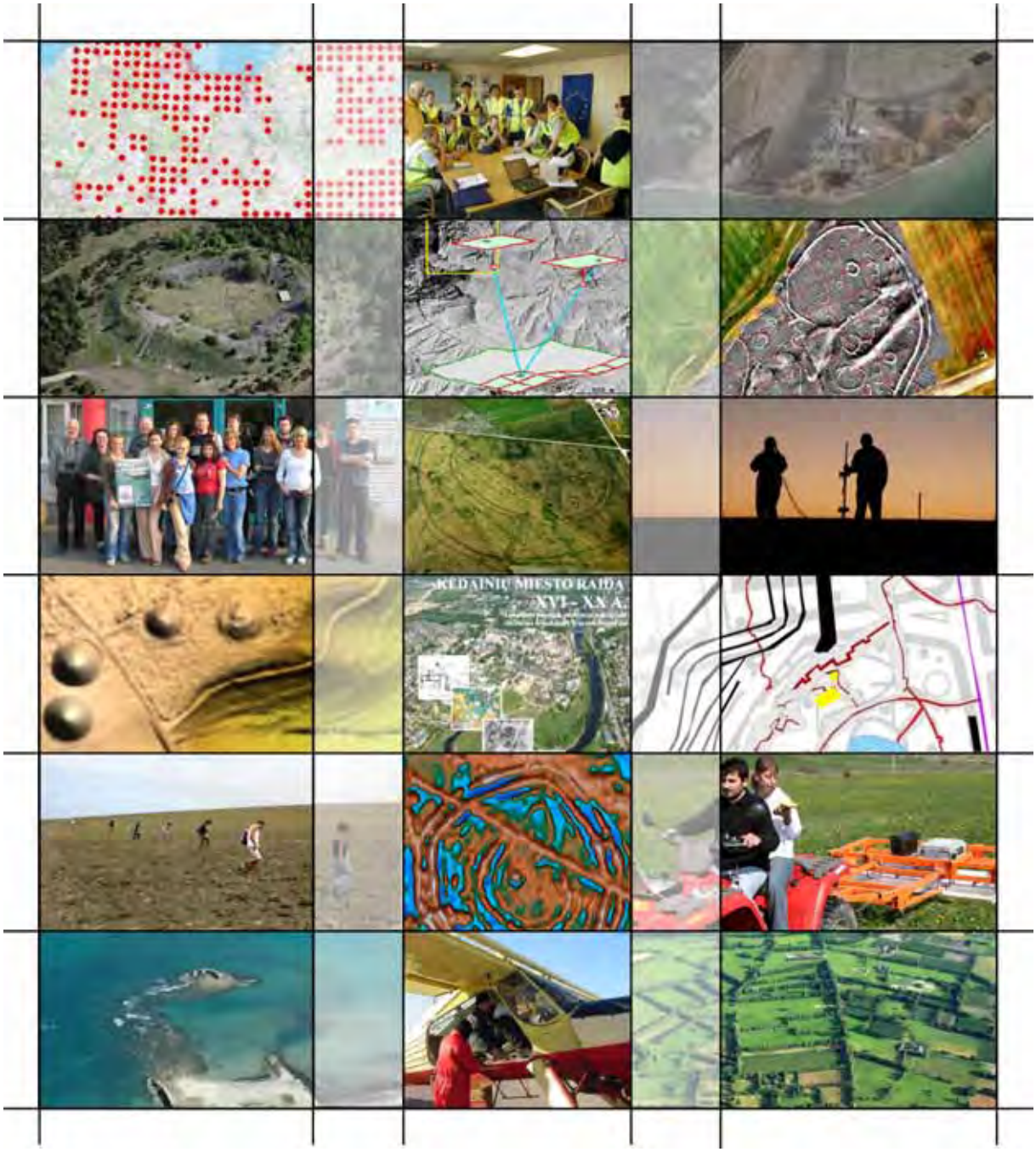
EUROPEAN LANDSCAPES

past, present and future

Culture 2000 Project Ref. No. CH-A2-UK-2077

FINAL REPORT

1 October 2004 – 31 October 2007



Through satellite imagery, airborne survey, fieldwork, geophysics and excavation, the aim of the project is to promote the exploration, public appreciation and conservation of heritage sites and landscapes across Europe.

Education and Culture

Culture 2000

ENGLISH HERITAGE

CONTENTS AND PROJECT PARTICIPANTS

Reports by co-organisers* and co-partners

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LANDSCAPE EXPLORATION, INTERPRETATION AND CONSERVATION IN TUSCANY, CENTRAL ITALY

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Background and objectives

As one of the pioneers of aerial archaeology in Italy, the Department of Medieval Archaeology at the University of Siena, through its recently-founded Laboratory for Landscape Archaeology and Remote Sensing (LAP&T) at Grosseto, has contributed to the project in four main ways:

- A structured and long-term programme of archaeological air survey in Tuscany.
- The purchase, evaluation and use of satellite and laser imagery for heritage purposes.
- The integration of aerial, satellite, geophysical and field-walking survey in landscape studies.
- The organisation of a Training School, workshops and the exchange of skills to promote aerial survey, remote sensing and landscape studies in Italy and beyond.

Aerial survey, air-photo interpretation and mapping

With support from Culture 2000 for additional flights, 150 hours of aerial survey were flown during the project, recording landscapes, townscapes and archaeological sites in southern Tuscany. About 45 previously unknown sites were recorded, many at risk of damage or destruction by ploughing or other modern developments. The University's air-photo archive now contains over 33,000 traditional and digital images. To assist their analysis and public presentation a number of students were trained in air-photo mapping and interpretation. Development work during the project also helped to make air photographs from the University's growing archive available on an interactive website at http://shaq.archeo.unisi.it/oblique/.

Cropmarks of a previously unknown Roman villa and a medieval castle mound discovered from the air.

Integration of aerial, geophysical and field-walking survey

The project saw the testing and evaluation of geophysical equipment for large-scale data acquisition – particularly important in Tuscany because of the nature and use of the region's soils. Without the integrated use of multi-sensor approaches it would rarely be possible to achieve a real impact on Cultural Resource Management or on the search for a better understanding of the region's developing settlement patterns through time. Hence the tests within the project on the GSSI TerraVision system (with 14 radar antenna and 12 cm resolution) and the Foerster MultiCAT system (4 fluxgate gradiometer). Both systems gave extremely interesting results and the University is now contemplating adding to its existing geophysical equipment so as to increase its future capacity to contribute to research and conservation.

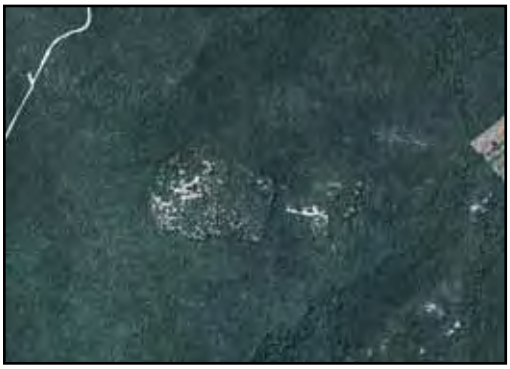
A major component of the Siena project has been the combined use of air photography, field-walking survey (top right) and (in the rest of this image) various forms of geophysical survey, including ground-penetrating radar, the results of which for one of the Aiali buildings are seen at bottom left.

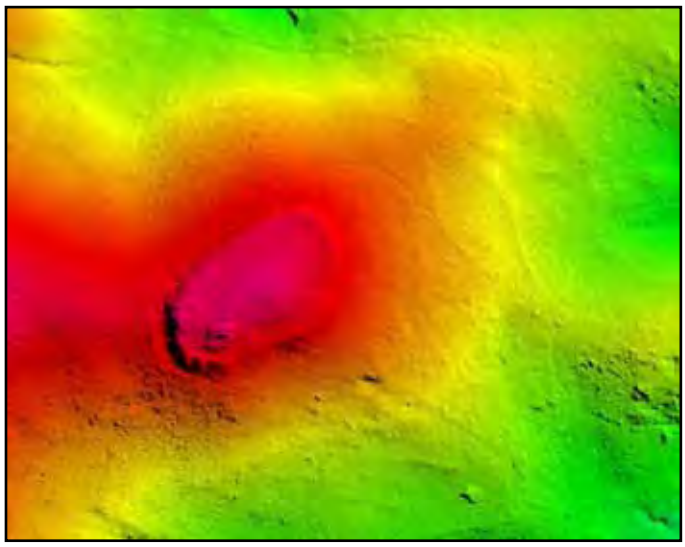
Laser-scanned landscape data

During 2005, in partnership with the UK Natural Environment Research Council, lidar data was acquired for four sample areas, representing different kinds of cultural sites and woodland cover in Tuscany. Lidar survey will be particularly important in the heavily wooded landscape of Tuscany (and of Italy as a whole), since it can 'see through the trees' to create a digital terrain model of the underlying surface, including otherwise-hidden landscapes and archaeological features. The principal aim within the project was to identify the potential of airborne laser scanning for mapping archaeological features hidden from traditional air photography by the obscuring blanket of trees (almost half of Italy's land-mass is covered in woodland or forest).

Preliminary analysis of the lidar data was carried out within the project and will continue in the longer term through cooperation (and a student exchange) with the University of Durham in the UK. The results are beginning to show the extent to which laser signals can penetrate different kinds of Mediterranean tree cover at locations with known archaeological sites typical of those found in Tuscany. The potential to advance knowledge is enormous because many as yet unexplored sites and landscapes lie 'protected' by woodland cover, in contrast to those in agricultural areas where most archaeological sites have been destroyed or flattened by centuries of ploughing. The capacity to record these previously hidden sites will help in the formulation of strategies for their longer-term investigation and conservation.

Lidar imagery of a wooded medieval castle. Whilst the photograph below shows the surface of the tree-canopy, the image on the right, of the processed last-return lidar signals reveals the underlying earthworks.





Training School, workshops and student exchange

One of the project's main events, in May-June 2005, was a 10-day international Summer School at Grosseto on *Aerial Survey, digital photography and GIS-based interpretation*. Twenty-one undergraduate and post-graduate students and researchers, from over 100 applicants from various fields of research and heritage conservation, received instruction and practical experience both on the ground and in the air. Each student flew for about 8 hours during the School's programme of aerial exploration, during which over 15,000 photographs were taken. Among innovations were several new teaching methods, the presence of participants from Spain and the training of pilots from the Aero Club of Florence to assist in future survey work.

A successful specialist Workshop, initiated through the Culture 2000 project but funded mainly by Leica Geosystems, was held at Grosseto in June 2005, on *GPS and Laser Scanning in Archaeological Research*. More than 150 students and research workers took part and a publication is planned. In 2006 logistical and specialist support was provided for a workshop on *Archaeological Landscapes and Digital Technologies*, again largely funded by outside bodies.

In July 2006 the project helped to organise the first Italian summer school on *Geophysical Survey for Archaeology*. The 35 students, from 60 applicants, spent time on theoretical lessons, field-data collection and data processing under the direction of 15 tutors from Europe and beyond. Much new data was collected and interpreted for a site first discovered through aerial survey and progress was made on the evaluation of various methods of data integration.

In November 2006, with financial help from a range of outside bodies, the project mounted a week-long Summer School entitled *Exploring Archaeological Landscapes*, which brought together international experts and 31 students from across Europe (from 75 applicants). The school was based mainly on presentations and extended discussion, but also involved the demonstration of survey instruments in the field. New ideas were developed on 'visibility', 'serendipity' and 'emptiness' as important concepts in archaeological work.

This event immediately preceded the 2nd International Conference on Remote Sensing and Archaeology, *From Space to Place* (below), held at Rome in December 2006 as a result of organisational work by representatives of CNR-ITABC and the Laboratory of Landscape Archaeology and Remote Sensing at Grosseto. During the four days of the conference almost 100 papers were presented by over 200 authors, with discussion by an estimated 150 active participants. The speakers came from 25 countries on four different continents.

During 2006 a postgraduate student from Siena spent two weeks in the Department Prehistory at the University of Vienna, attending lessons and working in the laboratory of Dr. Michael Doneus. Other students from the University attended meetings and workshops in Italy and other parts of Europe, including the annual meetings of the Aerial Archaeology Research Group and the final conference of Culture 2000 co-partners at Prague in October 2007.

The manual of air photography (left) and two posters from Culture 2000 events (centre and right).

Traditional and Internet publications

A major event, in May 2005, was the publication of a profusely illustrated manual on the theory, practice and uses of aerial archaeology, the first to deal in Italian with exploratory air survey of the kind promoted through the Culture 2000 project. The book, *In volo nel Passato: aerofotografia e cartografia archeologica* (Musson, Palmer and Campana 2005), arose as a by-product of an earlier Culture 2000 project which helped to fund the first Italian aerial archaeology school at Siena in 2001. The book is now available as a pdf download from the Internet (http://www.bibar.unisi.it/libri/bda12.html).

Throughout the project the University regularly posted information about Culture 2000 events on its own websites (notably www.lapetlab.it) with the aim of raising public and official awareness of heritage landscapes in Italy and of the need for their presentation and conservation as part of the common cultural heritage of Europe. This website has been progressively enhanced, in both Italian and English, throughout the course of the project. News and other items were also contributed to the Culture 2000 project's central website.

Networking and exchange of skills

Staff and students from the University continued to play an active part in enhancing the pan-European network of contacts in aerial archaeology, remote sensing and landscape studies. Conferences and workshops were attended and presentations made. A particularly fruitful exchange of skills in the processing and interpretation of lidar imagery was developed with the University of Durham in the UK. This will continue beyond the end of the Culture 2000 project.

Conclusions

The Culture 2000 project has allowed the University to develop its work in a variety of ways in aerial and geophysical survey, data integration and the interpretation of lidar data, as well as extending its contacts with experts and research students across Europe. A number of important events were facilitated through cooperation with other bodies and outside funding sources, and important agreements for the supply of equipment or software were reached with Geostudi Astier, Zenit, Leica Geosystems and ESRI Software. Future events springing from the Culture 2000 project will include an exchange visit by a research student to Durham University in the UK, an exhibition in Siena on *Medieval Landscapes from the Air* and a Summer School on *3D Modelling in Archaeology*, to be held at Ascona, Swizerland, in May 2008.

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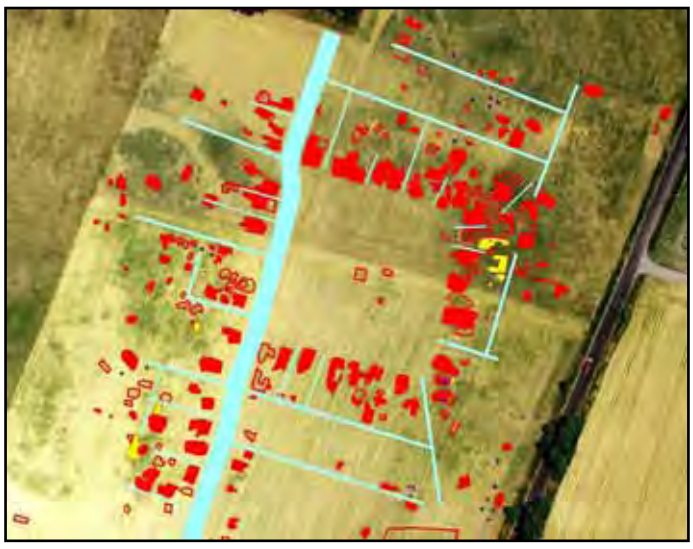

HIGHLIGHTS 2004-2007

Belgium *Air photographs uncover the battlefields of Ypres*

Czech Republic *Air survey, excavation and a grand exhibition*

English Heritage *Air photo training schools at home and abroad*

Estonia *Estonian archaeologists take to the air*

Germany (Mecklenburg-Vorpommern) *Seeing beneath the waves*

Germany (Baden-Würtemberg) *Iron Age fortresses in their landscape setting*

Germany (Freiburg) *Airborne laser scanning to 'see through the trees'*

Hungary *Combining techniques to explore the Neolithic*

Italy (Puglia) *Uncovering and mapping the past through aerial survey*

Italy (Salento) *Modern techniques and a Roman harbour*

Italy (Tuscany) *Air survey, laser scanning and geophysics*

Lithuania *Raising awareness through aerial archaeology*

Poland *New discoveries and new systems for heritage conservation*

Slovakia *Stone Age monuments from the air and on the ground*

A LOST TOWN RE-FOUND

Szamotuły, in Poland is a medieval town, its originally open market square now filled with later buildings (top). Until recently historians believed that the town always occupied its present site. This view changed dramatically in July 2006 when spectacular air photographs, taken as part of the Culture 2000 project, revealed its original location at Mutowo, 2.5km away, where it had stood before a disastrous fire in the 14th century. One of the photographs is shown here (centre), rectified to fit the present-day map. In the bottom image the town's large open square, outlined by the dark marks of cellars beneath its surrounding buildings, has been plotted on the rectified photograph, along with the presumed lines of the linking streets.