

Technological Advances in Landscape and Heritage Management Recording:

an ArchaeoLandscapes Europe one day symposium

12th August 2011

Seminar Room H204, Humanities Institute of Ireland, University College Dublin

Organised by UCD School of Archaeology

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Abstract

Organised by [Rob Sands](#) and [Steve Davis](#), UCD School of Archaeology and sponsored by the [Humanities Institute of Ireland](#), with additional support from the Office of Public Works and Ordnance Survey Ireland, this one day [Archaeolandscapes Europe](#) symposium focuses on the increasing use of technology in the recording of archaeological sites, monuments and landscapes. A series of invited speakers will discuss recent project.

| Programme | | |
|------------|---|----------------------|
| 9:20 | Welcome | Rob Sands |
| 9:30 | ArchaeoLandscapes Europe - Supporting Remote Sensing Methods as a Tool for Archaeological Research and Cultural Heritage Protection of Europe | Axel Posluschny |
| 10:00 | Spatial Data sharing within Cultural Heritage | Anthony Corns |
| 10:30 | DEM visualization techniques for archaeological interpretation | Žiga Kokalj |
| 11:00 | Coffee | |
| 11:30 | Unknown, virtually: The Nottingham Caves Survey | David Strange-Walker |
| 12:00 | The Scottish Ten: 3D Digital Documentation of Global Heritage Sites | Lyn Wilson |
| 12:30 | Lasers, Landscape and Muddy Boots. Potential Applications for Immersive Visualisation of Airborne Lidar | Keith Challis |
| 13:00 | Lunch | |
| 14:00 | Techniques for recording underwater and terrestrial cultural environments: some examples from the Centre for Maritime Archaeology, University of Ulster | Rory McNeary |
| 14:20 | Fish Tales and lasers: mud, wood, tides and challenges | Rob Sands |
| 14:40 | High Resolution LiDAR: modelling the micro-topography of iconic archaeological landscapes in Ireland | Rob Shaw |
| 15:00 | Talking about a revolution? LiDAR and landscape in the Boyne Valley and beyond | Steve Davis |
| 15:20 | Coffee | |
| 16:00 | Round Table Discussion: Future, potential and challenges | |
| 16:30-1700 | Close of Symposium | Steve Davis |

Speakers

- Dr Keith Challis, Vista Centre Birmingham, England
- Anthony Corns, Discovery programme, Ireland
- Dr Steve Davis, UCD School of Archaeology, Ireland
- Dr Ziga Kokalj, Institute of Anthropological and Spatial Studies Scientific Research Centre of the Slovenian Academy of Sciences and Arts
- Rory McNeary, Environmental Sciences Research Institute, Coleraine, Northern Ireland
- Dr Axel Posluschny, Project Manager, ArchaeoLandscapes Europe, Roman-Germanic Commission of the German Archaeological Institute, Germany
- Dr Rob Sands, UCD School of Archaeology, Ireland
- Rob Shaw, Discovery programme, Ireland
- Dr David Strange-Walker, Trent & Peak Archaeology, *University of Nottingham*, England
- Dr Lyn Wilson, Scottish Ten Project Manager, Historic Scotland Conservation Group, Scotland

Abstracts

ArchaeoLandscapes Europe - Supporting Remote Sensing Methods as a Tool for Archaeological Research and Cultural Heritage Protection of Europe

Axel Posluschny

Prospection in all its various forms, has always been one of the major sources for archaeological knowledge. Aerial archaeology has been of particular importance ever since crop marks, soils marks and so on became recognized as hints to former human remains and landscape artifacts. These methods have been supplemented by the growing application of computers and technologically based prospection methods like geophysics, LiDAR or satellite imagery. All together, these methods are the main basis of landscape archaeological research in Europe and beyond its borders.

On the other hand the knowledge and the intensity of use of these techniques differ all over Europe. Whereas countries like England and Germany are leading in the use of aerial archaeology, others like Spain or Portugal have very little experience in the use of aerial imagery for archaeological prospection.

To overcome these differences and to collect knowledge and expertise from different parts of Europe, the EU has started to support the "ArchaeoLandscape Europe" project from September 2010. 42 partners from all over Europe have applied for substantial funding from the EU to work together in a 5-years project. The target of the "ArchaeoLandscapes" project is to address existing imbalances in the use of modern surveying and remote sensing techniques and to create conditions for the regular use of these strikingly successful techniques across the Continent as a whole. It aims to create a self-sustaining network to support the use throughout Europe of aerial survey and 'remote sensing' to promote understanding, conservation and public enjoyment of the shared landscape and archaeological heritage of the countries of the European Union.

At least 4 aerial archaeology training schools, 6 technical workshops, 2 international conferences, various sessions at other conferences, 2 publications and a travelling exhibition (starting in 2013 in Dublin) will provide a public outreach and will help to reach the aims of the project as will the

webpage (<http://www.archaeolandscapes.eu>) where a number of manuals, introductory texts, best practice guides, reports and case studies will be published, both for archaeologists and interested laymen.

Spatial Data sharing within Cultural Heritage

Anthony Corns

The creation and use of digital spatial data such as Lidar, geophysical, aerial photography and other forms of remote sensing within cultural heritage and archaeological research has increased over the past decade. The ability to realize the full potential of this cultural heritage data through re-use and sharing with external organizations and the wider research community is limited.

The development of open standards and technologies has enabled the creation of spatial data infrastructures (SDI) allow users to discover, evaluate and use spatial data sets, and incorporate them into their own research and studies and across national and institutional boundaries. This paper discusses efforts within Europe including the EU Commission INSPIRE directive and the EU Culture funded ArchaeoLandscapes (ArcLand) project to promote SDI. The paper will illustrate how a cultural heritage (CH) SDI could link into primary activities within the ArcLand project including workshops, archive access and outreach activities and beyond. It will also explore how the **INSPIRE directive's** perspective could be expanded to be more inclusive of the CH sector and the potential it represents.

DEM visualization techniques for archaeological interpretation

Žiga Kokalj

Archaeological interpretation of lidar derived relief models is strongly dependent on the specific particularities of different data visualization techniques, especially when not backed up by extensive field surveying. Archaeologists dealing with such interpretations are mainly limited to analytical hill-shading, the most frequently used technique. It is a well-known technique, implemented in most geographic information systems and readily available as a product by most lidar data providers. In fact, a hill-shaded relief is what many understand as lidar data. It is easy to compute and can be intuitively interpreted. However, the technique is inadequate for a thorough investigation of microrelief structures. Even with big money invested into a lidar survey with a very detailed elevation model produced in a fairly simple environment, there is a big potential to miss some features simply because of their orientation. This paper offers some insight into advanced visualization techniques that can (have to) be used when interpreting or recording features from high resolution elevation models in order to gain a better and more thorough insight into the past landscape.

Unknown, virtually: The Nottingham Caves Survey

Dr David Strange-Walker & Julia E Clarke, Trent & Peak Archaeology, University of Nottingham.

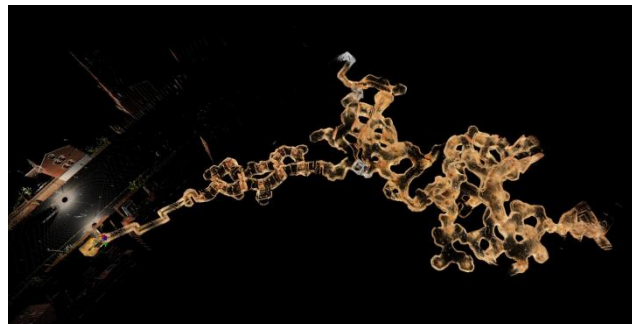
Beneath the modern city of Nottingham are hidden over 500 man-made sandstone caves, dating from the post-war period right back to the Anglo-Saxon origins of the city. The caves have been used for a huge range of functions, including houses, wine cellars, beer cellars, air-raid shelters, summerhouses, chapels, dungeons, follies, malt kilns, pottery kilns, tanneries, sand mines, tunnels, stables and even a bowling alley.

Some of these historic caves are well known and publicly accessible, but the vast majority are in private ownership, hidden beneath locked doors and trapdoors, and utterly unknown even within the city of Nottingham. These include important caves such as the medieval malting at 8 Castle Gate, an extraordinarily rare survival of a complete medieval industrial facility.

The Nottingham Caves Survey (funded by English Heritage and the Greater Nottingham Partnership) was conceived originally with the goals of improving asset management and enhancing preservation by record. Coupled with traditional photographic and text-based recording, the primary instrument chosen for metric survey was the terrestrial laser scanner. The speed and accuracy of this equipment made it the obvious choice for high-quality records of 3D structures.

What became very clear during pilot studies, however, was the potential of the laser scanner for visualising, as well as recording, hitherto hidden structures. Combining intensity-based point cloud data with panoramic HDR photography has allowed the project to generate high-quality still images and, more interestingly, rendered 3D flythrough and flyround videos. All this material is uploaded to the project's ever-expanding website (<http://NottinghamCavesSurvey.org.uk>)

This paper will discuss the ways that the Nottingham Caves Survey has utilised laser scanning, the **web and the new social media to bring Nottingham's caves to a new audience. The visualisation** possibilities afforded by this hardware and software have ensured that, as well as a high-quality archaeological record of the surveyed caves, increasing numbers of people are now aware of the **importance and scale of the city's fragile and little-known resource**. In its first year the project has generated over 57000 website hits and 145000 known views of its 3D videos, from 119 countries.



Left, Photorealistic render of King David's Dungeon beneath the modern Nottingham Castle. Right, silhouette image of Rouse's Sand Mine, an 18th-century underground quarry.

The Scottish Ten: 3D Digital Documentation of Global Heritage Sites
Dr Lyn Wilson, The Scottish Ten, Scotland

The Scottish Ten is an ambitious five year project using cutting edge technology to create **exceptionally accurate digital models of Scotland's five UNESCO designated World Heritage Sites** and five international ones in order to better conserve and manage them.

The primary aims of the Scottish Ten project are to:

- Record important historical sites for the benefit of future generations in Scotland and overseas.
- Share and disseminate Scottish technical expertise and foster international collaboration.

- Provide digital media to site managers to better care for the heritage resource.
- Recognise international Scottish cultural connections.

Led by Historic Scotland – **Scotland's heritage agency** – and its partner Glasgow School of Art, under **their collaborative venture 'The Centre for Digital Documentation and Visualisation LLP'**, the Scottish Ten project will create digital documentation of the sites for future development of world class and innovative research, education and management.

Lasers, Landscape and Muddy Boots. Potential Applications for Immersive Visualisation of Airborne Lidar

Dr Keith Challis, Institute of Archaeology & Antiquity, University of Birmingham, England

"The real work (in the study of landscape) is accomplished by the men and women with muddy boots..." W.G. Hoskins.

Methods of survey have developed dramatically in the recent past with the advent of new digital survey techniques, global positioning airborne and terrestrial laser scanning. The volume of data collected to record monuments and landscapes may now be vast, and levels of accuracy and precision unprecedented. This growth in data quality and volume has to some extent been accompanied by a reluctant theoretical debate, largely about method and meaning in the practice of survey. Less well explored is the area of visualisation of survey results, which has tended to remain rooted in traditional approaches, albeit facilitated by new digital media. The ability of modern digital survey to engage with others areas of archaeological debate, for example discussions of sense of place, meaning and interpretation in landscape, as embodied by for example the phenomenological approach to landscape has largely been ignored as it is poorly addressed using conventional static visualisation techniques. This paper explores the potential of computer game software to produce accurate, immersive and interactive visualisations of digital survey data of archaeological monuments.

Techniques for recording underwater and terrestrial cultural environments: some examples from the Centre for Maritime Archaeology, University of Ulster

Rory McNeary

The CMA was formed in 1999, jointly funded by the University of Ulster and the Northern Ireland Environment Agency (NIEA). CMA research is structured under the broad theme of maritime cultural landscapes - extending from riverine and lacustrine environments to the open ocean, with primary emphasis on coastal and nearshore archaeology. This paper presents an overview of techniques being employed at CMA for both underwater and terrestrial landscape and heritage management recording and discusses the potential uses of such data in terms of current research being undertaken at the centre.

Fish Tales and Lasers: mud, wood, tides and challenges

Dr Rob Sands , Dr Aidan O'Sullivan and Rob Shaw.

Wooden fishweirs , or at least what remains of them, provide an important testament to the importance of fish to the medieval population around the Fergus Estuary, Co. Clare, Ireland. In excess of 18 structures have been identified along the tidal boundary of the estuary and more are

being exposed as you read this. The structures so far identified range in date between approximately 1250 AD and 1450 AD, are constructed of a series of wooden uprights, between which some of the original wattle weave survives. Originally they would have formed large V shape structures that would have guided fish into the trap on an ebb tide. This presentation is from the perspective of a consumer of the technology currently available who is looking for ways of improving the recording of these structures and their environment. In the summer of 2011, in collaboration with Rob Shaw of the Discovery Programme we piloted the use of laser scanning to record three of the most complex examples so far discovered. The environment in which we were working presents a series of challenges:

- A forty minute boat ride from the nearest harbour
- A tidal window with a maximum of 3 hours but usually closer to 2-2.5 hours
- Structures completely submerged at high tide
- Thick estuarine muds
- Wet wooden surfaces

Work over three days in 2010 – was highly productive but raised questions as to how we might use technology in these environments into the future.

High Resolution LiDAR: modelling the micro-topography of iconic archaeological landscapes in Ireland

Rob Shaw, Discovery Programme, Ireland

The Discovery Programme has been pioneering the use of high resolution LiDAR data as a mapping and modeling resource for archaeological landscapes, working on a number of sites as part of its 3D modeling research interests. In general, the results have been well received, with the derived DTMs **and DSMs having an instant ‘wow’ factor. This paper will use examples from Ireland to show the exceptional quality of models available from high resolution LiDAR data sets, how they compare with ‘normal’ LiDAR models, and show how they are enhancing our understanding of landscapes.** However the paper will also consider the problems of data management and access to LiDAR data which are seriously inhibiting the ability of agencies to fully exploit their investment, problems which could result in reluctance to commission future projects. Finally the paper will consider an alternative to LiDAR which appears to offer a serious alternative for cost effective modeling.

Talking about a revolution? LiDAR and landscape in the Boyne Valley and beyond

Dr Steve Davis and Will Megarry, UCD School of Archaeology, Ireland

The increasingly straightforward availability of airborne LiDAR data within Ireland could be argued to have the potential to revolutionise our understanding of the Irish archaeological landscape. The ease with which these data can be manipulated at the end-user level, leading to the discovery of potentially important new archaeological sites is also game-changing: LiDAR in Ireland is rapidly becoming a tool which is used by lay-practitioners as well as specialists. At the most uncomplicated **level this is very much a ‘dots on maps’ exercise with LiDAR as a valuable tool in archaeological** prospection. While this in itself is of undoubted value this represents only a fraction of the worth of these datasets. In presenting examples from the Boyne Valley and elsewhere in Ireland we argue

that, increasingly, the value of these data goes beyond archaeological prospection and towards answering archaeological questions at the landscape scale.