

THE THREE DIMENSIONS OF ARCHAEOLOGY

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Contents

List of Figures and Tables.....	iii
Foreword to the XVII UISPP Congress Proceedings Series Edition Luiz OOSTERBEEK	vi
The Three Dimensions of Archaeology – Introduction..... Hans KAMERMANS, Chiara PICCOLI, Wieke DE NEEF, Axel G. POSLUSCHNY & Roberto SCOPIGNO	vii
Discussing the obvious or defending the contested: why are we still discussing the ‘scientific value’ of 3D applications in archaeology?..... Tijm LANJOUW	1
3Di – enhancing the record, extending the returns, 3D imaging from free range photography and its application during excavation Dominic POWLESLAND	13
Towards 3D GIS. Notes from the 2012 CAA-NL/DE chapter session ‘from 2.5 to 3 spatial dimensions’ Martijn VAN LEUSEN & Serge VAN GESSEL	33
Are we there yet? 3D GIS in archaeological research, the case of Tell Sabi Abyad, Syria Victor KLINKENBERG	39
Three-dimensional simulation of a fire in a simplified gallery of the Chauvet-Pont-d’Arc cave (Ardèche, France)..... Delphine LACANETTE, Jean-Christophe MINDEGUIA, Catherine FERRIER, Evelyne DEBARD & Bertrand KERVAZO	49
Using digital photogrammetry to produce 3D models at prehistoric ditched enclosures: Perdigões as a case study José L. CARO, Víctor JIMÉNEZ-JÁIMEZ & José Enrique MÁRQUEZ-ROMERO	61
3D modeling by digital photogrammetry applied to the Palaeolithic mammoth bone dwelling settlement of Gontsy (Ukraine)..... Lioudmila IAKOVLEVA, François DJINDJIAN & Yves EGELS	73
Archaeology and coastal erosion: monitoring change through 3D digital techniques Elias LÓPEZ-ROMERO, Patricia MAÑANA-BORRAZÁS, Alejandro GÜMIL-FARIÑA & Marie Yvane DAIRE	89
Fast 3D recording techniques: a low-cost method for the documentation and analysis of scattered architectural elements as a part of the EMCHAHE project Patricia MAÑANA-BORRAZÁS, Rebeca BLANCO-ROTEA & José Carlos SÁNCHEZ-PARDO	99

Using airborne laser scanning and historical aerial photos to identify modern age fortifications in the Minho Valley, Northwest Iberian Peninsula	111
Rebeca BLANCO-ROTEA, João FONTE, Alejandro GÜMIL-FARIÑA & Patricia MAÑANA-BORRAZÁS	
Devilish details – fine-tuning survey techniques for ephemeral sites.....	121
Wieke DE NEEF & Martijn VAN LEUSEN	
Geophysical survey on “El Mazo de la Castañera” (Cantabria, Spain): looking for open-air domestic remains.....	133
Eduardo CARMONA BALLESTERO, Cristina VEGA MAESO, Oscar LÓPEZ JIMÉNEZ & Victoria MARTÍNEZ CALVO	
Electrical resistivity imaging survey around the caves of the Ojo Guareña Karst complex (Merindad de Sotoscueva, Burgos, Spain)	141
L. BERMEJO, A. I. ORTEGA, R. GUÉRIN, A. BENITO-CALVO, J. M. PARÉS, M. A. MARTÍN, E. ARACIL, U. MARURI & J. A. PORRES	

List of Figures and Tables

D. POWLESLAND: 3Di – enhancing the record, extending the returns, 3D imaging from free range photography and its application during excavation

FIGURE 1. DIGITISED FIELD DRAWING FROM WEST HESLERTON, NORTH YORKSHIRE.....	16
FIGURE 2. FOUR RENDERINGS OF THE PLAN OF THE POST SETTINGS OF A TIMBER BUILDING.....	17
FIGURE 3. 3D LASER SCAN MADE USING A LEICA HD LASER SCANNER SHOWING INTERNAL FEATURES	19
FIGURE 4. POINT CLOUD FROM 3D LASER SCAN SHOWING THE EAST FACING WALL AND DOORWAY	20
FIGURE 5. AN EARLY SfM EXPERIMENT RECORDING AN EXCAVATED NEOLITHIC PIT.....	22
FIGURE 6. DETAIL VIEW OF PART OF A SECTION THROUGH A BRONZE AGE BARROW	24
FIGURE 7. MULTIPLE SECTIONS OF TRENCHES EXCAVATED IN THREE DIFFERENT YEARS.....	25
FIGURE 8. SMALL EXCAVATION EXAMINING THE RAMPART OF A LARGE HILL-FORT AT ROULSTON SCAR.....	26
FIGURE 9. ISOMETRIC VIEW OF THE SAME MODEL WITH CAMERA POSITIONS SHOWN IN FIGURE 8	26
FIGURE 10. TRIANGULATED MESH COVERING THE TRENCH SHOWN IN FIGURES 8 AND 9	27
FIGURE 11. THE COMPLETED AND ANNOTATED 3DI MODEL SHOWING AN EARLIER STAGE IN THE EXCAVATION.....	27
FIGURE 12. CAMERA POSITIONS RECORDED USING A SMALL QUADCOPTER TO MODEL AN EARTHWORK FEATURE	30
FIGURE 13. 3DI MODEL GENERATED FROM MORE THAN 150 IMAGES GATHERED USING A DJI QUADCOPTER	31

M. van LEUSEN & S. van GESSEL: Towards 3D GIS. Notes from the 2012 CAA-NL/DE chapter session ‘from 2.5 to 3 spatial dimensions’

FIGURE 1. EXAMPLE OF WHAT A TRUE VOLUMETRIC MODEL MIGHT LOOK LIKE	34
FIGURE 2. LEGO MODEL USING VOXELS OF DIFFERENT DIMENSIONS TO REPRESENT OBJECTS, CUTS AND FILLS	36
FIGURE 3. GOCAD MODEL OF SUPERFICIAL GEOLOGICAL DEPOSITS IN THE GLASGOW AREA	36

V. KLINKENBERG: Are we there yet? 3D GIS in archaeological research, the case of Tell Sabi Abyad, Syria

FIGURE 1. THE MAIN SUBSYSTEMS OF A GEOGRAPHIC INFORMATION SYSTEM	40
FIGURE 2. OVERVIEW MAP OF TELL SABI ABYAD WITH THE NEOLITHIC AS WELL AS THE ARCHITECTURE	41
FIGURE 3. 3D VIEW OF EXTRUDED ARCHAEOLOGICAL HORIZONS	42
FIGURE 4. 3D DISTRIBUTION OF A SELECTION OF THE LATE NEOLITHIC BURIALS FROM TELL SABI ABYAD.....	43
FIGURE 5. 3D DISTRIBUTION OF CUNEIFORM TABLETS IN A HALLWAY OF THE DUNNU	44
FIGURE 6. SECTION DRAWINGS AMONGST THE SCHEMATIC ARCHITECTURE.....	45

D. LACANETTE, J.-C. MINDEGUIA, C. FERRIER, E. DEBARD & B. KERVAZO: Three-dimensional simulation of a fire in a simplified gallery of the Chauvet-Pont-d’Arc cave (Ardèche, France)

FIGURE 1. MAP OF THE CHAUVET-PONT-D’ARC CAVE WITH EXAMPLES OF FAMOUS PAINTINGS AND ENGRAVINGS.....	50
FIGURE 2. CHANGE OF COLOUR OF THE LIMESTONE, TO PINK/RED (LEFT), TO GREY (RIGHT).....	50
FIGURE 3. SOOT DEPOSIT AND SPALLING	51
FIGURE 4. LOCATION OF THE THERMAL IMPACTS IN THE CHAUVET CAVE IN VIOLET	52
FIGURE 5. LOCATION OF THE FIREPLACES IN THE MEGACEROS GALLERY.....	52
FIGURE 6. QUARRY OF LUGASSON. SOOT DEPOSIT AND SPALLING AND RUBIFICATION	53
FIGURE 7. PHOTOGRAMMETRY OF THE QUARRY AND RECONSTRUCTION IN FDS	54
FIGURE 8. DISTRIBUTION OF MEASURED AND SIMULATED WALL TEMPERATURES.....	54
FIGURE 9. DISTRIBUTION OF TEMPERATURE AND VELOCITIES.....	55
FIGURE 10. RELEASE AND DISSIPATION OF THE SMOKE AND SOOT DEPOSIT ON THE UPPER PART OF THE WALL.....	55
FIGURE 11. DOMAIN CONCERNED BY THE 3D SIMULATION OF THE FIRE	56
FIGURE 12. TEMPERATURE DISTRIBUTION ON A SLICE IN A VOLUME LIKE THE MEGACEROS GALLERY	57
FIGURE 13. VISUALISATION ON A SLICE OF THE LOCATION OF THE HIGHEST TEMPERATURES.....	57
FIGURE 14. AIR VELOCITY DISTRIBUTION AND EVACUATION SCHEME OF THE AIR NEAR THE FIRE	58
FIGURE 15. SMOKE DISTRIBUTION IN A VOLUME LIKE THE MEGACEROS GALLERY DURING THE FIRE	58
FIGURE 16. FRACTIONAL EFFECTIVE DOSE DISTRIBUTION ON A SLICE OF VOLUME	59

J. L. CARO, V. JIMÉNEZ-JÁIMEZ & J. E. MÁRQUEZ-ROMERO: Using digital photogrammetry to produce 3D models at prehistoric ditched enclosures: Perdigões as a case study

FIGURE 1. AERIAL VIEW AND MAGNETOGRAM OF PERDIGÕES	63
FIGURE 2. MICRO-TOPOGRAPHIC SURVEY AT PERDIGÕES	64
FIGURE 3. BASIC 3D WORKFLOW AT PERDIGÕES.....	67
FIGURE 4. CREATION OF PHOTOGRAMMETRIC COMPOSED FLOOR PLANS AT PERDIGÕES.....	67
FIGURE 5. SECTOR L AT PERDIGÕES, AREA AROUND THE 'IMBREX'	68
FIGURE 6. PHOTOGRAMMETRIC RECONSTRUCTION AND SUBSEQUENT 3D MODELLING AT SECTOR L IN PERDIGÕES	68
FIGURE 7. ARTEFACTS FROM SECTOR L AT PERDIGÕES SELECTED FOR THE 3D MODELLING TEST	69
FIGURE 8. SYNTHETIC IMAGES REPRESENTING THE IDOL AND THE LOOM WEIGHT FROM SECTOR L AT PERDIGÕES	69

L. IAKOVLEVA, F. DJINDJIAN & Y. EGELS: 3D modeling by digital photogrammetry applied to the Palaeolithic mammoth bone dwelling settlement of Gontsy (Ukraine)

FIGURE 1. TOPOGRAPHY OF THE SLOPE OF THE UDAĬ RIVER AND LOCATION OF THE SETTLEMENT OF GONTSY	74
FIGURE 2. THE SETTLEMENT BEFORE EXCAVATIONS (DURING THE WINTER) AND DURING EXCAVATIONS.....	75
FIGURE 3. THE MAP OF THE EXCAVATIONS SINCE 1871	76
FIGURE 4. A GENERAL VIEW OF THE SETTLEMENT UNDER THE LARGE HANGAR N°1	77
FIGURE 5. THE MAMMOTH BONE BED UNDER THE HANGAR 2 IN THE BOTTOM OF THE EASTERN PALEORAVINE	77
FIGURE 6A. THE SMALL MAMMOTH BONE HUT N°2	78
FIGURE 6B. RECONSTITUTION OF THE SMALL MAMMOTH BONE HUT N°2	79
FIGURE 7. THE MAMMOTH BONE HUT N°3 (EXCAVATIONS 2014).....	80
FIGURE 8. THE MAMMOTH BONE HUT N°4 (EXCAVATIONS 2010-2011).....	80
FIGURE 9. THE MAMMOTH BONE HUT N°5 (EXCAVATIONS 2013).....	81
FIGURE 10. THE DATA ACQUISITION BY OBLIQUE PHOTOGRAPHY.....	82
FIGURE 11. GENERAL VIEW OF THE THREE MAMMOTH BONE HUTS BY 3D DIGITAL PHOTOGRAMMETRY	84
FIGURE 12. 3D DIGITAL PHOTOGRAMMETRY: THE CONTOUR LINE OF THE MAMMOTH BONE HUT N°5	85
FIGURE 13. 3D DIGITAL PHOTOGRAMMETRY: SQUARE L5 OF THE MAMMOTH BONE HUT N°4.....	86

E. LÓPEZ-ROMERO, P. MAÑANA-BORRAZÁS, A. GÜMIL-FARIÑA & M. Y. DAIRE: Archaeology and coastal erosion: monitoring change through 3D digital techniques

FIGURE 1. LOCATION MAP OF STUDY AREAS	90
FIGURE 2. DGPS POSITIONING OF REFERENCE STATIONS. PÉNESTIN PENINSULA (BRITTANY, FRANCE)	92
FIGURE 3. COASTAL PATH AT LE LOMER (PÉNESTIN, BRITTANY, FRANCE)	93
FIGURE 4. GENERAL VIEW OF GUIDOIRO AREOSO (RÍA DE AROUSA, GALICIA, SPAIN)	94
FIGURE 5. HALANGY PORTH (SAINT MARY'S, ISLES OF SCILLY, UK)	95
TABLE 1. ARCHAEOLOGICAL SITES CONSIDERED FOR THE ANALYSIS.	91

P. MAÑANA-BORRAZÁS, R. BLANCO-ROTEA & J. C. SÁNCHEZ-PARDO: Fast 3D recording techniques: a low-cost method for the documentation and analysis of scattered architectural elements as a part of the EMCHAHE project

FIGURE 1. EMCHAHE CASE STUDY AREAS IN THE NW IBERIAN PENINSULA	100
FIGURE 2. SUMMARY OF THE DIFFERENT TECHNIQUES APPLIED IN THE PROSPECTIVE AND ANALYTICAL PHASES	102
FIGURE 3. SUMMARY OF THE WORKFLOW OF THE 3-D RECORDING TECHNIQUE IN EMCHAHE.....	103
FIGURE 4. DIFFERENCES IN THE SOUTHERN ELEVATION OF THE CHAPEL OF SAN MAMEDE DOS MÁRTORES	104
FIGURE 5. DIFFERENT VIEWS OF THE 3-D MODEL OF SANTO TOMÉ DE TORDEA CHURCH	105
FIGURE 6. EXAMPLE OF THE HIGH LEVEL OF DETAIL THAT CAN BE ACHIEVED USING THIS 3-D RECORDING SYSTEM.....	106
FIGURE 7. WE USE THE RESULTS OF PHOTOGRAMMETRY NOT ONLY TO SHOW THE CHURCHES	107

R. BLANCO-ROTEA, J. FONTE, A.I. GÜMIL-FARIÑA & P. MAÑANA-BORRAZÁS: Using airborne laser scanning and historical aerial photos to identify modern age fortifications in the Minho Valley, Northwest Iberian Peninsula

FIGURE 1. AREAS STUDIED AS A PART OF THE MODERN AGE FORTIFIED LANDSCAPES PROJECT	112
FIGURE 2. SUMMARY OF THE ANALYSIS OF ARCHAEOLOGICAL AND HERITAGE ELEMENTS	113
FIGURE 3. APPLICATION OF AIRBORNE LIDAR TO BASTIONED FORTIFICATIONS IN THE BAIXO MINHO	115
FIGURE 4. WORKFLOW OF THE PHOTOGRAMMETRIC RECONSTRUCTION OF THE FORTIFICATIONS OF EXTREMO.	117

*W. DE NEEF & M. VAN LEUSEN: Devilish details –
fine-tuning survey techniques for ephemeral sites*

FIGURE 1. THE SIBARITIDE IN NORTHERN CALABRIA (ITALY)	122
FIGURE 2. THE CLASSIFICATION OF PROTOHISTORIC SITES	124
FIGURE 3. SITES T94 AND T231, CONTRADA DAMALE. RESULTS OF THE MAGNETIC GRADIOMETER SURVEY.....	125
FIGURE 4. SITE T231. RESULTS OF REPEATED MAGNETIC GRADIOMETER SURVEY ON THE EXPOSED SURFACE	126
FIGURE 5. TWO COMPLETE LATE BRONZE AGE STORAGE VESSELS OF THE DOLIO CORDONATO O A FASCE TYPE.....	129
FIGURE 6. VIEW OVER THE CONTRADA DAMALE, THE TOWN OF FRANCAVILLA MARITTIMA	129

E. CARMONA BALLESTERO, C. VEGA MAESO, O. LÓPEZ JIMÉNEZ & V. MARTÍNEZ CALVO:
**Geophysical survey on “El Mazo de la Castañera” (Cantabria, Spain):
looking for open-air domestic remains**

FIGURE 1. LOCATION OF EL MAZO DE LA CASTAÑERA	134
FIGURE 2. SURVEYED ZONES IN EL MAZO DE LA CASTAÑERA.....	135
FIGURE 3. SURFACE MAPS FROM M1 ZONE: ELECTRIC CONDUCTIVITY (EC) AND MAGNETIC SUSCEPTIBILITY (MS)	135
FIGURE 4. READINGS AND INTERPRETATION OF MAGNETIC SUSCEPTIBILITY FROM M2 ZONE.....	136
FIGURE 5. READINGS AND INTERPRETATION OF ELECTRIC CONDUCTIVITY FROM M3 ZONE.....	136
FIGURE 6. READINGS AND INTERPRETATION OF MAGNETIC SUSCEPTIBILITY FROM M4 ZONE.....	137
FIGURE 7. READINGS AND INTERPRETATION OF MAGNETIC SUSCEPTIBILITY FROM M5 ZONE.....	137
FIGURE 8. READINGS AND INTERPRETATION OF ELECTRIC CONDUCTIVITY FROM M6 ZONE.....	138

*L. BERMEJO, A. I. ORTEGA, R. GUÉRIN, A. BENITO-CALVO, J. M. PARÉS, M. A. MARTÍN, E. ARACIL,
U. MARURI & J. A. PORRES: Electrical resistivity imaging survey around the caves of
the Ojo Guareña Karst complex (Merindad de Sotoscueva, Burgos, Spain)*

FIGURE 1. DETAIL OF THE OJO GUAREÑA KARST. KAITE AND PALOMERA CAVE ARE HIGHLIGHTED IN DARK GREY.....	142
FIGURE 2. PALOMERA CAVE ENTRANCE AREA PLAN. THE ERT PROFILE LAYOUT IS MARKED IN DARK GREY	143
FIGURE 3. KAITE PLAN: A IS THE ANCIENT ENTRANCE; B THE SANCTUARY AREA; C THE CURRENT ACCESS	144
FIGURE 4. PALOMERA’S ERT PROFILE WITH BOTH WENNER-SCHLUMBERGER AND DIPOLE-DIPOLE RESULTS.....	146
FIGURE 5. KAITE’S ERT PROFILES.....	147
FIGURE 6. DETAIL OF KAITE’S ANCIENT ENTRANCE	148

Foreword to the XVII UISPP Congress Proceedings Series Edition

Luiz OOSTERBEEK
Secretary-General

UISPP has a long history, starting with the old International Association of Anthropology and Archaeology, back in 1865, until the foundation of UISPP itself in Bern, in 1931, and its growing relevance after WWII, from the 1950's. We also became members of the International Council of Philosophy and Human Sciences, associate of UNESCO, in 1955.

In its XIVth world congress in 2001, in Liège, UISPP started a reorganization process that was deepened in the congresses of Lisbon (2006) and Florianópolis (2011), leading to its current structure, solidly anchored in more than twenty-five international scientific commissions, each coordinating a major cluster of research within six major chapters: Historiography, methods and theories; Culture, economy and environments; Archaeology of specific environments; Art and culture; Technology and economy; Archaeology and societies.

The XVIIth world congress of 2014, in Burgos, with the strong support of Fundación Atapuerca and other institutions, involved over 1700 papers from almost 60 countries of all continents. The proceedings, edited in this series but also as special issues of specialized scientific journals, will remain as the most important outcome of the congress.

Research faces growing threats all over the planet, due to lack of funding, repressive behavior and other constraints. UISPP moves ahead in this context with a strictly scientific programme, focused on the origins and evolution of humans, without conceding any room to short term agendas that are not root in the interest of knowledge.

In the long run, which is the terrain of knowledge and science, not much will remain from the contextual political constraints, as severe or dramatic as they may be, but the new advances into understanding the human past and its cultural diversity will last, this being a relevant contribution for contemporary and future societies.

This is what UISPP is for, and this is also why we are currently engaged in contributing for the relaunching of Human Sciences in their relations with social and natural sciences, namely collaborating with the International Year of Global Understanding, in 2016, and with the World Conference of the Humanities, in 2017.

The next two congresses of UISPP, in Melbourn (2017) and in Geneva (2020), will confirm this route.

The Three Dimensions of Archaeology – Introduction

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This volume brings together presentations from two sessions organized for the XVII World UISPP Conference that was held from 1-7 September 2014 in Burgos (Spain). The sessions are: *The scientific value of 3D archaeology*, organised by Hans Kamermans, Chiara Piccoli and Roberto Scopigno, and *Detecting the Landscape(s) – Remote Sensing Techniques from Research to Heritage Management*, organised by Axel Posluschny and Wieke de Neef. The common thread amongst the papers presented here is the application of digital recording techniques to enhance the documentation and analysis of the spatial component intrinsically present in archaeological data. For a long time the capturing of the third dimension, the depth, the height or z-coordinate, was problematic. Traditionally, excavation plans and sections were documented in two dimensions. Objects were also recorded in two dimensions, often from different angles. Remote sensing images like aerial photographs were represented as flat surfaces. Although depth could be visualized with techniques such as stereoscopes, analysis of relief was troublesome. All this changed at the end of the last century with the introduction of computer-based digitization technologies, 3D software, and digital near-surface sampling devices. The spatial properties of the multi-scale archaeological dataset can now be accurately recorded, analysed and presented. Relationships between artefacts can be clarified by visualizing the records in a three-dimensional space, computer-based simulations can be made to test hypotheses on the past use of space, remote sensing techniques help in detecting previously hidden features of landscapes, thus shedding light on bygone land uses.

The methods and techniques that fall under the broad definition of 3D archaeology have now reached a mature state, where the advance in technology is at the service of archaeological research.

The session on *The scientific value of 3D archaeology* was dedicated to the presentation of methods, techniques and applications within the broad topic of 3D archaeology, with a specific focus on their scientific relevance. The papers selected for publication give a good overview of the application of digital 3D methodologies in archaeology, discussing how the use of 3D models has helped in the analysis and interpretation of archaeological evidence in a way that could not have been achieved by traditional documentation. The volume opens with the paper by Tjmm Lanjouw, which considers the application of 3D visualizations in archaeology from a theoretical perspective, focussing especially on digital reconstructions and virtual reality applications. Dominic Powlesland discusses the benefits of 3D imaging to accurately document the excavation process and enhance its interpretation, drawing on the experience accumulated by the Landscape Research Centre in Yorkshire. Martijn van Leusen and Serge van Gessel take into consideration the archaeological requirements of a 'true' 3D GIS,

which were discussed in the related session at the 2012 CAA Dutch-German chapter meeting. On the same subject, the paper by Victor Klinkenberg shows the usefulness of a 3D GIS for the interpretation of the 3D distribution of burials and artefacts at the site of Tell Sabi Abyad in Syria. Delphine Lacannette, Catherine Ferrier, Jean-Christophe Mindeguia, Evelyne Debard and Bertrand Kervazo present their research on a three-dimensional fire simulation in the Chauvet-Pont-d'Arc cave (France). Their study aimed to identify the zones that were suitable for occupation within the cave, by simulating temperature, smoke and the distribution of toxic gases of the fires that were lit inside. Next, the paper by Jose L Caro, Víctor Jiménez-Jáimez and José Enrique Márquez-Romero presents the result of digital photogrammetry applied to the prehistoric ditched enclosures of Perdigões (Portugal). Dealing with the application of photogrammetric techniques is also the paper by Lioudmila Iakovieva, François Djindjian and Yves Egels, which focusses on the 3D documentation of the Palaeolithic mammoth bone dwelling at Gontsy (Ukraine). Elias López-Romero, Patricia Mañana-Borrazás, Alejandro Güimil-Fariña and Marie Yvane Daire discuss the benefit of a 3D documentation of coastal heritage sites, which are threatened by erosion, focussing on selected case study areas in Galicia (Spain), Brittany (Western France) and Isles of Scilly (Britain). Finally, Patricia Mañana-Borrazás, Rebeca Blanco-Rotea and José Carlos Sánchez-Pardo present the methodology they have adopted for the 3D documentation of early medieval churches in Galicia (Spain), which enables stratigraphic analysis of the structures and an easy dissemination of their results.

The second part of this volume collects the papers that were selected for publication among those that were presented at the session *Detecting the Landscape(s)*. Techniques such as aerial reconnaissance, Airborne Laser Scanning (LiDAR), Geophysics, UAVs etc. have become major sources of archaeological information, especially for large areas and landscapes as a whole. Each of these techniques adds to the integration of the third dimension in archaeological research. The aim of this session was to highlight the great potential of these techniques for all aspects of landscape archaeology, including but not restricted to site detection, landscape research, heritage management, site and landscape preservation. Speakers were invited to place special focus on national and regional survey strategies and to discuss different research scales, from broad-brush to site specific approaches.

The participants in this session highlighted the application of non-invasive or remote sensing techniques, but also the complex interactions between these digital techniques and “traditional” archaeological recording methods such as field walking and excavation. The papers collected in this volume include four very different approaches to remote sensing for archaeology. First of all, Rebeca Blanco-Rotea, João Fonte, Alejandro Güimil-Fariña and Patricia Mañana-Borrazás discuss the use of airborne laser scanning and aerial photography for the detection of Modern Age fortification structures in the poorly accessible landscape of the Minho Valley (Portugal / Spain). On a site-specific scale, Wieke de Neef and Martijn van Leusen focus on the potential of the integration of surface distributions, geophysical data, and subsurface remains for the reconstruction of Late Bronze Age rural settlement in Calabria (Italy). Eduardo Carmona Ballester, Cristina Vega Maeso, Oscar López Jiménez and Victoria Martínez Calvo show how electro-magnetic induction survey can be applied to mitigate archaeological detection biases in the heavily vegetated landscape of Cantabria (Spain). Finally, Lucia Bermejo, A. I. Ortega, R. Guérin, A. Benito-Calvo, J. M. Parés, M. A. Martín, E. Aracil, U. Maruri and J. A. Porres discuss the application of electric resistivity surveys for the identification of possibly anthropogenic deposits and natural infill processes in a karstic cave system in the province of Burgos (Spain). These contributions show that remote sensing techniques have a great potential for archaeological research in otherwise poorly investigated areas, which adds a further dimension to our knowledge of land use in the past.