

LANDSCAPE EXPLORATION, INTERPRETATION AND CONSERVATION IN TUSCANY, CENTRAL ITALY

Dr S Campana, Prof R Francovich, Dept of Medieval Archaeology, University of Siena

Background and objectives

The Department of Medieval Archaeology at the University of Siena, a pioneer of aerial archaeology and remote sensing in Italy, is contributing to the project in four main ways.

- A structured and long-term programme of archaeological air survey in Tuscany, especially within two carefully chosen study areas, Val d'Orcia and Parco dell'Uccellina.
- The purchase, evaluation and application of satellite and laser imagery for heritage uses.
- The integration of aerial, satellite, geophysical and field-walking survey in landscape studies, each supporting the others in the exploration of heritage landscapes in Tuscany.
- The organisation of Workshops, a Training School and student exchanges to promote the application of aerial survey, remote sensing and landscape studies in Italy.

Through its recently-founded Laboratory for Landscape Archaeology and Remote Sensing at Grosseto (LAP&T) the University is presenting the project results in ways which will raise public and official awareness of the heritage landscapes of Italy and of the need for their presentation and conservation as part of the common cultural heritage of Europe.

Progress to the end of 2005

Aerial survey has continued and been intensified throughout the reporting period. Laser imagery has been acquired for four sample areas. The integration of aerial, geophysical and other forms of landscape survey has been further developed. The planned Training School in aerial archaeology was held in late May/early June 2005, a year earlier than intended. Contributions were also made to a specialist Workshop and to Culture 2000 meetings. An Italian-language book on archaeological air survey, begun during an earlier Culture 2000 project, was brought to completion in May 2005.

Aerial survey

120 hours of aerial survey were undertaken between September 2004 and the end of 2005, mostly recording landscapes and archaeological sites in southern Tuscany but also including excavations in progress and about 45 previously unknown sites, most of them at risk of damage or destruction by ploughing or other modern developments. The University's air-photo archive now contains over 27,000 traditional and digital images. To assist their analysis and public presentation two postgraduate students were trained during the year in air-photo mapping and interpretation. Photographs from previous years are already available on an interactive website and more recent images will be added as part of the Culture 2000 project (<http://shaq.archeo.unisi.it/oblique/>).

Laser-scanned landscape data

Through Culture 2000 contacts the University in May 2005 acquired lidar imagery for four sample areas. The technique will have a particular importance in the heavily wooded landscape of Tuscany, being capable of 'seeing through' trees to create a digital terrain model of the underlying surface, including otherwise-hidden landscapes and archaeological features. The imagery was collected for the UK Natural Environment Research Council through contacts with Dr R Bewley of English Heritage. In 2006 training in the use of the data will take place at the University of Durham in the UK.

Integration of aerial, geophysical and field-walking survey

The first year of the project saw the testing and evaluation of geophysical equipment for large-scale data acquisition – very 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 pattern through time. Hence the recent tests on the GSSI TerraVision system (14 radar antenna and 12 cm resolution) and the Foerster MultiCAT system (4 fluxgate gradiometer). Both systems gave very interesting results and the University is now working on plans to add to its own existing equipment.

Training School, Workshops and student exchange

The main event during 2005 was a 10-day international Summer School in Archaeology at Grosseto on *Aerial Survey: digital photography and GIS based interpretation*. More than 100 students applied for the 21 places available. From 30 May to 8 June post-graduate and PhD students from various fields of research and heritage conservation received a combination of instruction and practical experience, on the ground and in the air. Several new teaching methods were introduced. Each student flew for an average of 8 hours during 110 hours of aerial exploration. Over 15,000 photographs were taken over central and southern Tuscany. Important innovations were the first-time presence of participants from Spain and the training of pilots from the Aero Club of Florence to assist in future air-survey work.



Two previously-unknown sites discovered during the Summer School at Grosseto in June 2005. Left: Roman villa near the ancient city of Cosa, Southern Tuscany. Right: Cropmarks of a multi-ditched circular enclosure, shown by later ground-based survey to belong to the Medieval period.

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 (without cost to the Culture 2000 project). A further workshop on *Archaeological Landscapes and Digital Technologies*, again largely funded outside the Culture 2000 project, is under preparation for July 2006. A postgraduate student from Siena spent two weeks in the Department of Prehistory at the University of Vienna, attending lessons and working in the Aerial Survey Laboratory of Dr Michael Doneus.

Traditional and Internet publications

2005 saw the publication of a pioneering 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*, arose out of a Culture 2000 scheme which helped to fund the first Italian aerial archaeology school at Siena in 2001. The book was launched during the Grosseto School in May 2005 by two of Italy's distinguished researchers in aerial archaeology, Prof Fabio Piccarreta and Prof Giuseppe Ceraudo. Throughout 2005 the University regularly posted information about Culture 2000 activities on its websites, notably www.lapetlab.it. During 2006 there will be further enhancements of this and other websites in both Italian and English.

HIDDEN LANDSCAPES IN THE TAVOLIERE DELLE PUGLIE

Apulia, Foggia, Southern Italy

Prof Giuliano Volpe, Dr A V Romano and Dr R Goffredo, for the University of Foggia

Background and objectives

The Department of Human Sciences at the University of Foggia, and its archaeological section in particular, is a relatively new institution. The Department has already started a wide range of archaeological and landscape research, employing the integrated use of a variety of survey methods and instruments in partnership with other universities and research institutes. To develop its expertise in the field of exploratory aerial survey the Department promoted in May 2003 a training school in aerial survey, photo-interpretation and mapping. Flights made during the school showed the enormous potential of the Tavoliere for recording partially understood ancient landscapes only visible through aerial survey for a few weeks in early summer and autumn each year. The project has given the University the opportunity to enhance its capacity in these fields in four important and potentially long-lasting ways.

- By putting in place a structured and long-term programme of archaeological air survey.
- By developing the use of satellite and laser imagery for archaeological purposes.
- By achieving a closer integration between systematic ground survey, aerial exploration, remote sensing and investigative techniques in the study of the ancient landscape.
- By organising a training school, attending meetings and arranging student exchanges to promote the use of aerial survey, remote sensing and landscape studies in Italy.

The University is in process of establishing a laboratory of landscape archaeology to specialise in aerial survey, air photography and remote sensing, and to promote intensive aerial survey over the Tavoliere in the coming years. A special focus will be provided by the organisation of a second Training School, where students from Italy and elsewhere Europe will study both traditional and new techniques in aerial archaeology and landscape studies.

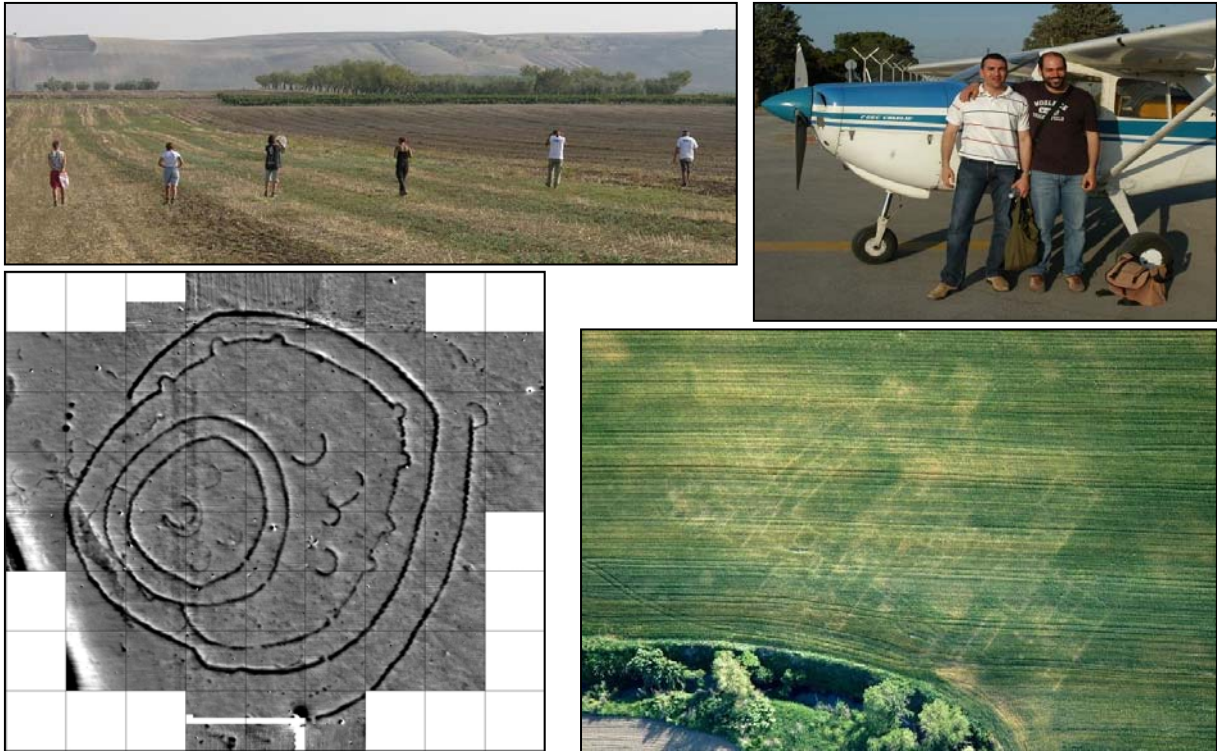
Progress to the end of 2005

Activity to the end of 2005 has been relatively restrained, so as to conserve resources and funding for the Training School later in the project (now planned for May 2007). But a very successful programme of aerial exploration was undertaken in the early summer of 2005 and steps were made towards gaining access to lidar data. Work was also done on combined aerial and ground-based survey in two areas already under intensive study by the University.

Aerial survey and air photo mapping

An intensified programme of aerial survey over the Tavoliere in 2005 saw the recovery of information on literally hundreds of archaeological sites, many of them new to the record. They ranged in date from prehistory to the Roman period, the Middle Ages and later. Conditions for the recovery of evidence in the ripening grain and parched grassland were the best for several years. Previously unrecorded Roman villas appeared in striking numbers, along with substantial 'new' areas of Roman land division. Altogether, 45 hours of aerial reconnaissance were undertaken, 30 by Dr Otto Braasch from Germany and 13 by Dr Valentino Romano and Luigi Fruggiero, a pilot colleague from the Aero Club di Foggia. The latter were the first independent flights made by the University without 'foreign' assistance.

Approximately 6000 digital images were added to the University's growing air-photo archive in 2005. Improvements were made to the database system for archiving and analysing the photographs. Un-costed work by two PhD students saw the rectification and mapping of a significant number of low-level oblique air photographs, especially for partially-known and previously unrecorded sites in the Celone and Ofanto Valleys. Mapping and interpretation work of this kind will be intensified through a student contract in 2006 and 2007.



Clockwise from top left: *Field-walking survey in the Celone Valley. Archaeologist and pilot after a Culture 2000 flight in 2005. Air photograph of Roman villa in the Celone Valley study area. Multi-ditched Neolithic settlement, depicted by geophysical survey undertaken in 2005.*

Laser imagery and related aerial photography

In May 2005 the Universities of Foggia and Lecce learned through Culture 2000 contacts that lidar and other airborne imagery of the ancient city of Arpi, near Foggia, was being taken for the University of Durham, CNR Potenza and the UK Natural Environment Research Council. In response, intensive oblique air-photography of the city was undertaken by Dr Braasch for the University of Foggia, to enable comparison of the results from the two remote-sensing techniques. Plans are in hand for the training of research students from Foggia in the treatment and interpretation of lidar data during 2006 at the University of Durham in the UK.

Integration of aerial and ground-based research

As part of on-going PhD research funded by the University field-checking of archaeological sites first recorded from the air was undertaken at a number of locations, notably in the University's special study areas of the Celone Valley, west of Foggia, and the Ofanto Valley in the vicinity of Canosa. This kind of work will continue as part of the project in future years.

Improvement were made during 2005 to the GIS system to assist future integration between aerial evidence and field survey data, using orthophoto coverage for the Province of Foggia as well as national (IGM) map-coverage at a variety of scales. Models were also created for the interpretation of poorly-defined air-photo features, both by checking air-photo sites on the ground and by taking air photographs of sites initially identified through ground-based survey.

Training School, meetings and student exchanges

The Training School originally planned for 2005 will now be held in May 2007. Research students from the University took part in the Culture 2000 co-ordination meetings at Munich and Leuven in September 2004 and 2005, the annual meeting of the Aerial Archaeology Research Group in 2005, the Rome Seminar associated with the Culture 2000 project in November 2004 and the aerial archaeology Training School at Grosseto in May-June 2005.

AERIAL SURVEY AND MEDIEVAL LANDSCAPES IN SOUTHERN APULIA

Combining modern and traditional technology

*Mrs E Achiardi, Agenzia per il Patrimonio Culturale Euromediterraneo
Prof Giuseppe Ceraudo, Prof Paul Arthur, University of Lecce*

Background and objectives

The institutions involved in this part of the project are described at the foot of the next page. The contribution by the Agenzia and the University of Lecce to the Culture 2000 project will lie in the development and combination of new and traditional techniques for understanding the towns, settlements and landscapes of Southern Apulia (Salento). This is an area of aggressive agricultural development, in which archaeological sites and landscapes are at constant risk of damage or total destruction by heavy ploughing and erosion. A combination of new aerial survey, analysis of existing air photo and satellite imagery along with ground-based survey will serve to demonstrate the losses and aid future protection of key elements of the archaeological and landscape heritage. By enhancing the range of techniques deployed by one of the country's most respected universities the project will also help to promote the active use of exploratory air survey throughout Italy.



Left. Traditional photogrammetric equipment in the laboratory of the University of Lecce. This kind of equipment still has an important role to play in the analysis and mapping of archaeological information recorded from the air. Right. An example of the heavy ploughing which is devastating the archaeological sites and landscapes of Southern and many other parts of Italy.

Progress to the end of 2005

Administrative and staffing problems have prevented active progress in 2005 but the work-schedule has been revised (below) and the co-partners (including the main sponsor, English Heritage) are confident that the original objectives can be achieved in the remaining lifetime of the project. The work and finances will be supervised by academic and administrative staff in the University of Lecce but reporting to the EC will be through the Agenzia. The whole of the original funding will still be available for use.

Plans for 2006/2007

The principal aspects of the project in Salento will be as follows.

- The creation of specific procedures for archaeological and landscape exploration, including – for the first time in this part of Italy – active aerial survey from light aircraft.

- The combined use of traditional methods of ground-based survey alongside air photo analysis of the kind already taken to a high level by the University.
- The innovative study of infra-red and satellite imagery for its capacity to detecting and locate archaeological sites within the landscapes of antiquity and of the present day.
- The creation of a database and GIS environment for the dynamic management of the data to aid efficient landscape planning and conservation of the historic environment.
- The training of two students (potential research workers or conservation archaeologists in the future) in the combined use of aerial survey, field survey and satellite data.

Given the limited resources available emphasis will be placed on aerial and ground-based examination and on the positioning of Mediaeval settlements through the use of GPS technology and satellite imagery. An important aspect of traditional survey will be the study of a representative transect of ancient and modern landscape extending from the modern town of Lecce to its ancient port at San Cataldo.

Public presentation

This kind of work attracts wide public interest in Italy and there will be opportunities to raise outside funds for the public presentation and publication of the Culture 2000 work. Contributions will also be made to the project's central web-site and 'virtual exhibition'.

Revised budget	Year 1	Year 2	Year 3	Totals
Travel/subsist, workshops/C2000 meetings	-	1000	1000	2000
Fieldwork/photo analysis (2 students)	-	9000	9000	18000
Travel costs during fieldwork	-	1100	1100	2200
Participation in Foggia air survey school (3)	-	2700	-	2700
Aerial survey programme (c15hrs per year)	-	2900	2900	5800
Purchase of air photo, satellite imagery etc	-	6300	-	6300
Travel/subsistence for landscape survey	-	1500	1000	2500
Website etc	-	500	500	1000
TOTALS	-	25000	15500	40500
Contribution to University by Agenzia	7500	7500	7500	22500
Culture 2000 funds, via Agenzia	9210	790	8000	18000

The University of Lecce

Within the University of Lecce the Laboratories of Ancient Topography and Photogrammetry and of Medieval Archaeology have worked closely together for many years in the field of the cultural heritage management, notably through field survey and the study of ancient landscapes. This work has produced a substantial quantity of archive material, now incorporated within the University's database management system. The University has the equipment for creating specific cartography and photo interpretation. Its air photo archives, GIS software and technical staff will provide essential support for the Culture 2000 project. The University will make un-costed contributions in the form of office space, maps, computer equipment and programs etc along with academic supervision, general administration and financial management.

The Agenzia per il Patrimonio Culturale Euromediterraneo aims to promote integration between the different areas of the Mediterranean countries and the European Union, through the analysis, study and promotion of interaction between the different cultural, juridical, and socio-economic systems. It also concerns itself with the interaction and integration of scientific and professional competencies, in the matter of the preservation and valorisation of cultural heritage, which do not have a homogeneous distribution in the Euro Mediterranean Area. At present the Agenzia, a non-profit-making public body, is formed by the Municipality of Lecce, the Universities of Lecce, Foggia and Patras, UNIMED-Union of the Mediterranean Universities and CUM-Community of the Mediterranean Universities. The Agenzia will provide the Italian financial contribution to the project and pass to the University and account for Culture 2000 funds received from the principal beneficiary, English Heritage.