

KNOWLEDGE, ANALYSIS  
AND INNOVATIVE METHODS  
FOR THE STUDY AND THE DISSEMINATION  
OF ANCIENT URBAN AREAS



Proceedings of the KAINUA 2017  
International Conference in Honour  
of Professor Giuseppe Sassatelli's 70<sup>th</sup> Birthday  
(Bologna, 18-21 April 2017)

edited by  
Simone Garagnani, Andrea Gucci

ARCHEOLOGIA E CALCOLATORI

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*All'Insegna del Giglio*

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## TABLE OF CONTENTS

|   |     |
|---|-----|
| SIMONE GARAGNANI, ANDREA GAUCCI, ELISABETTA GOVI, <i>Ancient reality and contemporary research. An introduction to the Conference KAINUA 2017 and its Proceedings</i>                             | 11  |
| ANCIENT CITIES: PAST AND CURRENT PERSPECTIVES   |     |
| MARIO TORELLI, <i>From ruins to reconstruction: past and present</i>  | 27  |
| PAOLA MOSCATI, <i>Archaeological computing and ancient cities: insights from the repository of «Archeologia e Calcolatori»</i>  | 47  |
| KAINUA PROJECT  |     |
| GIOVANNANGELO CAMPOREALE†, <i>Sulla genesi della città nell'Italia preromana. Economia, sociologia, urbanistica: il caso dell'insediamento dell'Accesa</i>  | 69  |
| ELISABETTA GOVI, <i>Kainua-Marzabotto: the archaeological framework</i>   | 87  |
| ANDREA GAUCCI, <i>Kainua Project: principles, theoretical framework and archaeological analysis</i>   | 99  |
| GIULIA MORPURGO, CHIARA PIZZIRANI, CHIARA MATTIOLI, <i>The craft settings in Kainua-Marzabotto: places and archaeological issues</i>  | 113 |
| STEFANO SANTOCCHINI GERG, ENRICO ZAMPIERI, BOJANA GRUŠKA, GIACOMO MANCUSO, <i>Topographical survey and digital models</i>   | 129 |
| SIMONE GARAGNANI, <i>Archaeological Building Information Modeling: beyond scalable representation of architecture and archaeology</i>   | 141 |
| AURELIO MUZZARELLI, MALIK FRANZOIA, <i>The ancient Digital Terrain Model and the infrastructure of the Etruscan city of Kainua</i>  | 151 |
| BOJANA GRUŠKA, GIACOMO MANCUSO, ENRICO ZAMPIERI, <i>Building materials and virtual models of the Etruscan city of Kainua</i>  | 165 |
| GIUSEPPE SASSATELLI, <i>Kainua Project Special Session: conclusioni</i>   | 177 |
| ETRUSCAN CITIES AND THEIR LANDSCAPES: NEW PERSPECTIVES, INNOVATIVE METHODS AND DISSEMINATION  |     |
| CARMINE PELLEGRINO, AMEDEO ROSSI, <i>Contemporary landscape and the archaeological record. An integrated approach to the study of the Etruscan-Samnite site of Pontecagnano (SA)</i>              | 189 |
| MARIA PAOLA BAGLIONE, BARBARA BELELLI MARCHESINI, CLAUDIA CARLUCCI, LAURA MARIA MICHETTI, <i>Pyrgi, harbour and sanctuary of Caere: landscape, urbanistic planning and architectural features</i> | 201 |

|   |     |
|---|-----|
| GIOVANNA BAGNASCO GIANNI, MATILDE MARZULLO, ANDREA GARZULINO,<br><i>The last ten years of research at Tarquinia</i>   | 211 |
| GIUSEPPINA ENRICA CINQUE, HENRI BROISE, VINCENT JOLIVET, <i>Civita<br/>Musarna (VT), il suo territorio e la chora di Tarquinia in età ellenistica:<br/>uno spazio ritualmente suddiviso?</i>                                    | 223 |
| PATRICIA S. LULOF, MAARTEN H. SEPERS, <i>The Acquarossa Memory Project.<br/>Reconstructing an Etruscan town</i>   | 233 |
| EMANUELE TACCOLA, LISA ROSSELLI, <i>Understanding Etruscan art<br/>and architecture through 3D modeling: the case of Volterra</i>   | 243 |
| TOMMASO QUIRINO, <i>Open architecture RDBMS and GIS as tools for<br/>analysing the Etruscan presence in the Po Plain: towards a model of the<br/>urban/non urban landscape</i>  | 253 |
| FROM THE ANCIENT CITIES TO THE LANDSCAPES: PROJECTS AND<br>RESEARCHES   |     |
| FRANK VERMEULEN, <i>Scanning and visualization of Roman Adriatic townscapes</i>   | 269 |
| ALESSANDRO CAMPEDELLI, MARCO DUBBINI, MARTINA MONICA,<br><i>Geo-archaeological study of the territory of Burnum's Roman site<br/>(Croatia) through LANDSAT multi-temporal satellite images and high<br/>resolution GeoEye</i>   | 277 |
| ILARIA ROSSETTI, <i>Reshaping the urban space: Bakchias in Ptolemaic<br/>and Roman times</i>  | 291 |
| FEDERICA BOSCHI, ENRICO GIORGI, MICHELE SILANI, <i>Reconstructing<br/>the ancient urban landscape in a long-lived city: the Asculum<br/>Project – combining research, territorial planning and preventative<br/>archaeology</i> | 301 |
| FERRAN CODINA, GABRIEL DE PRADO, ISIS RUIZ, ALBERT SIERRA,<br><i>The Iberian town of Ullastret (Catalonia). An Iron Age urban<br/>agglomeration reconstructed virtually</i>   | 311 |
| ANNA CHIARA FARISELLI, FEDERICA BOSCHI, MICHELE SILANI, MELANIA<br>MARANO, <i>Tharros – Capo San Marco in the Phoenician and Punic Age.<br/>Geophysical investigations and virtual rebuilding</i>                               | 321 |
| SIMONE MANTELLINI, <i>A city and its landscape across time: Samarkand<br/>in the ancient Sogdiana (Uzbekistan)</i>  | 333 |
| STARTING AND ONGOING PROJECTS   |     |
| STEFANO FINOCCHI, VINCENZO BALDONI, <i>Numana and its ancient territory:<br/>new data and research perspectives</i>   | 345 |

|  |     |
|--|-----|
| GIUSEPPE LEPORE, ENRICO GIORGI, VINCENZO BALDONI, FEDERICA BOSCHI,<br>MARIA CONCETTA PARELLO, MARIA SERENA RIZZO, <i>New methodologies<br/>to analyze and study the Hellenistic-Roman quarter in Agrigento</i>   | 353 |
| MICHELE SILANI, ENRICO GIORGI, FEDERICA BOSCHI, GABRIELE BITELLI,<br>ALBERTA MARTELLONE, <i>Seeing into the past: integrating 3D<br/>documentation and non-invasive prospecting methods for the analysis,<br/>understanding and reconstruction of the ancient Pompeii. The case<br/>of the House of Obellio Firmo (IX, 14)</i> | 361 |
| ISABEL ESCRIVÀ, JOSÉ J. MARÍN, ALBERT RIBERA, MIQUEL ROSSELLÓ,<br>ALFREDO SANTONJA, <i>Reconstructing the Late Antiquity Episcopal<br/>Complex of Valentia</i>   | 369 |
| GERVASIO ILLIANO, <i>Misenum: the harbour and the city. Landscapes in context</i>  | 379 |
| VALERIA POSCETTI, SAVERIO GIULIO MALATESTA, VIRGINIA CIRILLI,<br>FRANCESCO LELLA, VITO RONDINELLI, SALVATORE ESPOSITO, MARCO<br>BALSÌ, <i>Preliminary results of the Castelmonardo Project</i>   | 391 |
| <b>METHODOLOGIES, APPLICATIONS AND INTEGRATED SOLUTIONS</b>  |     |
| MARIA ROUSSOU, FRANCESCO RIPANTI, KATERINA SERVI, <i>Engaging visitors<br/>of archaeological sites through “emotive” storytelling experiences:<br/>a pilot at the Ancient Agora of Athens</i>  | 405 |
| MARCO GAIANI, <i>Management and communication of archaeological artefacts<br/>and architectural heritage using digital IS. What today? What next?</i>  | 421 |
| ANDREA D’ANDREA, ANGELA BOSCO, MARCO BARBARINO, <i>A 3D environment<br/>to rebuild virtually the so-called Augusteum in Herculaneum</i>  | 437 |
| GIOVANNA LIBEROTTI, CORRADO ALVARO, <i>Using laser scanner technology<br/>to analyse mud-brick architecture in the ancient Near East. The Palatial<br/>Complex of Arslantepe (Malatya, Turkey)</i>   | 447 |
| MOISÉS HERNÁNDEZ CORDERO, <i>Geomatics approach to surveys<br/>for Late Antiquity buildings. The Episcopal Palace in Side, Turkey</i>  | 457 |
| FILIBERTO CHIABRANDO, GIULIA SAMMARTANO, ANTONIA SPANÒ,<br>GRAZIA SEMERARO, <i>Multi-temporal images and 3D dense models<br/>for archaeological site monitoring in Hierapolis of Phrygia (TR)</i>  | 469 |
| ELISABETTA DONADIO, RICCARDO MAZZA, FEDERICO BARELLO, <i>Multimedia<br/>digital solutions from image and range based models for ancient<br/>landscapes communication</i>   | 485 |
| VALERIA CERA, <i>Knowledge and valorization of historical sites through<br/>low-cost, gaming sensors and H-BIM models. The case study<br/>of Litternum</i>   | 497 |

|   |     |
|---|-----|
| ALFONSO IPPOLITO, MARTINA ATTENNI, CRISTIANA BARTOLOMEI,<br><i>Digital acquisition: reflections on data quality</i>   | 507 |
| AARON PATTEE, ARMIN VOLKMANN, MATTHIAS UNTERMANN, <i>Integrative<br/>GIS-based investigation of the medieval fortress architecture of Pfalz,<br/>incorporating photogrammetry, geoinformatics and landscape analysis</i>        | 521 |
| JACOPO BONETTO, ARTURO ZARA, <i>The Nora Virtual Tour: an immersive visit<br/>in the ancient city</i>   | 531 |
| SILVIA BERNARDONI, MARCO MONTANARI, RAFFAELE TROJANIS,<br><i>Open History Map</i>   | 539 |
| GIOVANNI AZZENA, ROBERTO BUSONERA, CHIARA PERINI, <i>The future (?)<br/>of effective protection</i>   | 549 |
| SHORT PAPERS  |     |
| SARA LORETO, <i>Gropello Cairoli (PV): computer applications for<br/>historical-topographic synthesis</i>   | 563 |
| ANNACHIARA PENZO, FEDERICA PRONI, ANTONIO GOTTARELLI,<br><i>The archaeological settlement of Monte Bibebe (Bologna)</i>   | 571 |
| ILENIA GRADANTE, DAVIDE TANASI, <i>3D digital technologies for architectural<br/>analysis. The case of the “Pagan Shrine” in the Catacombs of Santa<br/>Lucia (Siracusa, Sicily)</i>  | 581 |
| FRANCESCO GABELLONE, IVAN FERRARI, <i>Reconstruction of Villino Florio’s<br/>wooden ceiling using 3D technologies</i>   | 587 |
| FRANCESCO GABELLONE, IVAN FERRARI, FRANCESCO GIURI, MARIA CHIFFI,<br><i>3D technologies for a critical reading and philological presentation<br/>of ancient contexts</i>  | 591 |
| ANTONIO PECCI, FABIO DONNICI, <i>When there was no GIS system:<br/>rediscovering archaeological researches of the 19<sup>th</sup> century through<br/>the use of the drone. The case study of Mount Siri (Anzi, Basilicata)</i> | 597 |
| MARTIJN VAN DER KAAIJ, <i>Heron Visualisation Engine. Visualisation<br/>and dissemination of semantic cultural heritage data</i>  | 603 |
| TATIANA VOTROUBEKOVÁ, <i>Etruscan rock-cut tombs with decorated façades.<br/>A 3D approach</i>  | 609 |

WHEN THERE WAS NO GIS SYSTEM:  
REDISCOVERING ARCHAEOLOGICAL RESEARCHES  
OF THE 19<sup>TH</sup> CENTURY THROUGH THE USE OF THE DRONE.  
THE CASE STUDY OF MOUNT SIRI (ANZI, BASILICATA)

1. INTRODUCTION

The use of drones and techniques of modern photogrammetry based on the Structure from Motion and Imaged-Based methodologies (REMONDINO, EL-HAKIM 2006; CAPRIOLI, SCOGNAMIGLIO 2009) allow the production of three-dimensional models related to partial areas or whole landscapes. By the 3D models, it is possible to extrapolate orthophotos, DEM (Digital Elevation Model), Google KMZ that can be added to GIS platforms for the analysis and the study of the investigated objects. Furthermore, 3D models produced in a very high resolution and precision way allow us to perform analysis on the microreliefs (PECCI 2016). In the field of archaeology, such techniques and methodologies have particular success, and they are established as a new tool of remote sensing (DE REU *et al.* 2013; LASAPONARA *et al.* 2017).

In this contribution, the results of these applications will be shown in the archaeological investigation of the peak of Mount Siri, the acropolis of the ancient Anxia (Anzi, Basilicata). This is a very rich archeological area, in which several excavations, unfortunately known only through brief descriptions, were conducted since the 19<sup>th</sup> century.

2. CASE STUDY

The ancient centre, indicated in the *Tabula Peutingeriana* as *Anxia*, along the *via Herculia*, is located in correspondence of the modern village of Anzi (Potenza), on a rocky peak (Mount Siri, 1067 m) that dominates the surrounding territory. Due to its particular attitude as a natural fortress in the heart of the ancient Lucania, its privileged position with respect to the internal communication routes and its richness of natural resources, the site was always particularly suitable for human settlement.

Between the end of 18<sup>th</sup> and the first thirty years of 19<sup>th</sup> century, the researches in the territory of Anzi had a great success, but led to the systematic dispersion of countless archaeological findings (DONNICI in press). Here, furthermore, new professionals were born: they were the “esperti scavatori” (expert archaeologists) and “rattoppatori de’ cocci” (restorers of vessels) from Anzi, at that time known as the most renowned around the Kingdom of Naples (DONNICI *et al.* in press).



As already mentioned, our case study concerns a small part of the territory of the modern Anzi: the peak of Mount Siri. In this area, crossed by Via Salita Rosario, we can now see the astronomical observatory, the Church of Santa Maria del Rosario and a tank of the local aqueduct. Moreover, until a few decades ago, the tower of a medieval fortress was still visible on the top. The slopes of the the peak are very steep (average slope about 45% on the southern part and 60% along the first hundred meters of the northern one).

The first reports of archaeological findings on the peak of Mount Siri are given by the Lucanian scholar Andrea Lombardi (LOMBARDI 1987, 75-74). He mentions the discovery, made before 1832, of more than a hundred ancient graves, «in the place called Coste di S. Maria, in the northern part of the village» (transl. from Italian). In the graves «some of the most valuable objects were found: Nolan and Sicilian figured vessels, some of them with Greek inscriptions; very good bronze objects, rare crystal vases and some golden or silver ornaments» (transl. from Italian).

About thirty years after Lombardi, G. D'Errico claims he could see on the Mount Siri the foundation of a castle, and the traces of an ancient road that, according to him, was a part of the *via Herculia* (D'ERRICO 1865, 76).

However, the news of excavations “a pozzetto”, the so called “fogge”, dates back to the beginning of 20<sup>th</sup> century, where ceramic fragments, amber objects and an iron spearhead were found (DI CICCIO 1900, 36).

The last archeological findings in the area date back to the early 1980s, exactly close to the modern car parking in the northern part of the peak, where «a series of holes of a roundish shape in the ground» were discovered. Escaved in Middle Ages for landfill purposes, they contained a large number of archaeological materials that attests the human presence since the Iron Age (BOTTINI 1982, 48).

F.D.

### 3. RESEARCH METHOD AND RESULTS

The 3D model, realized with the drone and the Structure from Motion and Imaged-Based methodologies, was obtained processing 300 aerial images of the peak of the Mount Siri. Pictures were taken at zenith and at an angle in order to obtain a total coverage of the area. The drone we used is a DJI Phantom Vision 2+. The 3D model, elaborated with the Agisoft Photoscan software, results from a point cloud of 14,460,135 points, and a mesh of 32,988,767 faces; it was georeferenced on the basis of a previous topographical survey. From the 3D model it was possible to extrapolate the orthophoto (pixel size 0.0456361 m) and the DEM (pixel size 0.182544 m) to be analyzed in the GIS software (QGIS).

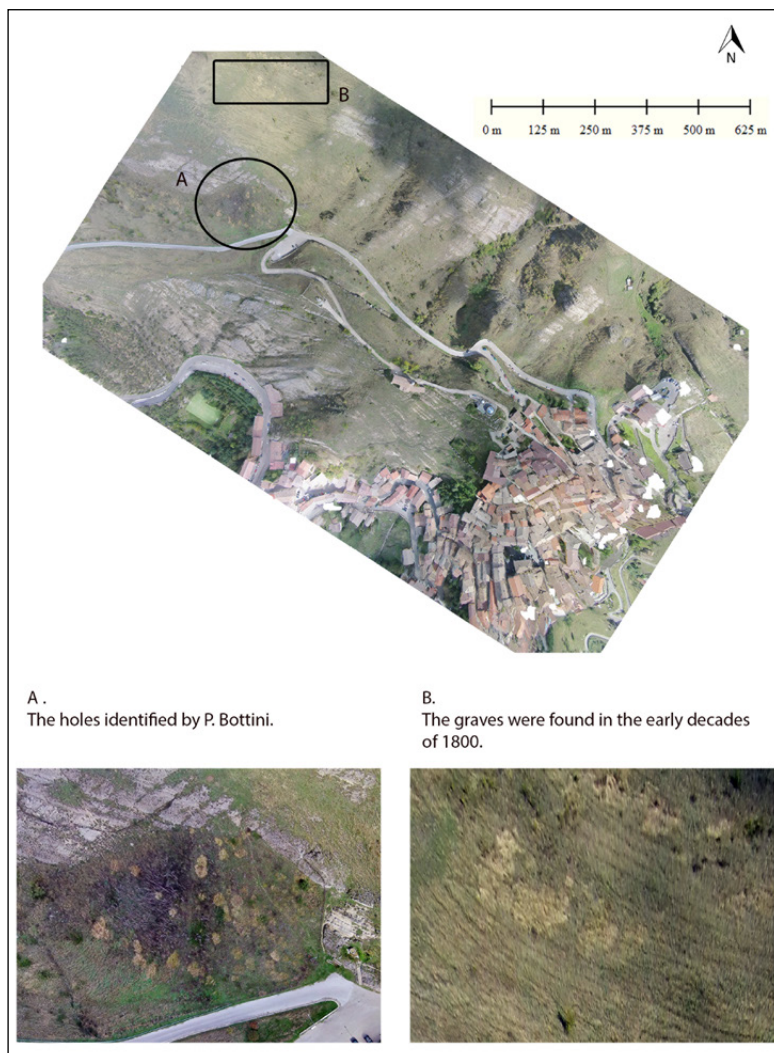


Fig. 1 – 3D Model and DEM of the peak of Mount Siri.

Starting from the analysis of the microrelief (Fig. 1), we can clearly see a straight mark in the north-eastern part of the peak, perhaps due to the presence of an ancient road, now disappeared. If this hypothesis is correct, the road was very large (about 14 m) and directly connected with the modern one which runs below (strada Campo Sportivo San Donato). We are probably in front of the access road to the medieval fortress, almost certainly the road identified

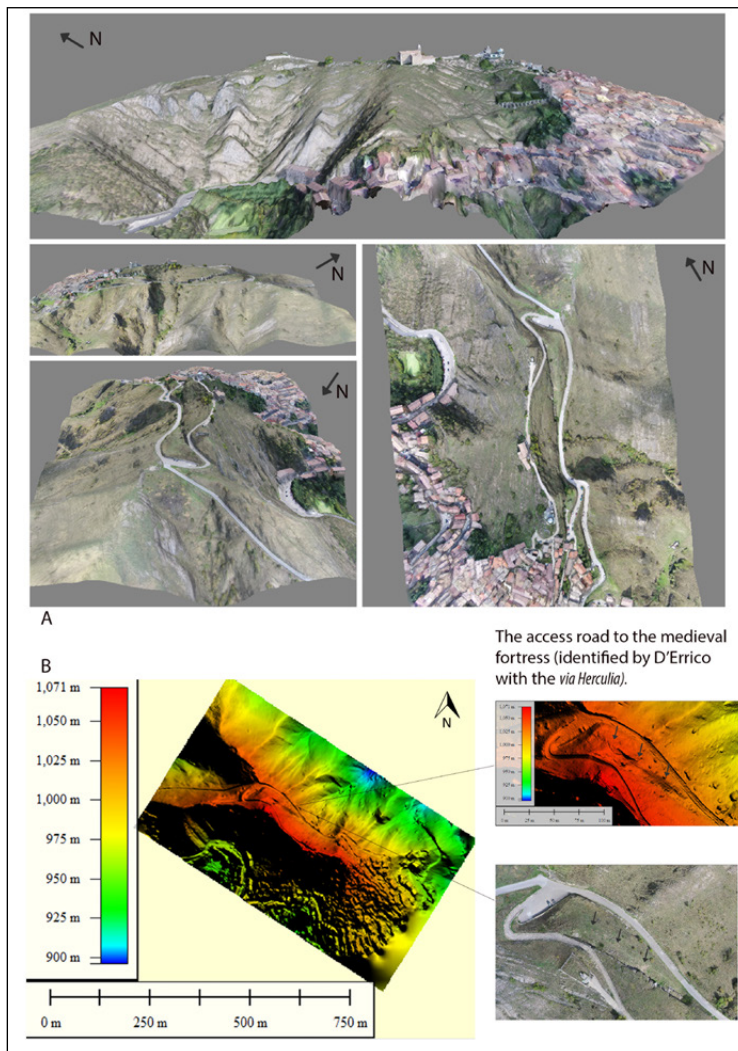


Fig. 2 – Orthophoto of the peak of Mount Siri.

by D'Errico as the *via Herculia*. In the orthophoto (Fig. 2), furthermore, we can see with a certain safety the holes identified by P. Bottini in the northern part of the modern car parking.

Relying on these types of crop marks, it is easy to identify other similar discoveries, perhaps the “fogge” found at the beginning of the 20<sup>th</sup> century by the archaeologist V. Di Cicco.

Other crop marks can be seen in the orthophoto, in a special way along the northern slopes of peak of Santa Maria (precisely in NE direction), namely the findspot where the graves were found in the early decades of 19<sup>th</sup> century.

#### 4. CONCLUSIONS

News technologies of remote sensing on Unmanned Aerial Vehicle (UAV) platform allow us a qualitative and quantitative increase of the archaeological data. In some contexts, like that one discussed in this paper, they seem to be the only instruments capable of making more information, also in absence of an archaeological excavation. In our case study, they have enabled us to geolocalize, with good certainty, the archaeological discoveries that occurred in the past centuries, being able to fix them in the space with a high degree of accuracy.

A.P.

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## ABSTRACT

Modern archaeologists often find it difficult to identify the exact position on the field (and on the maps) of the finds brought to light during archaeological excavations, particularly those conducted before the second half of the 20<sup>th</sup> century. In these cases, in fact, they are obliged to record data and information on their GIS as being unable to locate the correct place, or even the area, of those ancient archaeological investigations. This inability to be precise creates several problems from a topographical point of view and negatively influences the archaeological reconstruction of specific territories or sites. Therefore, how is it possible to correctly locate and, as a result, mark on the map what was discovered or excavated in the recent past? One possible solution is the 3D reconstruction of a modern landscape through the use of the UAV technology and some derived applications, such as digital techniques based on Structure from Motion and Imaged-Based methodologies. The 3D model can be analyzed using the GIS system, and through the analysis of the micro-relief and aerial photos it is possible to use an important tool to locate past archaeological investigations. In this paper, we present the case study of Mount Siri (Anzi, Basilicata), the location of several important archaeological discoveries which were made during the 19<sup>th</sup> century.

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