

Please note the embargo until 7 September 2015, 00:01 BST!

## **The Stonehenge Hidden Landscapes Project reveals traces of standing stones beneath Durrington Walls super-henge**

***The remains of a major new prehistoric stone monument have been discovered less than 3 kilometres from Stonehenge. Using cutting edge, multi-sensor technologies the Stonehenge Hidden Landscapes Project has revealed evidence for a large stone monument hidden beneath the bank of the later Durrington Walls 'super-henge'.***

The findings were announced on the first day of the British Science Festival [07 September], hosted this year at the University of Bradford.

Durrington Walls is one of the largest known henge monuments measuring 500m in diameter and thought to have been built around 4,500 years ago. Measuring more than 1.5 kilometres in circumference, it is surrounded by a ditch up to 17.6m wide and an outer bank c.40m wide and surviving up to a height of 1 metre. The henge surrounds several smaller enclosures and timber circles and is associated with a recently excavated later Neolithic settlement.

The Stonehenge Hidden Landscapes Project team, using non-invasive geophysical prospection and remote sensing technologies, has now discovered evidence for a row of up to 90 standing stones, some of which may have originally measured up to 4.5 metres in height. Many of these stones have survived because they were pushed over and the massive bank of the later henge raised over the recumbent stones or the pits in which they stood. Hidden for millennia, only the use of cutting edge technologies has allowed archaeologists to reveal their presence without the need for excavation.

At Durrington, more than 4.5 thousand years ago, a natural depression near the river Avon appears to have been accentuated by a chalk cut scarp and then delineated on the southern side by the row of massive stones. Essentially forming a C-shaped 'arena', the monument may have surrounded traces of springs and a dry valley leading from there into the Avon. Although none of the stones have yet been excavated a unique sarsen standing stone, "The Cuckoo Stone", remains in the adjacent field and this suggests that other stones may have come from local sources.

Previous, intensive study of the area around Stonehenge had led archaeologists to believe that only Stonehenge and a smaller henge at the end of the Stonehenge Avenue possessed significant stone structures. The latest surveys now provide evidence that Stonehenge's largest neighbour, Durrington Walls, had an earlier phase which included a large row of standing stones probably of local origin and that the context of the preservation of these stones is exceptional and the configuration unique to British archaeology.

This new discovery has significant implications for our understanding of Stonehenge and its landscape setting. The earthwork enclosure at Durrington Walls was built about a century after the Stonehenge sarsen circle (in the 27<sup>th</sup> century BC), but the new stone row could well be contemporary with or earlier than this. Not only does this new evidence demonstrate an early phase of monumental architecture at one of the greatest ceremonial sites in prehistoric Europe, it also raises significant questions about the landscape the builders of Stonehenge

inhabited and how they changed this with new monument-building during the 3<sup>rd</sup> millennium BC.

The Stonehenge Hidden Landscapes Project is an international collaboration between the University of Birmingham and the Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology (LBI ArchPro) and led by Professor Wolfgang Neubauer and Professor Vincent Gaffney (University of Bradford). As part of the project, experts from many different fields and institutions have been examining the area around Stonehenge revealing new and previously known sites in unprecedented detail and transforming our knowledge of this iconic landscape.

*“Our high resolution ground penetrating radar data has revealed an amazing row of up to 90 standing stones a number of which have survived after being pushed over and a massive bank placed over the stones. In the east up to 30 stones, measuring up to size of 4.5 m x 1.5 x 1 m, have survived below the bank whereas elsewhere the stones are fragmentary or represented by massive foundation pits,”* says Professor Neubauer, director of the LBI ArchPro.

*“This discovery of a major new stone monument, which has been preserved to a remarkable extent, has significant implications for our understanding of Stonehenge and its landscape setting. Not only does this new evidence demonstrate a completely unexpected phase of monumental architecture at one of the greatest ceremonial sites in prehistoric Europe, the new stone row could well be contemporary with the famous Stonehenge sarsen circle or even earlier,”* explains Professor Gaffney.

*“The extraordinary scale, detail and novelty of the evidence produced by the Stonehenge Hidden Landscapes Project, which the new discoveries at Durrington Walls exemplify, is changing fundamentally our understanding of Stonehenge and the world around it. Everything written previously about the Stonehenge landscape and the ancient monuments within it will need to be re-written,”* says Paul Garwood, Senior Lecturer in Archaeology at the University of Birmingham, and the principal prehistorian on the project.

Dr Nick Snashall, National Trust Archaeologist for the Avebury and Stonehenge World Heritage Site, said: *“The Stonehenge landscape has been studied by antiquaries and archaeologists for centuries. But the work of the Hidden Landscapes team is revealing previously unsuspected twists in its age-old tale. These latest results have produced tantalising evidence of what lies beneath the ancient earthworks at Durrington Walls. The presence of what appear to be stones, surrounding the site of one of the largest Neolithic settlements in Europe adds a whole new chapter to the Stonehenge story.”*

Dr Phil McMahon of Historic England said: *“The World Heritage Site around Stonehenge has been the focus of extensive archaeological research for at least two centuries. However this new research by the Hidden Landscapes Project is providing exciting new insights into the archaeology within it. This latest work has given us intriguing evidence for previously unknown features buried beneath the banks of the massive henge monument at Durrington Walls. The possibility that these features are stones raises fascinating questions about the history and development of this monument, and its relationship to the hugely important Neolithic settlement contained within it.”*

**Imagery for download at**

<http://www.lbiarchpro-imagery.at/stonehenge2015>

**Project website (including video material)**

<http://lbi-archpro.org/cs/stonehenge/index.html>

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**Additional information about the Stonehenge Hidden Landscapes Project (2010–15)**  
<http://lbi-archpro.org/cs/stonehenge/index.html>

The Stonehenge Hidden Landscapes Project has brought together experts in non-invasive geophysical prospection and remote sensing, and specialists in British prehistory and landscape archaeology in order to carry out one of the most sophisticated single archaeological projects in Europe. The outstanding geophysical survey and visualization capabilities of the team has been made possible only because of the unique expertise and combined resources of the project partners, the Digital Humanities Hub and Department of Classics, Ancient History and Archaeology at the University of Birmingham; the Ludwig Boltzmann Institute for Archaeological Prospection & Virtual Archaeology (LBI Arch Pro) in Vienna and its European partners; the School of Archaeological Sciences at the University of Bradford; the Austrian Central Institute for Meteorology and Geodynamics (ZAMG), the Department of Earth Sciences at the University of St Andrews; and the Soil Spatial Inventory Techniques Research Group at the University of Ghent.

This project aimed to address gaps in our knowledge and understanding of the Stonehenge landscape by conducting a cutting-edge geophysical and remote sensing survey at an unprecedented scale and resolution. Beginning in July 2010, the fieldwork took about 120 days, spread over five years. Cutting-edge geophysical technologies, applied at an unprecedented spatial scale and resolution using multiple motorized magnetometers, ground-penetrating radar arrays, electromagnetic induction sensors, earth resistance surveys and terrestrial 3D laser scanners, have revealed the landscape of Stonehenge through the largest and most detailed archaeological prospection project.

The results of the survey project are used to create a highly detailed archaeological map of the 'invisible' landscape, providing the basis for a full interpretative synthesis of all existing remote sensing and geophysical data from the study area. For the first time, it will therefore be possible to create total digital models of the Stonehenge landscape at a true 'landscape scale' that will not only transcend the immediate surrounds of individual monuments within the study area but will also tie them together within a seamless map of sub-surface and surface archaeological features and structures.

The Stonehenge Hidden Landscapes Project is supported by the work of numerous young researchers and remote sensing and archaeological specialists. These include Klaus Löcker, Mario Wallner and Dr Geert Verhoeven (Austria), Philippe De Smedt (Belgium) and Eamonn Baldwin, Henry Chapman, Paul Garwood and Dr Eugene Ch'ng (United Kingdom).

The Stonehenge Hidden Landscapes Project is a collaborative work carried out under the auspices of the National Trust and English Heritage.

**Web links**

Ludwig Boltzmann Institute ArchPro (<http://archpro.lbg.ac.at> and <http://lbi-archpro.org/cs/stonehenge/>)

Digital Humanities Hub, University of Birmingham

(<http://www.birmingham.ac.uk/facilities/digitalhumanitieshub/index.aspx>)

School of Archaeological Sciences (<http://www.bradford.ac.uk/archenvi/>)

Department of Earth and Environmental Sciences

(<http://earthsci.st-andrews.ac.uk/>)

ORBit University of Ghent

(<http://www.ugent.be/bw/soilmanagement/nl/onderzoek/bodeminventarisatietechnieken-orbit>)

The National Trust (<http://www.nationaltrust.org.uk>)

English Heritage (<http://www.english-heritage.org.uk/>)

## **Biographies and additional quotes**

### **Professor Vincent Gaffney**

Professor Vincent Gaffney is Chair in Landscape Archaeology at the University of Bradford. Vince has worked in many parts of the world, including Italy, Croatia and the United States. Past projects include the Wroxeter Hinterland Project, which carried out the first comprehensive geophysical survey of a major Roman town in Britain. He leads the team mapping the vast prehistoric landscapes that now lie beneath the southern North Sea. Recent research projects include the study of what may be the world's earliest time reckoner at Warren Field in Aberdeenshire. Professor Gaffney is also a member of the teams that scanned the mausoleum of Diocletian in Split and, with Princeton and Durham, are creating an agent-based model of the Byzantine army that marched to the battle of Manzikert in 1071.

### **Professor Wolfgang Neubauer**

Wolfgang Neubauer studied Prehistoric Archaeology, Mathematics, Archaeometry and Computer Science at the University of Vienna and the Vienna University of Technology. He specialises in archaeological prospecting, digital documentation and virtual reality visualisation of archaeological heritage. Wolfgang has carried out archaeological research on sites all over the world for over 30 years, has coordinated many national and international research projects, and is currently Director of the Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology (LBI ArchPro). His recent research focused on the development of hardware and software for non-invasive, large-scale efficient geophysical exploration of archaeological landscapes at unprecedented resolutions. Besides the survey in Stonehenge, his institute is focusing on large-scale surveys of Viking Age sites and landscapes in Scandinavia. He is currently directing the detailed prospection of Roman Carnuntum (Austria) after the detection of the unique school of gladiators in 2011, the largest geophysical survey ever attempted to explore a Roman site.

### **Dr Christopher Gaffney**

Chris Gaffney was appointed to the staff at Bradford in October 2007 and is now Head of School. His link with Bradford goes back to the 1980s, as he undertook both undergraduate and postgraduate degrees at this university. Having completed doctoral research (in Earth Resistance), Chris formed a commercial archaeological geophysical company with John Gater. Subsequently, GSB Prospection became the largest group working in Britain, and in the summer of 2007 Chris was awarded an Honorary Doctorate for popularising archaeological geophysics via Time Team and other media opportunities. His research interests include developing commercial avenues while reducing the environmental footprint of prospecting devices. His most recent project is DART, which investigates changes in physical properties that allow detection using remote sensing.

### **Dr Henry Chapman**

Henry Chapman is Senior Lecturer in Archaeology and Visualisation and Director of the Digital Humanities Hub at the University of Birmingham. He specializes in the archaeology of prehistoric landscapes, and the relationships between humans and their changing environments in the past, particularly through the application of digital technologies. Henry has worked on sites throughout the UK and in other countries including Bosnia, Egypt, France, Ireland, Italy and the Netherlands, on a range of research and television-based projects. His recent research has included the prehistoric archaeology of peat bogs, Neolithic and Bronze Age ceremonial landscapes, Iron Age marsh forts in their landscape settings, and enigmatic later prehistoric riparian timber alignments.

### **Mr Paul Garwood**

Paul Garwood is Senior Lecturer in Archaeology at the University of Birmingham, specializing in European Neolithic and Bronze Age prehistory and the archaeology of ritual

and religion. He has carried out research on the Stonehenge landscape for 25 years, focusing especially on Early Bronze Age burials and funerary monuments, and has been involved in fieldwork in the Stonehenge area since 2007. Other current projects include work on the earliest farming societies in Britain, and surveys and excavations of major Early Neolithic monuments in the Medway and Trent valleys.

*“Our understanding of Stonehenge and the Stonehenge landscape has been built up gradually over three centuries of archaeological fieldwork, but the Hidden Landscapes Project marks a radical transformation not only in terms of our knowledge base but also our capacity to explore further. The results of our project, especially high-resolution mapping of almost the entire landscape, will provide the basis for future research in the Stonehenge landscape for generations to come. The sheer scale, detail and seamless character of the map data, new site discoveries, and our reinterpretations of every facet of past activity around Stonehenge, sets new agendas for Stonehenge research and for ‘landscape archaeology’ more widely.”*

#### **Dr Richard Bates**

Richard Bates is an applied geophysicist working in the Department of Earth and Environmental Sciences, University of St Andrews. Richard began his career in industry using geophysical methods to solve exploration and environmental problems. However, on his return to academia he has concentrated on developing techniques for application in a range of applied fields including exploration of buried and drowned archaeological landscapes. Current projects include investigations of the World Heritage Sites of Orkney, the ancient human discoveries in Norfolk and lost landscapes of the North Sea.

*“Working on these sites is such a privilege, the new and improved geophysical techniques are providing the opportunity to investigate the landscapes with incredible detail revealing buried evidence of the past environments and monuments in a way that we could only dream of 10 years ago. Academically we can learn so much more about our ancestors now but the geophysics is also giving us new ways to share the discoveries and hopefully inspire a new generation to become interested archaeology.”*

#### **Dr Philippe De Smedt of Ghent University, Belgium**

Philippe De Smedt is a researcher at the Department of Soil Management, Ghent University (Belgium). After obtaining a degree in archaeology, he completed doctoral research in Bio-science Engineering, which addressed the application of electromagnetic induction (EMI) sensors and dedicated processing techniques. Within the research group of Soil Spatial Inventory Techniques (ORBit) he specializes in the use of such non-invasive soil sensors to help understanding past human environments. At Stonehenge, his research focusses on the relationship between past natural landscape variations and the prehistoric occupation of the landscape.

*“In landscape archaeology every aspect of the subsurface adds a new piece to the complex archaeological puzzle. By combining a broad range of survey methods the Hidden Landscapes Project bridges that gap as it provides a wide and highly detailed view on our buried past. Through an approach founded in soil science, we aim to combine archaeological information with insights into past natural landscape variations. The integration of these and other geophysical data not only changes our understanding of the prehistoric Stonehenge landscape, but provides a new perspective on studying the past.”*

#### **Professor Marc Van Meirvenne of Ghent University, Belgium**

Marc Van Meirvenne is a soil scientist specialised in soil inventory techniques. Over 15 years his research focuses on the use of non-invasive soil scanning, including ground penetrating



radar, electromagnetic induction and magnetometry. One of the application fields for these techniques is archaeology and in this way his work links with the activities at Stonehenge. One of his postdoctoral collaborators, Philippe De Smedt, is actively conducting this research with yearly field campaigns at Stonehenge, including the site of Durrington Walls.

*“Recent developments in non-destructive soil prospection techniques have revolutionised our possibilities to investigate the soil of entire landscapes at great detail.”*

## **Stonehenge Hidden Landscape Project Partners**

### **University of Birmingham (The Digital Humanities Hub and GG TOP)**

The Digital Humanities Hub and the Department for Classics, Ancient History and Archaeology (CAHA) at Birmingham co-operate to support academic research and application development in Archaeology, Heritage and the Humanities. Using state-of-the-art technology in the Michael Chowen and Garfield Western Prototyping Hall, Hub staff provide unparalleled opportunities for research, postgraduate study and professional training in digital humanities, while staff research specialisms within CAHA include the prehistory of north-west Europe, the archaeology of the Mediterranean world, environmental and landscape archaeology, and museology. The Birmingham team incorporates the work of GG TOP a multi-disciplinary project at the University of Birmingham that is developing underground mapping technology using gravity based on quantum technology. Our physics research collaborators are developing a sensor that is able to pick up gravity signals precise enough to identify persons next to the sensor. Our partners in engineering are working on the inversion of the signal; because gravity signals are passive they need to be interpreted to give an accessible picture. Collaborators within civil engineering are working on the characterisation of sources of interest. These range from oil and gas deposits to water pockets and pipes. Archaeologists within the project are using the gravity sensor and associated signal processing to add to data from existing geophysical techniques to create a more detailed and extensive picture of archaeological features beneath the soil.

### **The Ludwig Boltzmann Institute for Archaeological Prospection and Virtual**

**Archaeology** (<http://archpro.lbg.ac.at>) is a research institute of the Ludwig Boltzmann Gesellschaft (<http://www.lbg.ac.at>) and was founded in 2010. The institute carries out its research activities together with several international partner organizations and aims to create a network of archaeological scientists supporting interdisciplinary research programmes for the development of large scale, efficient, non-invasive technologies for the discovery, documentation, visualisation and interpretation of Europe's archaeological heritage. The lead partners of the institute based in Vienna, are the University of Vienna (A), the Vienna University of Technology (A), ZAMG-the Austrian Central Institute for Meteorology and Geodynamics (A), the Province of Lower Austria (A), Airborne Technologies (A), 7reasons (A), the Austrian Academy of Sciences (A), The Austrian Archaeological Institute (A), RGZM-the Roman-Germanic Central Museum Mainz (D), the National Historical Museums – Contract Archaeology Service (S), the University of Birmingham (GB), the Vestfold County Council (N) and NIKU-the Norwegian Institute for Cultural Heritage Research (N).

### **The Austrian Central Institute for Meteorology and Geodynamics**

The Austrian Central Institute for Meteorology and Geodynamics (ZAMG) is a research institution of the Austrian Federal Ministry for Science, Research and Economy. The department for Geophysics contributes worldwide to the understanding of processes in the Earth's interior. This information also assists in dealing effectively with natural hazards which may affect people, buildings, dams and construction sites. It also supplies the Austrian

Federal Warning Agency, the Austrian Army and Non-Governmental Organizations with information regarding natural disasters elsewhere. Geophysicists at the ZAMG study the internal structure of the earth using gravity, magnetic, electrical and seismic methods to investigate the evolution of the earth, earthquakes, tsunamis, landslides, changes of the Earth's magnetic field and volcanoes. In addition, magnetic and geo-electrical measurements and georadar are used to detect hidden waste deposits and natural resources. The ZAMG hosts an interdisciplinary research group for archaeological prospection (ZAMG ArcheoProspections®), collaborating with the LBI ArchPro in the development and application of cutting-edge geophysical prospection instrumentation, data processing and visualization. <http://www.zamg.ac.at/cms/de/produkte/geophysik/archo-prospections-r>

### **School of Archaeological Sciences**

The School of Archaeological Sciences integrates Archaeological Sciences, Geography, Environmental Sciences, Biological Anthropology and Forensic Sciences in a single profoundly multidisciplinary department bridging the sciences and the humanities. In Archaeological Sciences, a unique mix of scientists, archaeological scientists and archaeologists focus on several areas: the analysis and interpretation of material culture; environmental archaeology; the analysis of contact and interaction between societies; and archaeological chemistry, biochemistry and geophysics.

### **Department of Earth Sciences at the University of St Andrews**

The Department of Earth Sciences at the University of St Andrews carries out research addressing the profound questions about the co-evolution of Earth and life and with an emphasis on delivering societal and economic impact. It spans the study of recent environmental change to Earth System evolution in Deep Time, all underpinned by a suite of state-of-the-art analytical and field facilities.

### **Ghent University, Belgium**

The research unit 'ORBit' of the Department of Soil Management at Ghent University, Belgium, specialises in techniques to inventory soil properties, including the identification of buried anthropogenic phenomena. Over the past 15 years it has acquired a strong specialisation in the use of mobile non-destructive soil sensors, especially with electromagnetic induction. This unit is a collaborative partner of LBI ArchPro and has conducted three surveys at Stonehenge over the past three years in collaboration with the University of Birmingham, covering in total about one square mile. This research is ongoing.

**The National Trust** cares for over 73,000 archaeological sites, making it the largest privately owned collection in England, Wales and Northern Ireland. The Trust's archaeologists are involved in projects across all areas of the organisation, including historic houses, gardens, parks, coast, woodland and countryside, from a huge range of periods –

<http://www.nationaltrust.org.uk>. Within the Stonehenge World Heritage Site, the National Trust owns and cares for 827 hectares (2,100 acres) of downland surrounding the iconic stone circle. Today thanks to the Trust's extensive programme turning ploughed fields into pasture, visitors can explore the landscape and follow in the footsteps of the people who built its prehistoric monuments, including the Stonehenge Avenue, the Cursus and Durrington Walls - <http://www.nationaltrust.org.uk/stonehenge-landscape>

**Historic England** is the public body that looks after England's historic environment. We champion historic places, helping people to understand value and care for them, now and for the future. <http://HistoricEngland.org.uk>