



## CONTENTS AND PROJECT PARTICIPANTS

1	CONTENTS AND PROJECT PARTICIPANTS	
2	SUMMARY AND OVERALL ASSESSMENT OF PROJECT RESULTS	
4	DEVELOPMENT AND PROGRESS OF THE PROJECT	
	<b>Reports by co-organisers* and co-partners</b>	
6	BELGIUM*	University of Ghent
10	CZECH REPUBLIC	University of West Bohemia, Pilsen
14	UNITED KINGDOM*	English Heritage
18	ESTONIA	National Heritage Board of Estonia
22	FINLAND	Helsinki University of Technology
24	GERMANY*	State Authority for Culture and the Preservation of Monuments, Mecklenburg-West Pomerania
28	GERMANY*	Cultural Heritage Service Baden-Württemberg
32	GERMANY	Institute for Landscape Management, University of Freiburg
34	HUNGARY*	Baranya County Museum Authority, Pécs
38	ITALY*	University of Foggia
42	ITALY*	University of Siena
46	ITALY	University of Salento, Lecce acting for the Agency for Euromediterranean Cultural Heritage
50	LITHUANIA	Department of Lithuanian Heritage Protection
54	POLAND	Adam Mickiewicz University; Poznań Archaeological Museum and the Polish Academy of Sciences
58	ROMANIA	Institute for Cultural Memory (CIMEC)
62	SLOVAKIA	Slovak Academy of Sciences
66	EXHIBITION	Czech National Museum, Prague, Oct 2007-Jan 2008
68	WHAT ELSE?	Spin-off activities and associated events

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## HIDDEN LANDSCAPES IN THE TAVOLIERE DELLE PUGLIE

### Foggia, Apulia, Southern Italy

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#### Background and aims

Although still relatively young, the archaeological section of the Department of Human Sciences at the University of Foggia has set in train a comprehensive archaeological study of the ancient landscapes that falls within the cultural region of Daunia, in northern Puglia, at the top of the heel of Italy. The Department's approach is that of 'total archaeology', involving the integrated use of multiple sources (archaeological, epigraphic, literary and documentary etc) as well as new technologies and innovative techniques derived both from the humanities and from the world of science. This approach gives the opportunity to examine the landscape from a distance, as it were, and potentially to fill a 'gap' in Italian archaeology between the examination of individual settlements and the study of the landscape as a whole.

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 plain around Foggia. The Culture 2000 project has allowed the University to enhance its capacity in this and related 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 other 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.

#### Aerial survey, air photo interpretation and mapping

Through the Foggia Aero Club, and with international assistance by pilots and experienced aerial surveyors from Germany and the UK, more than 200 hours of exploratory air survey have been undertaken during the three years of the Culture 2000 project, recording archaeological sites across Northern Apulia but also covering excavations in progress, townscapes, historic buildings and typical landscape features. This work has led to the discovery and recording of hundreds of previously unknown 'sites', within ancient landscapes from prehistory to recent times that are virtually continuous across the Tavoliere plain.

It has been possible during the project to develop the first stages of a systematic and continuing programme of exploration and monitoring of the archaeological heritage of Northern Apulia. The importance of *monitoring* lies in the fact that the Tavoliere and the surrounding hills are now under serious threat from ill-planned urban and rural development, from environmentally damaging public projects (in particular wind-farms) and from the renewed scourge of illegal excavation by the tomb robbers who have destroyed so much of Italy's Etruscan heritage.

After three years of work within the project the University's air photo archive now contains around 46,000 traditional and digital images. The project has also allowed the University to purchase the complete archive of vertical air photographs taken in 1954-55 for national mapping purposes. This is a hugely valuable historical source for future research and conservation work, in that the photographs show the landscape as it appeared before the dramatic changes brought about by intensive arable cultivation and urban development from the 1960s onwards.

Following photo-reading, interpretation and geo-referencing, the most informative oblique (and occasionally vertical) photographs have been rectified and then imported into a GIS system, in



*The remarkable cropmark ditches of a Neolithic village, with internal 'compounds', near Foggia. Also visible is the overlying rectangular pattern of Roman roads, farms, fields and agricultural planting.*



*Left: The cropmarked walls of a previously unknown Roman villa west of Foggia. Right: The devastation caused by wind-farm construction on the site of a multi-period Neolithic and later settlement complex.*

'themed' layers according to the type of archaeology recorded, producing a cumulative record of the whole of the evidence available on the air photographs. The process has produced a series of archaeological maps which can be used in on-going study of the stages of historical land-use of the area and (equally importantly) in the planning of conservation strategies for the archaeological sites and historical landscapes so defined. As a result of work done and contacts made during the course of the Culture 2000 project, the aerial survey flights which produce much of the information for these maps are now being part-funded by the potential developers of wind-farms and other construction projects.

### **Laser imagery and related aerial photography**

In May 2005 the Universities of Foggia and Lecce learned through Culture 2000 contacts that lidar (laser scanning) 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 within the Culture 2000 project to enable comparison with the lidar data. The lidar imagery is undergoing processing at the University of Durham and a member of the project team from Foggia will take part in this work during three-month study-visit to Durham in 2008.

### **Integration of aerial and ground-based research**

The landscape of the Tavoliere presents a complex palimpsest of past landscapes laid one upon the other, from the Neolithic through the later prehistoric, Roman and medieval periods, virtually to the present day. Only through the integration of the results from aerial reconnaissance, other remote-sensing methods and traditional techniques such as field-walking survey and limited test excavation, can the more complete understanding of these long-preserved traces of the past be understood and (to an extent, at least) protected.

The University's response has involved an interaction and integration between broad-scale survey of large areas (in effect the whole of the Tavoliere plain) with the intensive study of more restricted zones, in particular through the field-checking of archaeological evidence (much of it initially obtained through aerial survey) in the University's special study areas of the Celone, Ofanto Valley and Carapelle Valleys. This kind of work will continue in future years.

Improvements were made during the project in the University's GIS system to assist integration between aerial evidence and field survey data. Methodologies were created for the interpretation of poorly-defined air-photo features, both by checking 'air-photo' sites on the ground and by taking air photos of features initially identified through ground-based survey.

In addition, a systematic programme of high-resolution magnetometer survey was initiated through a collaboration with Professor Marcello Ciminale of the University of Bari and Dr Helmut Becker from Munich. Work has focused in the first instance on a number of the most interesting and dramatic sites revealed during field-walking and aerial survey, so as to further define the plan-forms of the sites and to test the aerial and ground-based evidence.

### **Training School, meetings and student exchanges**

The Aerial Archaeology Training School, which followed the same basic pattern as an earlier one mounted by the University in 2003, was held a year later than originally planned, in May 2006. Twenty-three students from across Europe (18 in a 'beginners' group and 5 in an 'advanced' group) took part in integrated aerial and ground-based instruction and exercises with the help of tutors and pilot-instructors from Austria, Germany, Slovenia and the UK. The students have now taken their newly-acquired skills and perceptions back to their native countries and to other parts of Italy for use in their future careers.



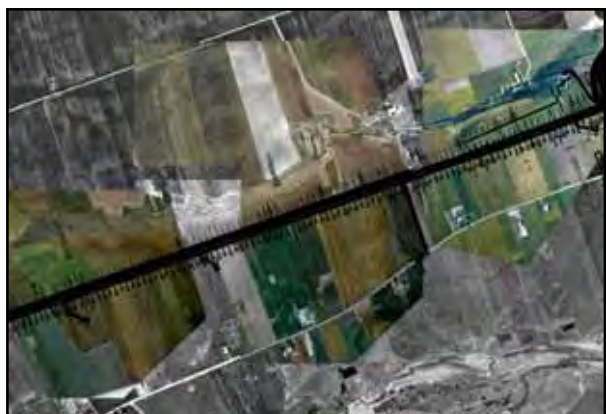
*Students and tutors at the Aerial Archaeology Training School at Foggia in May 2007.*

Members of the Culture 2000 'team' took part in the project's co-ordination meetings at Munich and Leuven in 2004 and 2005, in the annual meeting of the Aerial Archaeology Research Group in 2005, in the Rome Seminar in 2004, in the aerial archaeology Training School at Grosseto in 2005, and in the final meeting of Culture 2000 co-partners in Prague in October 2007, when material from Foggia was also included in the international exhibition opened on that occasion.

### **General assessment of the project**

After three years of intensive activity supported or supplemented by the Culture 2000 project the University feels confident that the Italian scientific community now understands more fully the potentialities of aerial archaeology in heritage research, interpretation and conservation. Skills and attitudes from across Europe have been passed on to a new generation of students through the Training School, and the University's international contacts have been further enhanced.

In some ways the most important result lies in the University's success in using aerial and ground-based survey to reveal often unsuspected traces from the past while at the same time framing strategies for the future protection and conservation of the region's archaeological sites and landscapes. The University will continue its pioneering use of aerial survey to identify 'areas of archaeological sensitivity' worthy of protection, the aerial work now being at least partly funded by the potential developers themselves. The effectiveness of the University's contribution to archaeological and landscape conservation will be further enhanced by its recently assumed leadership and coordination of a major project by the Regional Authority (along with other universities and the Soprintendenza) to create a General Map of the Cultural Heritage of Puglia, recording all of the archaeological sites known throughout the Region.



*Left: Rectified air photographs (in colour) along the intended route of a new railway line. Right: Part of the resulting map of 'archaeologically sensitive' areas, made to assist conservation before and during the building work. Air photographs and maps of this kind will contribute to conservation efforts in other areas.*



### 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-Württemberg)** 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

Szamotuly, 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.

