu, <i>Wefts and Warps: The Identity Paths (Flussio - Planargia, Sardinia, Italy)</i>	» 79
Emanuele Brienza, Luigi Calì, Mariangela Liuzzo Survey, <i>3D Modelling and GIS for Interpretation, Communication and Enhancement of Archaeological Heritage. Landscape Archaeology in Agrigento</i>	» 88
Fatemeh Johari, <i>Contributions From The Digitalization of Archaeological Documents For The Study of Northern Shores of Persian Gulf (Siraf, Iran)</i>	» 91
Francesca Fatta, Manuela Bassetta, Andrea Manti, Andrea Marraffa, <i>The Classical Theater and Its Material Culture: The Case of Lipari's Masks</i>	» 99
Giacinto Taibi, Rita Valenti, Concetta Aliano, Emanuela Paternò, <i>The Acme of A Cultural Inner Being: To Unearth and To Reshape The Ancient City</i>	» 107
Giovanna A. Massari, Martina Tava, <i>Archaeology/Landscape: a Mutual Influence in Both Directions</i>	» 115
Giuseppe Mazzacuva, <i>Laser Scanner Survey Techniques For a 3D Documentation of The Archaeological Site Tas Silg in Malta</i>	» 118
Giuseppe Nicastrò, <i>Landscape, Archaeology And Digital Survey: The Castellum Aquarum of Poggio Murella Manciano (Grosseto-Italy)</i>	» 125
Irene Carpanese, <i>Arca Project: a Reusable Approach to Archiving, Research and Communication in Archaeology</i>	» 134
Leonardo Paris, Carlo Inglese, Wissam Wahbeh, Pamela Maiezza, Maria Laura Rossi, <i>Art and Technique of Roman Bridges. The Augustus Bridge in Narni</i>	» 141
Luca Cipriani, Filippo Fantini, Silvia Bertacchi, <i>Archaeological Survey For Understanding Ancient Design: Mixtilinear Pavilions From Hadrian's Villa</i>	» 149
Marco Carpicci, Fabio Colonnese, <i>Laser Scanner &amp; Watercolours. An Integrated Approach to Documentation of Rupestrian Habitat of Cappadocia</i>	» 153
María de los Ángeles Utrero-Agudo, José Ignacio Murillo-Fragero, Rafael Martín-Talaverano, <i>Virtual Models For Archaeological Research and Dissemination: Current Needs and Challenges</i>	» 163
Marta Giani, <i>Experiences of Predictive Archaeology</i>	» 166
Michele Silani, Enrico Giorgi, <i>Retracing Ancient Roads: Reconnaissance and Three Dimensional Topographical Surveys in The Via Salaria Project</i>	» 171
Paola Puma, <i>Virtual Heritage: Some Experiences of Survey of Archaeological Finds by Low Cost Techniques</i>	» 180
Paolo Clini, Maria Gloria Cerquetti, Laura Bertuccioli, Laura Invernizzi, Massimo Gasparini, <i>Integrated Approaches For the Study, Enhancement and Dissemination of The Archaeological Heritage: The "Archeofano" Project</i>	» 184
Raffaele Catuogno, Antonella Di Luggo, <i>Survey Technologies and Systems For The Sharing and Dissemination of The Archaeological Heritage</i>	» 187
Saverio D'Auria, Rodolfo Maria Strollo, <i>A Landscape Baroque Reutilization of Two Roman Buildings on Colli Tuscolani: Surveys, Confirmations and Updates</i>	» 198
Sebastiano Giuliano, Mariangela Liuzzo, Alessandro Russo, <i>Among Topos, Geometry and Harmony: The Archaeological Site of The Greek Theatre of Akrai</i>	» 205
<b>SMART INDUSTRIAL ARCHAEOLOGY</b>	<b>» 213</b>
Daniela Cinti, <i>Mining Activity Along The Via Ariminensis. The Recovery of The Roman Consular and of The Eighteenth Century Ironworks in The Tuscan Tiber Valley Landscape</i>	» 213

Enrica Petrucci, Gloria Buscarini, <i>Canals, Water and Production in Fabriano's History: Study For the Construction of a Recovery Strategy and Development of Local Traditions</i>	» 221
Francesco Chiapparino, <i>The Industrial Heritage of The Papermaking in The Fabriano Area. Problems and Hypothesis of a Landscape and Territorial Valorization</i>	» 229
Letizia Musaiò Somma, <i>Stuttgart. Main Train Station by Paul Bonatz: a New Life For a Monument</i>	» 234
Riccardo Rudiero, <i>Industrial Archeology and Waldensian Valleys: Identity, Conservation and Enhancement of an Alpine Border Heritage</i>	» 241
Stefania Landi, <i>The Italian Grain Silos In The 1930S. Analysis, Conservation and Adaptive Reuse</i>	» 247
<b>HERITAGE SUSTAINABLEVALORIZATION AND CULTURAL DISTRICTS</b>	» 255
Adriana Formato, Anna Paola Pugnalonì, <i>Places... Remain... Hidden...</i>	» 255
Alessandro Luigini, Chiara Rizzi, <i>Atlas of Re.Cycle. A Learning Tool For Abandoned Cultural Heritage</i>	» 263
Alessandro Viva, <i>Scenarios For The Conservation and The Enhancement of Archaeological Heritage: a Gis Database For The Gallia Narbonensis Theatres</i>	» 267
Antonio Monterroso, Francisca Vicente, <i>Project Ager Mellariensis: Archaeology to Improve The Competitiveness of The Urban and Rural Areas of the Alto Guadiato (Córdoba-Spain)</i>	» 272
Brunella Canonaco, Francesca Molezzi, <i>The Recovery of The Beauty of Minor Historical Centers. The Albergo Diffuso as a Means of Reviving What Has Been Built</i>	» 279
Daniele Sacco, <i>An Example of Public Archaeology: The Project "Progetto Montefeltro: Atlante del Paesaggio". Strategic Partnerships Among Local Bodies to Promote and Protect The Historical Region of Montefeltro</i>	» 283
Fabio Donnici, Antonio Pecci, <i>"Ritorno ad Anxia": From Digital Exhibition to Virtual Museum</i>	» 291
Friederike Peteler, Livio De Luca, <i>Crowdsourcing Semantic-Aware Image-Based 3D Models For Spatiotemporal Analysis of Complex Heritage Sites</i>	» 299
Giulia Crinelli, Paolo Clini, Ramona Quattrini, Francesco Leoni, <i>Integrated Strategies of Promotion and Communication For Diffuse Cultural Heritage: a Pilot Project. Inside Flaminia Nextone Dce</i>	» 305
Laura Baratin, Sara Bertozzi, Alessandra Cattaneo, Elvio Moretti, <i>Conservation of Archaeological Heritage: Management and Innovation Policies</i>	» 314
Mario Centofanti, Stefano Brusaporci, Vittorio Lucchese, Pamela Maiezza, <i>The Representation of The Landscape as Construction of Knowledge</i>	» 318
Mariya Komarova, <i>Abandoned Villas of Russian Nobles in Rural Landscape</i>	» 325
Paola Durante, Alberto Giammaruco, Sofia Giammaruco, <i>Cultural Itineraries In "Grecia Salentina": a Virtual Tour of St. Stephen's Church in Soletto (Lecce)</i>	» 332
Patricia Duff, <i>Achieving Impact: Benefits Gained by Both Archaeologists and The Communities in Whose Landscape They Work</i>	» 339
Riccardo Giacomelli, <i>Alpine Refuges as Devices of Sustainable Development For High Lands</i>	» 346
Salvatore Di Fazio, Giuseppe Modica, Carmelo Riccardo Fichera, <i>ArcheOLOGY: a Spatial Data Infrastructure For The Integrated Management of The Historic Landscape and Heritage Related to Olive-Oil Production in Calabria (Italy)</i>	» 354
Antonio Monterroso, Massimo Gasparini, <i>Via Corduba – Emerita. Digital documentations in the Ager Mellariensis</i>	» 357
Gaia Pignocchi, Alessandra Panzini, Francesca Serpentine, <i>From Frasassi Gorge to The Via Flaminia. Real and Virtual Dimensions of The Local Area and Its Museums</i>	» 360
<b>Call For Paper</b>	» 367

**Scientific Committee:** Alonso Addison (Berkeley (University Of California), Fabrizio I. Apollonio (Alma Mater Studiorum-Unibo), Cristiana Bartolomei (Alma Mater Studiorum-Unibo-SCIRES-IT), Stefano Bertocci (Università Di Firenze), Carlo Bianchini (Università La Sapienza-Roma), Howard Burns (Scuola Normale Superiore di Pisa), Francesco Chiapparino (Univpm (Aipai Mual), Michela Cigola (Università di Cassino), Augusto Ciuffetti (Univpm (Aipai Italia), Paolo Clini (CSV-Univpm), Livio De Luca (CNRS (Marseille), Sandro De Maria (Alma Mater Studiorum-Unibo), Salvatore Di Fazio (Università Mediterranea di Reggio Calabria), Francesco Paolo Di Teodoro (Politecnico di Torino), Patricia Duff (University of Cambridge), Maurizio Forte (Duke University), Nicoletta Frapiccini (Museo Archeologico Nazionale Ancona), Marco Gaiani (Alma Mater Studiorum-Unibo), Andrea Galli (Univpm-Cirp), Enrico Giorgi (Alma Mater Studiorum-Unibo), Pierre Gros (Università Aix En Provence (Marseille), Eva S. Malinverni (Univpm-Cirp), Ernesto Marcheggiani (Univpm-Cirp/Kul-Ees), Oscar Mei (Parco Archeologico Fossombrone), Antonio Monterosso Checa (University Of Cordoba), Conor Newman (National University of Ireland (Galway), Mario Pagano (Soprintendenza Archeologia delle Marche), Juan M. Palerm (UNISCAPE), Bas Pedrolì (UNISCAPE), Sofia Pescarin (CNR-ITABC (Roma), Valeria Purcaro (Università Carlo Bo (Urbino), Fabio Remondino (FBK (Trento), Andrina Ricci (Università Roma Tor-Vergata), Mario Santana Quintero (Carleton University (Ottawa), Therese Steenberghen (KUL-SADL), Simon Stoddart (University of Cambridge), Virginia Valzano (CEIT-Italy – SCIRES-IT).

**Program committee:** Paolo Clini, Andrea Galli, Ramona Quattrini. **Organizing committee:** Adriana Formato, Anna Paola Pugnalonì, Luigi Sagone, Gianni Plescia, Floriano Capponi, Ramona Quattrini, Francesco Leoni, Laura Bertuccioli, Laura Invernizzi, Romina Nespeca, Ludovico Ruggeri. **The Seminar En-route Landscape & Archaeology was promoted by:** Centro Studi Vitruviani, Università Politecnica delle Marche, Uniscape, Università degli Studi di Urbino, DCE Flaminia Nextone. **In cooperation with:** Comune di Fano, Comune di Fossombrone, Comune di Cagli. **Sponsorship:** MIBACT Ministero dei Beni e delle Attività Culturali e del Turismo; Regione Marche; UID Unione Italiana Disegno; CEIT: Centro Euronormediteraneo di Innovazione Tecnologica; per i Beni Culturali e Ambientali e la Biomedicina; TICCIH: The International Committee for the Conservation of the Industrial Heritage; AIIA: Associazione Italiana di Ingegneria Agraria - Il sezione; Ordine degli Ingegneri della Provincia di Pesaro e Urbino; Ordine degli Architetti; Pianificatori; Paesaggisti e Conservatori della Provincia di Pesaro e Urbino.

**Organisation:** Tommaso Zanaica (UNISCAPE) en-route@uniscape.eu – No editing on English was done, language accuracy is up to authors.

## Virtual Heritage: Some Experiences of Survey of Archaeological Finds by Low Cost Techniques

Paola Puma

 DIDA, Dept. of Architecture, University of Florence, Florence, Italy – [paola.puma@unifi.it](mailto:paola.puma@unifi.it)

✓ **KEYWORDS:** Virtual heritage, survey of archaeological finds, faliscan finds, Narce, etruscan finds

### ◆ ABSTRACT

The paper presents the first two outcomes of the “Virtual heritage projects” research program, conducted in 2014-2015 by the group coordinated by the author and born to fulfill a specific scientific project; the aim of the research program was the idea of rethinking in terms of low cost and speed the data acquisition of survey of archaeological finds -when is only aimed at advanced visualization for musealisation- basing the (at that time) emerging technique of photo modeling (Shape From Motion- SFM).

The possibility of “representing the landscapes” of archaeological contexts in an effective and real impact in terms of musealisation, is transmitted by experiences of different types and scales as well in the reconstruction of the original environmental context as in the 3D model display of small objects at a larger scale than the real (Bertocci, Arrighetti, 2015). The use of HD 3D models of archaeological finds has the added value of many advantages linked to the possibility of visual and perceptual contact (and in more advanced cases, also of the interaction) with an unavailable object in time or in place or not accessible for reasons of conservation; this allows a number of advanced features, such as the vision larger scale in respect of real to be able to dwell on details not visible to the eye rather than the virtual restoration (Ippoliti, Meschini, 2011). The modeling of archaeological finds require a realistic representation of the nature morphologic, material and of conservation of artifacts with irregular geometries; photomodeling has introduced a working environment that allows the representation of three-dimensional objects based on global integration of phases of survey (which we have used for shooting with control points for the respect of measurement of the objects), modeling and representation (Remondino, Campana 2014).

### *The “Falisci in 3D” Project*

The first application of research (Fig. 1) was realized in 2014 on the occasion of the exhibition “The Hill people. Faliscan and Capenas finds in the National Archaeological Museum of Florence” (Camilli, Sorge, Zifferero 2014), dedicated to a broad selection of more than 800 finds from the same museum.

The exhibition allowed to retrace many complex dating from the late Bronze Age till the Romanization of the area of *Faliscan* settlements, including the Necropolis of Pizzo Piede, located in Narce (Viterbo-Italy); here was excavated the grave 23 (B), where were found about 40 objects belonging to a woman of the highest social level. The grave goods in the project



Fig. 1. The “Falisci in 3D” Project: the Faliscan territory; the grave goods from the tumb 23 (B); the objects documented; the post processing and the resulting 3D models.

come from a burial consisting of a sarcophagus in a deep pit with a niche adjacent to contain the rich furnishings (Camilli, Cianferoni 2014): the goods personal of the defunct (including princely rank items like an elaborate belt by bronze plating) and the home tools placed with the body (including a censer in bronze plate and a tripod complete of a bigger bowl and three smaller bowls).

The surveys were performed on about 20 pieces, in about 2 months and with mixed results; the outcomes, in fact, that can be considered reliable -both in terms of the compliance of metric characteristics as of the realistically visual features of the materials- may be declared for 15 objects, whose 3D models were displayed in the exhibition dedicated by a video projection of objects in scale from 50:1 to 100:1.

The video projected in the dedicated section of the exhibition is available at the link <https://youtu.be/OT7MXqyf2ZM>

### *The “Baratti in 3D” Project*

The second case study is referring to finds from the monumental Etruscan Necropolis of San Cerbone, located in the Archaeological Park of Baratti and Populonia, so important in the

landscape of Etruscan funerary archeology (Zifferero 2000). The vast resources that made the Etruscan town of Populonia a very rich city thanks to metalworking emanating both from its territory and from the island of Elba, allowed to the most powerful families around the VII century BC, to build the monumental necropolis that we can see in front of the sea of Baratti, where they have built rich burials of precious objects coming from far away and so impressive as to be known as the “tombs of the princes.” In 2015 thus it took place at the Museum of the Territory of Populonia in Piombino the campaign of survey of two grave goods from the Tomba del Bronzetto di Offerente and Fossa della biga (Fig. 2).



Fig. 2. The “Baratti in 3D” Project: the Tuscan territory related to the project: the Archaeological Park of Baratti and Populonia; the two tombs related to the project: Tomba del Bronzetto di Offerente, Fossa della biga; the post processing and the resulting 3D models.

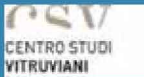
By calibrating different settings of data acquisition and processing, we reached the quality objectives defined by metrically reliable 3D reconstructions in double graphics output: geometric “not real” output for the appreciation of the dimensions and morphology of the pieces and texturized output for the visual appreciation of their workmanship’s value and characteristics of the material. The survey results rated as excellent by the archaeologists, with respect to the limits project time’s and budget’s, have amounted to 80% of the total 54 pieces documented.



## References

- Antinucci F., “Comunicare nel museo”. Roma, Laterza, 2010.
- Bertocci S., Arrighetti A., “Survey and documentation for archaeology, a special issue of Scires-it”, 2015, vol. 5/1-2. <http://caspur-ciberpublishing.it/index.php/scires-it>
- Benedetti B., Gaiani M., Remondino F., “Modelli digitali 3D in archeologia: il caso di Pompei”, SNS press, Pisa 2010.
- Brusaporci S., “Handbook of research on emerging digital tools for architectural surveying, modeling, and representation”, Igi Global, Hershey 2015.
- Camilli A., Cianferoni C., “La “principessa” di Narce”. In Camilli, Andrea, Sorge Elena, Zifferero, Andrea. Exhibition catalog Falisci, il popolo delle colline-materiali falisci e capenati al Museo Archeologico Nazionale di Firenze. Cortona, Tiphys edizioni, 2014.
- Fedeli F., “Popolonia, storia e territorio”, All'insegna del Giglio, Firenze, 1983.
- Frettoloso C., “Dal consumo alla fruizione: tecnologie innovative per il patrimonio archeologico”. Firenze: Alinea editrice, 2010.
- Ippoliti E., Meschini A., “Tecnologie per la comunicazione culturale”. *Disegnarecon*, 2011, vol. 4, n. 8, <https://disegnarecon.unibo.it/issue/view/276/showToc>
- Puma P., “The documentation of architecture and environment: technologies for the knowledge and the spreading of the cultural heritage, an overview”, 2012; in: Вестник Томского Университета. Культурология И Искусствоведение - Bollettino dell'Istituto delle Arti e Cultura della Tomsk State University № 1 (5)/2012.
- Puma P., “Local cultures, global heritage: surveying, collecting, communicating-new information models for knowledge and dissemination of cultural heritage”; in Proceedings of II International Colloquium Rigpac Urban Cultural Landscape and Territorial Identity An Approach between Cultural Diversities and Cultural Heritage, Firenze, 12-14/07/2012; Roma, Aracne, 2012.
- Puma P., Contributi per il rilievo archeologico di Popolonia. La necropoli monumentale”. Firenze, Edifir, 2014.
- Puma P., “Dallo scavo al 3D. Il corredo della Tomba B di Pizzo Piede: nuove applicazioni per la musealizzazione virtuale”. In Camilli A., Sorge E., Zifferero A. Exhibition catalog “Falisci, il popolo delle colline-materiali falisci e capenati al Museo Archeologico Nazionale di Firenze.” Cortona, Tiphys edizioni, 2014.
- Remondino F., Campana S., 3D Recording and Modelling in Archaeology and Cultural Heritage. Theory and best practices”, BAR International Series 2598, Oxford, Archaeopress, 2014.
- Zifferero A., a cura di, “L'architettura funeraria a Popolonia tra IX e VI secolo a.C.”, All'insegna del Giglio, Firenze 2000.

**UNISCAPE En-Route a. I - n. 4 - 2016**



**THIS SERIES IS PART OF I QUADERNI DI CAREGGI  
UNISCAPE'S ONLINE PUBLICATION  
ISSN 2281-3195**