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The complete Final Report or individual reports from partners can be downloaded from:

e-landscapes.com or

<http://www.muzarp.poznan.pl/EuLandscapes/EuLandscapes/index.htm>

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LIDAR SURVEY FOR ARCHAEOLOGICAL AND LANDSCAPE STUDIES

Seeing through the trees

Dr. Benoît Sittler, Institute for Landscape Management, University of Freiburg, Germany

Background and objectives

The motivation for joining the Culture 2000 project as an associate partner was to share the University of Freiburg's experience of working with airborne laser scanning (lidar) in documenting and assessing cultural landscapes, with particular reference to the exploration and analysis of 'ridge and furrow' cultivation hidden under woodland cover in southwest Germany.

The principal objectives of involvement with the Culture 2000 project were:

- To present the University experience with lidar applications at international conferences and discussion groups.
- To develop and maintain regular exchanges with the archaeological community involved with the use of this technique in France.
- To participate in meeting of the Culture 2000 co-partners to promote the mutual exchange of expertise and experience in the use of lidar for archaeological and landscape research.

Presentations to the scientific community

Lidar (**L**ight **D**etection and **R**anging, see opposite page) is a form of airborne laser scanning which can create a detailed 3d representation of the surface of the earth, and of archaeological features preserved upon it, even where these are hidden beneath tree-cover too dense to be penetrated by traditional air photography or ground-based survey. In addition to its applications in topographical mapping and archaeology, the technique has also been used in a wide range of other disciplines, including geographical studies, forestry and landscape research.

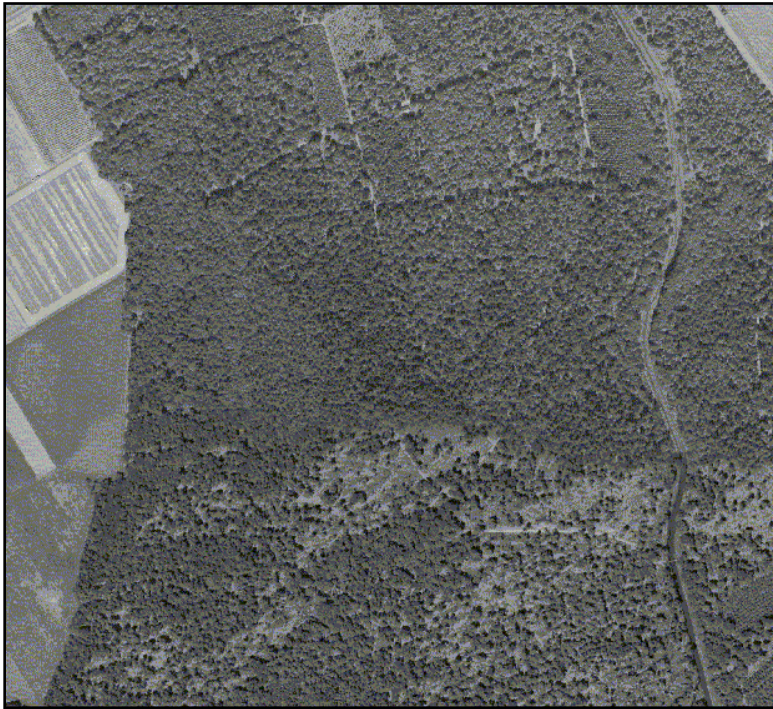
Pulses from an airborne laser scanner are reflected first from the surface of trees, buildings or open fields to produce an image like that shown at the top of the facing page. Other reflections (or 'echoes') may be returned by the lower branches of the trees, and finally even by the ground surface itself. With suitable filtering the last-pulse/last echo signals can produce a highly accurate 3D representation of the actual ground surface (a 'digital terrain model'), even where this lies obscured by dense tree cover. This is illustrated in the lower image on the facing page.

During the course of the Culture 2000 project the author took part in and/or gave presentations at a wide range of meetings, reporting regularly to the project's central secretariat and making presentations to co-partners at Munich in 2004, Schwerin in January 2007 and Prague in October 2007 (when the University's work also formed part of the Culture 2000 exhibition mounted at the Czech National Museum). A presentation was also given at the annual meeting of the international Aerial Archaeology Research Group at Copenhagen in September 2007.

Specialist conferences involving presentations and discussion, often focused on the University's own work with forested ridge-and-furrow field systems near Rastatt, in Germany, included those on Computer Applications in Archaeology at Tomar, Portugal, in March 2005, and the Unesco Conference on the use of space technologies for the conservation of natural and cultural heritage, in Mexico later the same year. Presentations were also given at specialist meetings in Austria, France, Germany, Italy and Poland.

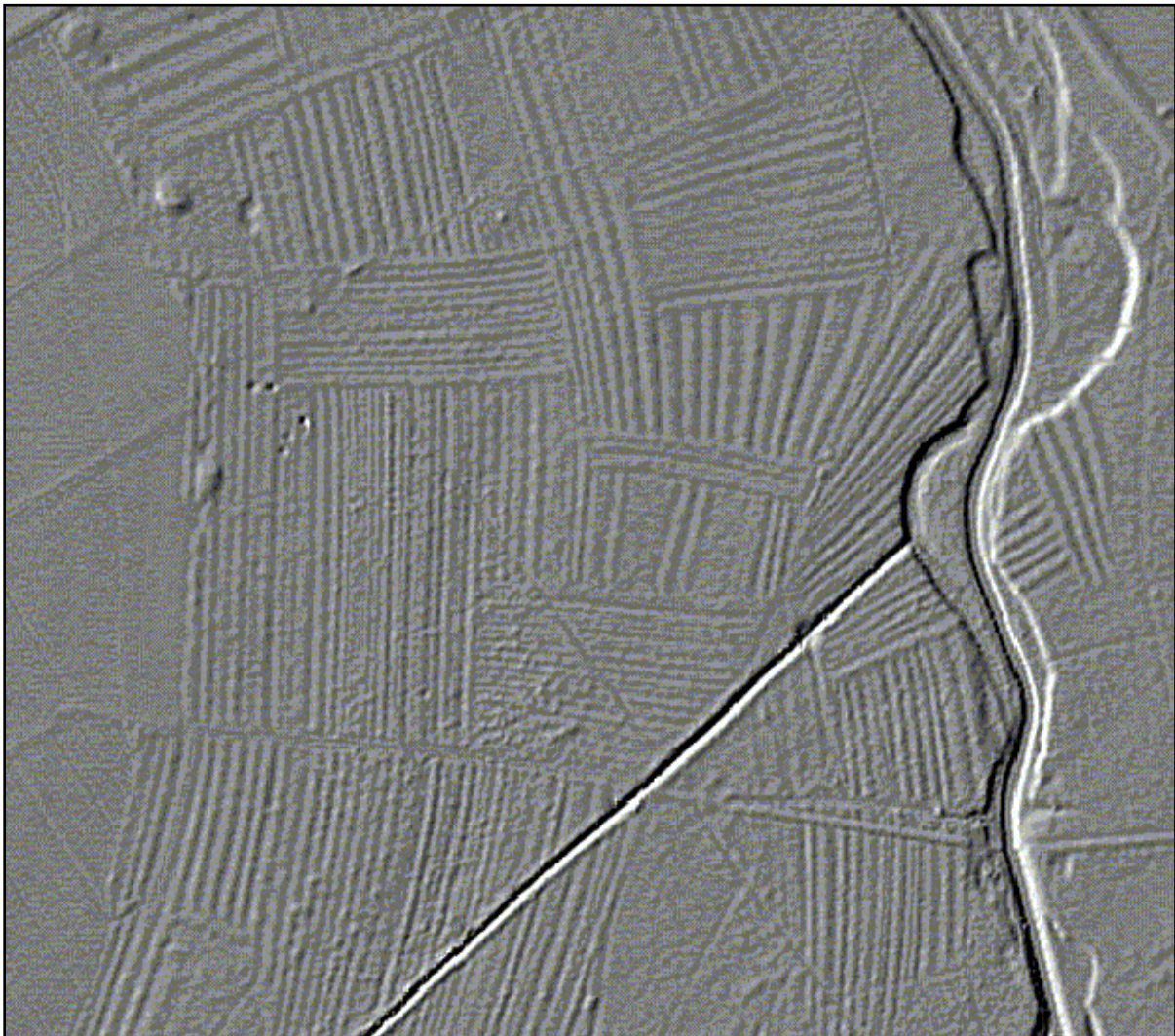
Summary and future prospects

As a result of the work undertaken at the University, and through the contacts made at the meetings noted above, the University of Freiburg became one of the partners in a joint funding proposal to the European Union's Seventh Framework Programme, aimed at promoting the use of lidar for the non-destructive monitoring and damage assessment of endangered cultural heritage sites. At the time of writing the result of the application is still awaited.



Left: Excerpt from a lidar survey near Rastatt in SW Germany. This image, derived from the first-pulse measurements ('first echo' in the diagram in the previous section of the report), shows the surface of the tree-cover, which obscures the greater part of the area, and a few open fields on the left.

Below: The same area, as derived from the last pulse ('last echo') data. The complex and well-preserved pattern of ridge-and-furrow cultivation, which has been protected from recent plough-erosion by the tree-cover, is now revealed in clear detail. Note the far more eroded condition of the earthworks in the regularly-ploughed modern fields on the left.





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.

