



VIRTUAL
HERITAGE
NETWORK

IRELAND

Maynooth University
19-21 November 2015

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Sponsors

We are very pleased to acknowledge that VHN: Ireland 2015 was organised with the support of:



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An Foras Feasa

THE INSTITUTE FOR RESEARCH IN IRISH
HISTORICAL & CULTURAL TRADITIONS



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creative**know**how



Maynooth University

National University of Ireland Maynooth

Formally established as an autonomous university in 1997, but tracing its origins to the foundation of the Royal College of St. Patrick in 1795, the National University of Ireland, Maynooth (Maynooth University) draws on a heritage of over 200 years' commitment to education and scholarship. The last two

decades have seen the University grow rapidly in scale, strength and stature. Maynooth University is today a university of international standing, renowned for the quality and value of its research and scholarship, for its dedication to excellent teaching, for providing an outstanding learning experience for its 10,000 students, and as a uniquely collegial environment in which to pursue scholarly work. Maynooth University is embarking upon a new and exciting phase of its development under the University Strategic Plan 2012-17 with a vision to consolidate the international reputation of Maynooth University "as a university known for outstanding teaching, excellent research, a global outlook, effective engagement with the society we serve, and our distinctive approach to the challenges facing modern higher education. The University has 27 academic departments which are organised into three Faculties: Arts, Celtic Studies and Philosophy; Science and Engineering; and Social Sciences. The University is also home to a number of multi- and trans-disciplinary research institutes, including the Hamilton Institute, the National Centre for Geocomputation, the National Institute for Regional and Spatial Analysis, the Institute of Immunology, and An Foras Feasa.



An Foras Feasa is an institute for research in Irish historical and cultural traditions based at Maynooth University. It is a leading international centre for Irish humanities research and a major research

institute for the arts and humanities at Maynooth University. The central role of the institute is to sustain a vibrant intellectual community and to stimulate individual and collaborative research in the arts and humanities across Maynooth University. The Institute has a particular emphasis in Digital Humanities. An Foras Feasa leads a number of teaching programmes at undergraduate and graduate level including the MA in Digital Humanities. An Foras Feasa also makes a significant contribution to the Irish inter-institutional Digital Arts and Humanities structured PhD, one of the most successful of its type in Europe. The Institute also supports an exciting range of intellectual activities, including hosting of visiting scholars from around the world.



ASHGATE

Over the past 45 years, Ashgate has grown to become one of the world's leading publishing houses. We understand the value of academic research and scholarship, and we are proud of our responsiveness, flexibility, and global reach. Our business is driven by a programme of cutting-edge research publications and specialist reference books. All books published within the Ashgate list are subject to peer review by recognized authorities in the field and we strive to work with our authors to make the experience

of writing or editing a book as satisfying as possible. We publish over 800 titles a year in Humanities and Social Science subject areas. Ashgate's Information and Cultural Management list is growing in response to international demand for new and innovative titles on the management of cultural organizations including the visual and performing arts, museums and heritage institutions, and library and information centres. Our key areas of publishing currently include:

- library and collection management
- museum and heritage management
- digital technologies - including the series *Digital Research in the Arts and Humanities*
- information marketing
- archiving and data management
- library building and design



Founded in 2000, Nicolas Boyes Stone Conservation (NBSC) has a dynamic team of skilled heritage specialists with a strong ethic and expertise in conservation, stone masonry, gilding, replication, surveying and assessment. NBSC also provides digital documentation services such as Laser scanning, Photogrammetry, Infrared and Ultraviolet Photography and Reflectance Transformation Imaging. Our offices and workshop are based in Edinburgh, but we undertake work throughout the UK and further afield.

- when it has to be **right**



Revolutionising the world of measurement and survey for nearly 200 years, Leica Geosystems creates complete solutions for professionals across the planet. Known for

premium products and innovative solution development, professionals in a diverse mix of industries, such as aerospace and defence, safety and security, construction, and manufacturing, trust Leica Geosystems for all their geospatial needs. With precise and accurate instruments, sophisticated software, and dependable services, Leica Geosystems delivers value every day to those shaping the future of our world. Our strength lies not only in our innovative developments in the fields of surveying, remote sensing and photogrammetry, but increasingly in our strategic partnerships with some of the world's leading technology companies and customers. Our strategic vision of geomatics has led to the integration of companies with expertise in laser-scanning technology, 3D visualisation and software for remote sensing, building and construction, GIS applications and machine guidance. Together with our partners and strategic alliances, we are one of the most comprehensive providers of solutions in the acquisition, visualisation and modelling of spatial data for numerous applications. Leica Geosystems is a brand within Hexagon Geosystems, the complete reality-capture solutions provider. With a sharp focus on information technologies that capture, measure, and visualise data, Hexagon Geosystems' high-quality products and solutions create real digital worlds. Leica Geosystems is part of Hexagon, Sweden (Nasdaq Stockholm: HEXA B; hexagon.com), a leading global provider of information technologies that drive quality and productivity improvements across geospatial and industrial enterprise applications.



Noho produces captivating digital experiences for museum, corporate and broadcast clients.

We also provide post-production services for commercials, TV and film companies. From evocative audio to rich, interactive video, web and 3D, our content informs, educates and inspires audiences, young and old alike. Our

experienced team is made up of award-winning animators, designers, video editors, writers and developers. Together, the Noho team provides a unique blend of creativity and technical expertise, or 'creative know-how'.

Noho provide three services, often integrated into a single solution:

- video (featuring 3D and motion graphics) & audio content
- interactive applications for touchscreens / smartphones
- responsive websites

Agisoft

Founded in 2006 as an innovative research company with focus on computer vision technology, through years of intensive R&D work Agisoft LLC has gained expertise in image processing algorithms, with digital photogrammetry techniques setting the direction for development of applied tools. We believe that new technology implementation for various industrial and socially important tasks is a way to foster low-budget methods of research and documentation. Agisoft is proud to be among the pioneers of digital photogrammetry solutions developers. With Agisoft PhotoScan currently being highly competitive photogrammetric software on the market, we see our mission as continuous R&D work to incorporate high-end technologies into the software for the users to have a tool to successfully solve 3D reconstruction, visualization, surveying and mapping tasks. Agisoft PhotoScan is designed specifically for those who value time, aim at technical efficiency and are ready to follow digital technologies to the world of unlimited opportunities. Developing stand-alone software, we strive to make our solution efficient for various applications, which challenges our team to wisely optimize algorithms concerning quality of the results, hardware resources consumption, and processing speed. Know-how algorithms, parallel computing, GPU acceleration form the basis for intelligent image processing system which is accurate, fast, and stable. Not only do we employ latest scientific achievements to produce high-end solution, but we also do see user feedback analysis as a key element to maintain sustainable development of the software that is to be a handy tool capable of solving the task you face, be it a large area mapping or a 3D object digitization task.

Acknowledgment of Organisers

Organising Committee

Chair: Dr Costas Papadopoulos

Costas Papadopoulos (BA in History and Archaeology, MSc in Archaeological Computing - Virtual Pasts, PhD in archaeological computing) is currently a Postdoctoral Research Fellow at An Foras Feasa, Maynooth University, Ireland. He specialises in 3D visualisation methods and technologies for recording, capturing, researching, and disseminating archaeological and cultural heritage data. In particular, his research, teaching and publications to date are primarily related to digital reconstructions, formal three-dimensional analyses of past built spaces, light in archaeology, Augmented Reality, and Computational Imaging, examining both the practical aspects of modern technologies and the theoretical dimension of such approaches. He has published his work in a monograph, edited volumes, conference proceedings and academic journals. He is currently working on the Oxford Handbook of Light in Archaeology (Oxford University Press).

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Deputy Chair: Anthony Corns

Anthony Corns graduated with a BSc (Hons.) in Geology & Physical Geography and an MSc in GIS from The University of Edinburgh, Scotland in 1997 and 1999 respectively. Has been the Technology Manager for The Discovery Programme for the past 15 years and is responsible for the management of the applied technology research, including: project management, 3D data capture at a range of levels (aerial lidar, terrestrial scanning, close range scanning), GIS for cultural heritage, dataset set management and archiving, metadata, promotion and dissemination of the use of technology within cultural heritage. He has participated in several EU funded projects including: 3D-ICONS (CIP), ARIADNE (FP7), LoCloud (CIP), and ArchaeoLandscapes Europe (Culture 2007-2013) and is currently a member of the DARIAH-Ireland steering committee and the CARARE Network.

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Social Media, Communications and Outreach Officer: Karolina Badzmierowska

Karolina Badzmierowska completed her MA in History of Art and Architecture at University of Limerick, Ireland and BA in Art History at the University of Gdansk, Poland. She is currently in her 3rd year of the Structured PhD Programme in Digital Arts and Humanities in the Department of History of Art and Architecture, Trinity College Dublin, where she was awarded Postgraduate Research Studentship in 2013. Karolina's doctoral research explores digital methodologies in art history with a focus on the concept of thematic research collections. Her case study is based on the 17th century Dutch paintings of church interiors and investigates the application of digital tools and methodologies in art historical research. She is particularly interested in virtual reconstruction of the church interiors from the paintings as a method used to analyse the perspective and its distortions. Her career to date combines strong interests in digital humanities, art history and museum studies and the experience acquired at the Hunt Museum in Limerick and the National Museum of Ireland. She is currently working as a Workflow and Communication Coordinator for the Letters of 1916, the first public humanities project in Ireland.

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Submissions and Reviewing Coordinator: Dara Fleming-Farrell

Dara Fleming-Farrell has six years' experience using a range of three-dimensional imaging techniques, including laser scanning, computed tomography, and photogrammetry, in archaeology and osteoarchaeology. She completed her BA at Trinity College Dublin where she read Ancient History and Archaeology and the History of Art and Architecture before completing an MSc in Forensic Anthropology at the University of Edinburgh. Her MSc dissertation focused on the use of three-dimensional CT images to examine trauma in forensic and archaeological skeletons. Dara is currently a final year PhD candidate in the Digital Arts and Humanities programme at Trinity College Dublin. Her doctoral research investigates the theoretical implications and practice applications of three-dimensional imaging to the study of evidence for interpersonal violence and warfare in archaeological skeletal assemblages.

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Submissions and Reviewing Coordinator: Eimear Meegan

Eimear Meegan is a final year PhD student in University College Dublin's School of Archaeology where her research uses visualisation techniques to explore the role of choice as a driver of social change in Neolithic island societies, both in Europe and the Mediterranean. A graduate of Trinity College Dublin (BA Ancient History and Archaeology and Spanish), Glasgow University (MPhil Mediterranean Archaeology) and University College Dublin (MA Cultural Policy and Arts Management), she has worked in both commercial and research archaeology for the last ten years and, having focused largely on archaeological theory in earlier postgraduate work, has spent the last number of years considering how virtual worlds can be used to engage with and enhance existing theoretical approaches to the materiality of production and construction in the prehistoric world.

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Publication Coordinator: Frank Lynam

Frank Lynam (BA in Ancient History and Archaeology and Italian, MPhil in Mesopotamian Archaeology) has more than a decade of experience working in R&D in the technology sector. He completed his BA at Trinity College Dublin where he read Ancient History and Archaeology and Italian. He studied Mesopotamian archaeology and the archaeology of South Asia during his MPhil in Archaeology at the University of Cambridge. He is currently in his final year of the 4-year Digital Arts and Humanities PhD programme at Trinity College Dublin. His doctoral research considers the Archaeological Semantic Web primarily from the perspective of user.

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Interpretive Centres and SMEs Liaison Officer: Niall Ó hÓisín

Niall Ó hÓisín is founder and Managing Director of Noho, specialist producers of captivating digital experiences for museum, corporate, and broadcast clients. He studied History and History of Art in UCD before training in computer animation and graphics. He began working in the Post Production industry in 1994 and has been at the forefront of the computer graphics industry in Ireland for the past 20 years, working in Screenscene (Head of 3D) and The Farm (Head of Graphics) before setting up Noho. He combines his technical and creative background in broadcast graphics, commercials and animation with his training and interest in history and history of Art. He is a founding member of the FP7-funded Virtual Museum Transnational Network (V-MusT); a European network of museum professionals, researchers and content providers. Through participation in this network, he keeps abreast of innovations and new discoveries in this field.

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Interpretive Centres and SMEs Liaison Officer: Gary Dempsey

Gary Dempsey is an archaeologist and 3D Designer working with RealSim Ltd. RealSim are producers of highly realistic interactive and passive 3D simulations of the world around us, which include applications for historical environment re-construction, marine simulation, and urban planning. Gary has a background in Heritage Studies (BA. Hons. Galway Mayo Institute of Technology) and Irish Studies (MA Centre for Irish Studies, NUI Galway). Working as the Education Officer at the archaeological complex of Rathcroghan, Co. Roscommon, he developed a greater interest in 3D recording techniques, kite aerial photography (KAP) and archaeological landscape studies. In 2013, he was accepted to join the first group of students on the International Heritage Visualisation (MSc.) course at the Digital Design Studio, Glasgow School of Art, Scotland. His research on historical graffiti using RTI and photogrammetry has led to his role as Coordinator for both the Roscommon Cross Slab Project (Roscommon3D) and Galway 3D citizen science projects, designed to involve community groups in the creation of digital museums.

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Archaeology Liaison Officer: Dr Christine Morris

Dr Christine Morris (BA Classics; PhD Classical Archaeology) is the Andrew A. David Associate Professor of Greek Archaeology and History at Trinity College Dublin. Her main area of research and archaeological fieldwork is the Aegean Bronze Age. Her interests in digital technologies in archaeology relate to work on Cretan peak sanctuaries; these include the use of GIS as a tool for intra-site analysis of the ritual assemblage, and an ongoing project '*Figures in 3D: digital scanning of clay figurines from Cretan Bronze Age peak sanctuaries.*' As well as using 3D representations and prints as a research/study tool, she is interested in how different modes of representation affect the relationship between researcher and object, and other consumers (students, wider public) and object.

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UK Virtual Heritage Liaison Officer: Dr Paul Reilly

Dr Paul Reilly is a visiting Senior Research Fellow at the Department of Archaeology, University of Southampton. He has published widely in archaeological computing, particularly in the field of visualisation and virtual archaeology. He has also worked and consulted extensively in the IT and Communications Industry. A former chair and life member of the international CAA organisation, his primary research interests today revolve around the relationship between archaeology in the field and its digital embodiment. In particular, how and where these digital embodiments are created, manipulated, transformed, presented, and interpreted, and the philosophical and social impacts of digital technology on our understanding of the nature of archaeology and how knowledge is represented in the digital. His most recent works explore the possibilities and implications of additive manufacturing to virtual archaeological theory and practice.

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Interactive Presentations, Exhibitions and Sponsors Coordinator: John Buckley

John Buckley is an artist, researcher and educator, lecturing in 3D Modelling, Real-time Rendering and VFX on the BA in 3D Design, Modelmaking and Digital Art in IADT Dun Laoghaire, where he also supervises Masters by Research in Visual Arts Practice and Cyberpsychology. His practice is focused on virtual and augmented reality technologies, videogames and real-time visualisation and his research interests are in the philosophy, politics and modalities of perception in digital cultures. He is currently a doctoral researcher in the Graduate School of Creative Arts & Media (GradCAM), pursuing a PhD in the political economy of massively multiplayer online videogames and has published in the area of social media and immaterial labour. John graduated from NCAD with an MA in Fine Art Media and BA in Printmaking & History of Art.

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Scientific Committee

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Ms Karolina Badzmierowska

Trinity College Dublin, Ireland

Mr John Buckley

Dún Laoghaire Institute of Art , Design and Technology, Ireland

Prof Eric Champion

Curtin University, Australia

Dr Angeliki Chrysanthi

University of Southampton, UK

Mr Anthony Corns

The Discovery Programme, Ireland

Dr Nicolás Dell'Unto

Lund University, Sweden

Mr Gary Dempsey

RealSim and Roscommon Cross Slabs Project, Ireland

Dr Stuart Dunn

King's College London, UK

Dr Stuart Eve

University College London, UK

Ms Dara Fleming-Farrell

Trinity College Dublin, Ireland

Dr John Fillwalk

Ball State University, USA

Dr Sorin Hermon

The Cyprus Institute, Cyprus

Dr Wim Hupperetz

University of Amsterdam, The Netherlands

Dr Stuart Jeffrey

Glasgow School of Art, UK

Dr Chris Johnson

University of California, Los Angeles, USA

Dr Ed Johnson

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Mr Frank Lynam

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Ms Eimear Meegan

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Dr Christine Morris

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Dr Patricia Murrieta-Flores

University of Chester, UK

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NUI Galway, Ireland

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Dr Eleftheria Paliou

University College London, UK and Heidelberg University, Germany

Dr Costas Papadopoulos

Maynooth University, Ireland

Dr Panos Parthenios

Technical University of Crete, Greece

Dr Laia Pujol

University of Barcelona, Spain

Dr Paul Reilly

University of Southampton, UK

Prof Susan Schreibman
Maynooth University, Ireland

Dr Roberto Scopigno
National Research Council, Italy

Dr Alice Watterson
Glasgow School of Art, UK

Dr Lyn Wilson
Historic Environment Scotland, UK

Exhibitors



The Discovery Programme Centre for Irish Archaeological Research

The Discovery Programme is a national archaeological research body supported by the Heritage Council. It conducts advanced analysis of Irish archaeology and pursues its goals by identifying 'gaps' in our knowledge or areas where intense research is required or would be valuable. A dedicated project

team is then employed for a suitable period to pursue the topic in question. It promotes interdisciplinary research involving experts in the humanities (anthropologists, historians, linguist) and the sciences (particularly the sciences that study the landscape and environment of the past; paleoenvironmental, osteoarchaeological, geological, flora and fauna). It engages with constantly evolving new technologies in digital imaging and surveying techniques and promotes their introduction into the operation of Irish archaeology more generally. It develops outreach activities to communicate the results of its projects to the general public as well the academic community. These activities include the publication of scientific books and papers and collaborative outreach projects with national cultural institutions, third and fourth level institutions, local authorities and local heritage partnerships. The Discovery Programme is funded through the Heritage Council and EU research grants.

nóho

creative**know**how

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experienced team is made up of award-winning animators, designers, video editors, writers and developers. Together, the Noho team provides a unique blend of creativity and technical expertise, or 'creative know-how'.

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U3D is a full-time 3D printing centre open for commercial printing, design services, classes, and collaborative research. We are the first 3D printing centre in Ireland that provides access to the latest industry standard machines. Our goal is to make high quality printing techniques available to the public. With

thousands of hours of printing experience and more than half a million euros in equipment (including drones and terrestrial laser scanners for data capture), U3D provides quick-turn around, high-precision prints at extremely competitive prices. We have now upped our game and can offer individualized scan to print facilities to turn your object into a 3D model ready to print.



RealSim are passionate about the empowering capabilities of merging technologies from high-end game engines with 3D survey data and graphic design. RealSim have been innovators in this field for the past 8 years and have been acknowledged as such by our peers in industry with multiple awards for our city, marine and

heritage environment applications. The success of RealSim to date is built upon the skills and expertise of our talented team, who together have over 20 years' experience in various 3D visualisation and spatial technologies. RealSim specialises in the following fields:

- 3D city and campus modelling
- GPS guided 3D ancient environment apps
- transport simulations
- marine simulations
- historical site reconstruction
- marketing and communication
- environmental impact studies

Programme Day-By-Day

Thursday 19th November

**Iontas Building, North Campus
Maynooth University**

Computational Imaging Workshop – 10am-5pm

Introduction

3D Recording is nowadays a necessary component in the preservation, understanding, analysis and presentation of cultural heritage. Fieldwork projects, research centres, and heritage institutions are increasingly employing digital recording methods not only as a means to present information to the public, but also to augment conventional records and enhance research outcomes.

The main aim of this workshop is to introduce participants to the capabilities of computational imaging for recording, visualising and analysing buildings' and objects' three-dimensional properties. The theoretical part of the workshop will provide the fundamental concepts and the data capture and processing methods applied to each technique, referring to characteristic examples and applications. During the practical part of the workshop, participants will get hands-on experience by performing all stages involved in 3D recording, i.e. capture, processing and viewing. They will also have the chance to use pre-captured datasets, as well as produce their own records.

What is it about?

The workshop will have two main components: Photogrammetry and Reflectance Transformation Imaging (RTI). In the first half, participants will learn how to create and produce 3D recordings by using simple digital photographs and photogrammetric techniques, such as Structure from Motion (SFM), using various online and stand-alone software. The main object of this one day workshop is to develop the skills needed to record heritage objects for virtual museums and research purposes and demonstrate best practice recording methods. In the second half, participants will learn a computational photographic method, Reflectance Transformation Imaging (RTI), that is based on the raking light principle that uses digital cameras and sources of light to enhance subtle surface details (surface, texture, colour) and generate interactive relighted surface models. They will learn how to capture the datasets, process images and view the results.

Workshop Instructors

Gary Dempsey, Coordinator Roscommon Cross Slab Project, Coordinator Galway 3D project, 3D Designer and Programmer with RealSim Ltd.

Dr Costas Papadopoulos, Postdoctoral Research Fellow at An Foras Feasa, Digital Heritage and 3D visualisation course leader



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Programme at-a-glance: Friday 20th November

Renehan Hall, South Campus Maynooth University

11:45–12:30

Registration

12:30–14:15

3D Data Capture, Representation & Reconstruction (Part 1) **Chair/Discussant: John Meneely**

Ogham in 3D – Digitising Ireland's Ogham Stones

Nora White, Dublin Institute for Advanced Studies

3D-Icons Ireland: Online Delivery of Complex Architectural 3D Models

Anthony Corns, Aaron Deevy, Gary Devlin, Louise Kennedy & Robert Shaw, The Discovery Programme

Breaking the Mould: Ireland's Replicas of Cultural Objects from the Historic to the Digital

Michael-Ann Bevivino, CRDS Ltd and University College Dublin

Picking up the Pieces: Digital Reconstruction of a Romanesque Doorway at Old Kyle, Co. Laois

Thomas Nelligan, TheStandingStone.ie, Gary Dempsey, RealSim Ltd

RePlay: Digitally Capturing Unique Skills in European Traditional Sports and Games

David Monaghan, Dublin City University (DCU), Amin Ahmadi, DCU, Francois Destelle, DCU, Dimitrios Zarpalas, The Centre for Research and Technology, Hellas (CERTH-ITI), Kieran Moran, DCU, Petros Daras, CERTH-ITI and Noel E. O'Connor, DCU

14:15–15:45

3D Data Capture, Representation & Reconstruction (Part 2) **Chair/Discussant: Paul Reilly**

Take a Picture-It Will Last Longer: Use of Low Cost Photogrammetry to Record Vulnerable Coastal Archaeology

James Bonsall & Sam Moore, Institute of Technology, Sligo

Applications of Digital Documentation in Conservation of Cultural Heritage: Case Study of the Jawbone Arch

Clara Molina Sanchez & Nicolas Boyes, Nicholas Boyes Stone Conservation Ltd

A Bird's Eye View: An Analysis of the Validity of the UAV Photogrammetry Platform in the Rapid Documentation of Cultural Heritage Under Threat
Daniel Maher, National Museum of Archaeology, Malta

3 Minutes in the Sky: a New, Fast, Low Cost Approach to Heritage Documentation
Debra Laefer & Jonathan Byrne, U3D and University College Dublin

15:45–16:15

Tea/Coffee

16:15–18:00

Digital Interaction and Museums (Part 1)
Chair/Discussant: Stuart Jeffrey

Provocation by Design – Creating Interpretive Visitor Experiences which Captivate, Thrill and Inspire
Andrew Todd, Tandem Design

A virtual Museum and a Real Community: From Images to Identities in Mazzano Romano, Italy
Jacopo Tabolli, Trinity College Dublin

Opportunities and Theoretical Challenges of Low Cost Visualisation and Interaction Technologies for Digital Heritage Data
Pim van Bree & Geert Kessels, LAB1100

EON World Heritage Initiative
James Moran, EON Reality

Myths and Megaliths: From the Darkroom to the Oculus Rift
Howard Goldbaum, Univeristy of Nevada, Reno

18:00–18:15

Break

18:15–19:15

Keynote Talk: 3D Interpretation and Presentation of Cultural Heritage: Case Studies from the Scottish Ten Project
Lyn Wilson, Historic Environment Scotland

19:15–19:45

Launch of the Digital Simulation Project – Contested Memories: the Battle of Mount Street Bridge

19:45–20:30

Wine reception

20:45

Conference dinner @ Avenue Cafe and Restaurant, Maynooth

Programme at-a-glance: Saturday 21st November

Renehan Hall, South Campus Maynooth University

08:30–09:00

Registration

09:00–10:30

Digital Interaction and Museums (Part 2)

Chair/Discussant: Christine Morris

Sounding Dublin: Mapping Contemporary Popular Experience and Promoting Music Tourism

Áine Mangaoang, Dublin City University

Tracing Séan Ó Riada's Projects in a Digital Context

Patrick Egan, University College Cork

Bringing an Archive to Life through Augmented Reality: the 'Excavating Egypt' Exhibition

David Vacas Madrid, The Egypt Exploration Society

Exploring Online Cultural Heritage. Integrating Queries through Tangible User Interfaces on the Web

Javier Pereda, University of Southampton

10:30–10:45

Tea/Coffee

10:45–13:00

The Digital and Beyond

Chair/Discussant: Will Megarry

History at the Next Level: Commercial Video Games as Virtual Heritage Objects

Joshua Savage, Maynooth University

The Digital Heritage Paradox

Wim Hupperetz, University of Amsterdam

The ACCORD Project: Community Co-Production, Authenticity and Authority

Stuart Jeffrey, Glasgow School of Art (GSA), Alex Hale, RCAHMS, Siân Jones, University of Manchester, Cara Jones, Archaeology Scotland & Mhairi Maxwell, GSA

Restoring the Digital Old Minster of Winchester

Paul Reilly, Stephen Todd & Andrew Walter, University of Southampton

The Battle of Mount Street Bridge: Digital Simulation for Historical Research

Susan Schreibman & Costas Papadopoulos, Maynooth University

The Battle of Mount Street Bridge: 3D Modelling and Artificial Intelligence - Problems and Perspectives

John Buckley, Dún Laoghaire Institute of Art, Design and Technology

13:00–13:45

Lunch

13:45–14:45

Keynote Talk: *Virtually Real or Really Virtual: Towards a Heritage Metaverse*

Jeremy Huggett, University of Glasgow

14:45–17:00

3D Analysis and Interpretation

Chair/Discussant: Frank Lynam

Using 3D and Network Analysis to Model Visitor Movement at Machu Picchu, Peru

Will Megarry, University College Dublin and The Johns Hopkins University

Historic Building Information Modelling (HBIM) of the Four Courts and Henrietta Street, Historic Classical Buildings in Dublin City

Maurice Murphy & Conor Dore, Dublin Institute of Technology

Historic Building Information Modelling (HBIM) as a Potential Tool for Adaptive Reuse

Evelien Dirix, Raymond Lemaire International Centre of Conservation

Small Changes, Big Results: 4D Monitoring of Stone Decay

John Meneely, Queen's University Belfast

Technological Advances in the Study of Cranial Morphology

Olivia Charonet & Manon Galland, University College Dublin

3D Scanning, Contact Digitising and Advanced 3D Digital Modelling for the Reconstruction and Analysis of Boats and Ships

Pat Tanner, University of Southampton

Abstracts and Biographies

Data Capture, Representation and Reconstruction (Part 1)

Ogham in 3D - Digitising Ireland's ogham stones

Nora White, Dublin Institute of Advanced Studies

The Ogham in 3D project aims to create 3D models of as many as possible of our surviving ogham stones (3D technology for a 3D script) and to make these freely available to everyone on our website (<http://ogham.celt.dias.ie>). The website, which was launched in 2013 and is a work in progress, brings together searchable information relevant to ogham from various disciplines (Celtic linguistics, archaeology, history, genealogy, epigraphy etc.). This presentation will look at the aims, methods and some results of the project to date, along with some future directions and potential uses for the 3D data.

Biography: Nora White's interests lie mainly in the early Irish language, literature and archaeology of Early Medieval Ireland. She is based in the School of Celtic Studies at DIAS and is Principal Investigator on the Ogham in 3D project. The most recent phase of the project, focusing on ogham stones in state care, is funded by the Department of Arts, Heritage and the Gaeltacht through the National Monuments Service. Since 2012, they have been collaborating with The Discovery Programme to capture and digitise ogham stones from various locations around the country. The results are available online at <http://ogham.celt.dias.ie/>.

3D- Icons Ireland: Online Delivery of Complex Architectural 3D Models

Anthony Corns, Aaron Deevy, Gary Devlin , Louise Kennedy & Robert Shaw, The Discovery Programme

This paper presents the final stage of the 3D-ICONS project, creating an online delivery platform to give the public access to the 3D models. The main European project was very much focused on the creation and publication of high quality metadata of the 3D models, allowing the public to find and reuse the models appropriately through Europeana, rather than the presentation of the content. For this reason, and seeing the potential beyond the life span of the EU co-funded project, the decision was made to create www.3dicons.ie, a website dedicated to the Irish content. The website was built with the intention of creating a rich resource focused on the 3D content, but with additional material of both informative and educational value.

Biographies: Robert Shaw Graduated in 1988 from the University of Glasgow with a first class BSc (Hons) degree in Topographic Science. A member of the Irish Institution of Surveyors since 2003, he worked initially in geodetic surveying and digital mapping before gaining over 20 years' archaeological surveying experience firstly with the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS), and currently The Discovery Programme in Ireland. His recent 3D documentation projects have included the recording and modelling of a number of high profile and prestigious cultural heritage sites in Ireland; the chambered tombs of Newgrange and Knowth, including the megalithic rock art; Skellig Michael monastic site, and Dún Aonghasa stone fort.

Anthony Corns graduated with a BSc (Hons.) in Geology & Physical Geography and an MSc in GIS from The University of Edinburgh, Scotland in 1997 and 1999 respectively. Has been the Technology Manager for The Discovery Programme for the past 15 years and is responsible for the management of the applied technology research, including: project management, 3D data capture at a range of levels (aerial lidar, terrestrial scanning, close range scanning), GIS for cultural heritage, dataset set management and archiving, metadata, promotion and dissemination of the use of technology within cultural heritage. He has participated in several EU funded projects including: 3D-ICONS (CIP), ARIADNE (FP7), LoCloud (CIP), and ArchaeoLandscapes Europe (Culture 2007-2013) and is currently a member of the DARIAH-Ireland steering committee and the CARARE Network.

Aaron Deevy graduated from the Dun Laoghaire Institute of Art, Design and Technology in 2014 where he completed his Bachelor of Arts in Modelmaking, Design and Digital Effects. He joined The Discovery Programme as part of the 3D Icons Project shortly thereafter. Within The Discovery Programme, he works to create accessible models of Irish heritage sites and objects from detailed 3D scans.

Gary Devlin graduated from Dublin Institute of Technology (Bolton St) in 2005 with a Bachelor of Science degree in Geomatics. He worked in GIS with NTL in Dublin before moving in 2007 into the field of archaeology, where he was employed as a surveyor for 2 years with Margaret Gowen & Co. He joined The Discovery Programme in 2009 and has worked across a broad range of projects since then. In his time with The Discovery Programme, Gary has helped to implement a range of new surveying techniques including terrestrial laser scanning, object scanning, RTI, SFM and drone surveying.

Louise Kennedy completed a BA in English and an MA in Archives and Records Management at University College Dublin. She has worked on literary, religious and research archives, cataloguing, exhibitions, archives formation and digitisation projects for public and private organizations. At The Discovery Programme, Louise assisted with the digitisation of a major collection of archaeological aerial photography. She works on ARIADNE (Advanced Research Infrastructure for Archaeological Dataset Networking) and LoCloud (Local Content in a Europeana Cloud), EU projects at the intersection of archaeology, heritage and accessibility.

Breaking the mould: Ireland's replicas of cultural objects from the historic to the digital
Michael Ann Bevivino, CRDS Ltd/University College Dublin

The Breaking the Mould project was initiated in late 2014 as a collaboration between CRDS Ltd., The Discovery Programme, UCD School of Art History and Cultural Policy and the National Museum of Ireland. Its main aim is to investigate the parallels between historic replicas and the current surge in digital replication in order to assess the benefits and long-term implications of advanced 3D replication technologies to cultural institutions in Ireland.

Biography: Michael Ann Bevivino began her recent research as part of the Irish Research Council's Employment-Based Postgraduate Programme in October 2015. Prior to this, she worked with The Discovery Programme on various projects, including the Late Iron Age and 'Roman' Ireland (LIARI) Project and the Medieval Rural Settlement (MRS) Project. She completed her Masters in Classics in UCD in 2010.

Picking up the Pieces - Digital Reconstruction of a Romanesque Doorway at Old Kyle Co. Laois
Thomas Nelligan, TheStandingStone.ie, & Gary Dempsey, RealSim Ltd. and Roscommon Cross Slabs Project

Old Kyle Cemetery in Co. Laois contains many fragments of a Romanesque building that once stood at the site. While fragmentary, these pieces, with the aid of digital technology, can be put back together to give us an indication of what this structure may have looked like. Four parts of the Romanesque doorway have been recorded and pieced back together using Agisoft Photoscan to present something which hasn't been seen in centuries.

Biographies: Thomas Nelligan has degrees from Trinity College Dublin and the University of Limerick and has recently published a monograph on ancient literature. He has also published in the Laois Heritage Society Journal and has presented in conferences around the world. Dr. Nelligan also runs TheStandingStone.ie which features nearly 400 articles on places of historical interest in Ireland.

Gary Dempsey is an archaeologist, programmer and digital designer with RealSim Ltd. Gary works on a number of citizen science projects, teaching communities photogrammetry to help in local heritage recording and conservation. Emerging from this work, he has developed the Roscommon 3D and Galway 3D digital museum projects.

RePlay: Digitally Capturing Unique skills in European Traditional Sports and Games

David Monaghan, Dublin City University (DCU), Amin Ahmadi, (DCU) Francois Destelle,(DCU) Dimitrios Zarpalas, The Centre for Research and Technology, Hellas (CERTH-ITI), Kieran Moran (DCU), Petros Daras (CERTH-ITI) and Noel E. O'Connor, (DCU)

Sport is one of the most universal of cultural pursuits - it is accessible and of interest to almost all. Traditional Sports and Games (TSG) are as diverse as our cultures. TSG organisations work tirelessly to promote participation in their sports, but also act as custodians of custom, language and history. However, trends in globalisation have led to a convergence of the majority of spectator interest to just a few mainstream sports with culturally homogeneous identities. In this paper, we present the case for the preservation of TSG using both existing state of the art 3D digitisation technology and low-cost personalisable solutions that we have developed. This dual approach allows for the styles of play of elite sportspersons (national heroes) to be captured with precision for posterity, but also allows for the amateur sportspersons (local heroes) to be captured with inexpensive setups to ensure personalized accessible solutions in local communities.

Biographies: Dr David Monaghan is an electronic engineer, optical engineer, visual artist, computer scientist and Fulbright Scholar, with a PhD in optical cryptography. He is currently employed as a Research Fellow and the Team Leader of the multi-modal human sensing group at the Insight Centre for Data Analytics in Dublin City University. Throughout his career, he has researched and published works on various topics including but not limited to; computer vision, optical cryptography, digital holography and a variety of 3D reconstruction techniques. He currently researches a wide variety of subjects from sports activity analysis and networked virtual environments to human motion analysis and reconstruction for cultural heritage preservation.

Dr Amin Ahmadi is a senior Postdoctoral Researcher at the Insight Centre for Data Analytics. He received his PhD in MEMS Inertial Sensors and Motion Analysis from SABEL Labs, Griffith University, Brisbane, Australia in 2010. His research has featured in the New Scientist and appeared on the BBC and ABC television and radio channels. He, along with his colleagues, won the prestigious Australian Prime Minister's Excellence Award for Innovation and Creativity in Sports Performance. Currently, he is involved in a number of European funded projects to develop novel solutions for monitoring and analysing human movements using wearable inertial sensors and computer vision.

Dr Francois Destelle is a Postdoctoral Researcher and is currently working on the RePlay project to develop novel solutions for capturing and reconstructing moving athletes in 3D using wearable inertial sensors and computer vision techniques. He obtained his PhD in Computer Graphics in 2010 from the National Polytechnic Institute of Grenoble, France. His research focused mainly on computer graphics, shape modelling and shape analysis. He was a Postdoctoral Researcher in the Department of Computer Graphics at LE2I of Dijon in 2011, investigating the movement and the deformation of 3D point clouds. His expertise is in Computer Graphics, motion tracking and active stereovision.

Dr Dimitrios Zarpalas is an electrical and computer engineer with an MSc in computer vision and a PhD in Medical Informatics. He has been an Associate Researcher in CErTH/ITI since 2008. His main research interests include 3D medical image processing, 3D shape analysis, real time 3D reconstruction from multiple passive/active sensors, dynamic mesh coding and 3D motion analysis.

Dr Kieran Moran is the Coordinator of the PATHway project. He is senior lecturer in Exercise Biomechanics and Funded Investigator and Targeted Project Coordinator in Insight. His focus is on optimizing exercise-based interventions for neuromuscular injuries/conditions across the lifespan and developing novel data analysis. Dr Moran is the Coordinator and conceptualized the idea of PATHway. His research is funded by SFI, EU projects and Industrial Partnerships. His main coordination roles have included: Director of the Human Movement Analysis Centre and Chairperson of the Exercise and Sport Science Association of Ireland. He is currently Head of School of Health and Human Performance in DCU.

Dr Petros Daras is the technical director of the PATHway project. He is a Researcher Grade B (equivalent to Associate Professor) at CErTH/ITI and head of the VCL group. His main research interests include multimedia processing, multimedia and multimodal search engines, 3D human motion capturing and analysis, real time 3D reconstruction from multiple sensors, dynamic mesh coding, medical image processing and bioinformatics. Dr Daras regularly acts as a reviewer/evaluator for the EC.

Noel E. O'Connor is a Professor in the School of Electronic Engineering at DCU and Funded Investigator in Insight Centre for Data Analytics. He was recently appointed as Director of the DCU Research and Enterprise Hub on Information Technology and the Digital Society. The focus of his current research is in multi-modal content analysis leveraging mutually complementary sensor data sources for applications in sports and health, digital media, ambient assisted living and environmental monitoring. Since 1999, Prof. O'Connor has published over 180 peer-reviewed publications, made 11 standards submissions and filed 6 patents and spun off a campus company. He is a member of the IEEE, Engineers Ireland and the IET.

Data Capture, Representation and Reconstruction (Part 2)

Take a Picture - it will last longer: Use of Low-cost Photogrammetry to Record Vulnerable Coastal Archaeology

James Bonsall & Sam Moore, Institute of Technology, Sligo

Climate predictions suggest an increase in severe cyclones and wave surges in the future which will continue to threaten middens, promontories, inter-tidal sites, wrecks and many other monuments that lie in coastal locations. The aim of the MASC Project is to engage with and provide training for individuals, voluntary community groups and interested NGO's living or operating along the coastline of Co. Sligo to recognise, record and monitor exposed or threatened cultural heritage sites. The MASC Project – a citizen science scheme – will assist archaeological research by recruiting amateur or non-professional scientists – people that live, work and use the coastline on a regular basis. Low cost or open source photogrammetry software and GPS enabled smartphones are readily available to volunteer citizen scientists who can accurately obtain and record data, monitor and digitally preserve exposed or threatened sites. This paper outlines the MASC project and discusses the potential of Virtual Reality in regards to the future of coastal heritage sites threatened by climate change

Biographies: Dr James Bonsall has been lecturing at IT Sligo since 2014, principally in archaeological geophysics, GIS and geoarchaeology. He is also a director of the Earthsound Archaeological Geophysics consultancy, director of the Kilcassel Landscape Project and co-director (with Dr Thomas A. Loughlin) of the Great Connell Abbey Exploration Project. James recently completed his PhD research for a National Roads Authority Fellowship which reappraised the effectiveness and use of geophysical legacy data with particular reference to the influence of geological, seasonal and archaeological variables. James' current research is the mapping of vulnerable coastal archaeological sites and he recently convened the Weather Beaten Archaeology Conference bringing together experts from across the world to exchange their experiences.

Sam Moore is an archaeologist with a keen interest in Irish passage tombs specifically and prehistory in general. He has written or contributed to a considerable number of local history articles, books and guides, and has considerable archaeological excavation and survey experience. Sam has been lecturing in archaeology at the Institute of Technology, Sligo since 2007. His main interest lies in the landscape and human interaction with it and the biography or 'life-history' of monuments including how mythology and folklore plays a role in the mental landscape.

Applications of Digital Documentation in Conservation of Cultural Heritage: Case study of the Jawbone Arch

Clara Molina Sanchez & Nicolas Boyes, Nicolas Boyes Stone Conservation Ltd

This session presents the development of the ongoing conservation of the emblematic Jawbone Arch from Edinburgh, and how digital documentation techniques such as Photogrammetry and 3D Laser Scanning have been the key element for the successful completion of the project.

Biographies: Clara Molina Sanchez is a trained conservator with years of experience in Cultural Heritage. In 2012, she was trained in 3D laser scanning by the Liverpool National Museum, soon after she realised the innumerable possibilities that these technologies could bring to the Conservation field. In 2014, she completed her MSc in International Heritage Visualisation at the Glasgow School of Art. Since then she has gained extensive experience on Digital Documentation techniques such as Laser Scanning, Photogrammetry and RTI. Currently she leads the Digital Documentation department at Nicolas Boyes Stone Conservation, carrying out multiple documentation projects from small artefacts and archaeological sites to built heritage.

Nicolas Boyes (BA Hons, P.G.Dip Arch Stone Cons. ACR, FSA Scot) trained in architectural stone conservation at Weymouth College. He spent over six years working within Historic Scotland at the Historic Scotland Conservation Centre in Edinburgh before establishing Nicolas Boyes Stone Conservation (NBSC) in January 2000. He has twenty years' of experience in the conservation of important historic carved stonework and statuary at both consultative managerial and practical levels. He is an accredited member of The Institute of Conservation (ICON). To relax, he races a 1968 Mini Cooper in a race series for classic saloon and sports cars, competing against Jaguars and Porsches and occasionally beats them.

A Birds Eye View: An Analysis of the Validity of the UAV Photogrammetry Platform in the Rapid Documentation of Cultural Heritage under Threat

Daniel Maher, National Museum of Archaeology, Malta

The digital documentation of cultural heritage is nothing new, indeed in recent years laser scanning and photogrammetry have become integral parts of the heritage industry, both in terms of the documentation and conservation of heritage objects and sites. These digital technologies are now being acknowledged as powerful tools for the archaeologist and conservator alike for the purpose of the preservation of our shared cultural heritage. Within the scope of this presentation we will be examining the potential applications of the UAV Photogrammetry platform as a tool for the rapid documentation of cultural heritage under threat from coastal erosion, as well as cultural erasure as a result of armed conflict. We will be highlighting the benefits and limitations of the technique as well as analysing it comparatively with established methods of aerial remote sensing.

Biography: Daniel Maher's primary degree was in Archaeology, obtained from UCD where he also obtained a Grad. Cert. in World Heritage Conservation. He has just completed his MSc at the Glasgow School of Art in International Heritage Visualisation where his thesis comprised an examination of the applications of UAV Photogrammetry on the rapid documentation of cultural heritage under threat. He has worked extensively in the heritage industries of Western Australia and New Zealand, with some experience in the heritage sectors of Ireland and Portugal. His specific areas of archaeological interest are in Neolithic Ireland with a particular focus on funerary rights of the Boyne Valley megalithic cultures, along with the digital documentation of cultural heritage via LiDAR and Photogrammetry. He is also a passionate proponent of indigenous rights globally, having had the privilege of working with the Aboriginal people of NW Australia and the Maori people of Aotearoa.

3 Minutes in the Sky: a new, fast, low-cost approach to heritage documentation

Debra Laefer & Jonathan Byrne, U3D and University College Dublin

Extensive, highly detailed surveys of heritage are often beyond the financial capabilities of many property owners, managers, and stewards. To address this issue, this paper will present the hardware and software technology that create good heritage documentation for less than €1000 using short, quick flights with unmanned aerial vehicles and videography.

See: <https://www.youtube.com/watch?v=hPYcpCiWuoY&feature=youtu.be>.

Biography: Prof Debra F. Laefer and Jonathan Byrne lead the "UAV for Inspection" efforts, recently launched at University College Dublin. They are also the co-founders of U3D, Dublin's only fully commercial level 3D hub.

Digital Interaction and Museums (Part 1)

Provocation by Design – Creating Interpretive Visitor Experiences that Captivate, Thrill and Inspire

Andrew Todd, Tandem Design

Engaging interpretive and exhibition design is not merely about communicating information effectively, it is about reaching out to touch the heart of each, unique visitor; it relates what is being displayed or described to something within the individual and connects on a personal level. Tandem have developed heritage and cultural interpretive experiences – including temporary and permanent exhibitions – for castles and ships, libraries and historic buildings, driving routes and walking trails. Tandem's lead Consultant/Creative Director will talk about some of the underlying principles that help shape their work, and how they create experiences that relate to the individual with compelling, creative solutions and strategies.

Biography: Andrew Todd is Creative Director within Tandem Design and is responsible for articulating the creative vision for each project, combining his love of museums, heritage and Graphic Design with his experience in the industry to conceptualise immersive interpretive experiences that captivate, thrill and inspire. Keenly aware of spatial and operational challenges in terms of capacity and visitor flow, behaviour and orientation, Andrew creates innovative solutions and interpretive experiences in which the storytelling and visitor experience take precedence. Bringing enormous enthusiasm and vision to every Tandem project, Andrew also has the critical management experience and skill to ensure that the vision for each project is realised to its fullest potential.

A Virtual Museum and a Real Community: From Images to Identities in Mazzano Romano, Italy

Jacopo Tabolli, Trinity College Dublin

This paper will present the adventure of a young virtual museum and its relation with the local community in Mazzano Romano (Italy). In September 2012, the Museo Civico Archeologico-Virtuale di Narce (MAVNA) was created in Mazzano Romano, Rome in order to display a collection of archaeological material found at Narce (8th-2nd centuries BCE) and until now stored in the City Hall but never before on public display. In addition to this collection, the Museum has undertaken an ambitious project to present the 'virtual' return of antiquities discovered in the archaeological site of Narce and preserved in various museums in Italy, Europe and abroad.

Biography: Jacopo Tabolli received his PhD in Archaeology from the Sapienza University of Rome in 2012. He is the editor of *Officina Etruscologia* and his first book on the necropolis of Narce was published in 2013. In 2012, he founded the Archaeological and Virtual Museum of Narce (MAVNA) in Mazzano Romano and since then he has been the Scientific Director. He has been excavating for several years at Veii and Narce. As of Autumn 2015, he is a Visiting Researcher at the Long Room Hub, Trinity College Dublin with a project entitled 'Masked Identities', which focuses on the study and virtual display of the votive masks of pre-Roman Italy.

Bringing an Archive to Life through Augmented Reality: the 'Excavating Egypt' Exhibition

David Vacas Madrid, The Egypt Exploration Society

The 'Excavating Egypt' exhibition at the London Office of the Egypt Exploration Society included the use of an augmented reality app, combined with archaeological information, 3D modelling and photogrammetry. The result was an app for different mobile devices, with which the visitors could see the three-dimensional objects represented on the archaeological drawings displayed at the exhibition, and interact with them. In this way, we were able to link the archaeological documentation of an archive to the archaeological materials they represented, showing the public their connection in an effective and didactic way.

Biography: David Vacas Madrid is an historian and archaeologist who received his BA in History from the Complutense University of Madrid where he specialised in Virtual Archaeology and Restoration. A member of the Spanish Society of Virtual Archaeology, he has collaborated on the Monte Bernorio in its Environment and the Jamila Environment projects since 2010, working on dissemination and outreach and developing websites and social media strategies etc. He currently heads photographic and photogrammetric documentation in the field and the laboratory for various archaeological projects.

EON World Heritage Initiative

James Moran, EON Reality

Complex and accurate replicas of real locations can be used both as educational tools or virtual tourism to promote a nation's culture and attract tourists. Rather than simply reading about a location, students across the world can experience famous and culturally significant locations.

Biography: EON Reality is the world leader in Virtual Reality based knowledge transfer for industry, education, and edutainment. It recently established the EON World Heritage Initiative as part of EON's Learn for Life Program to capture, preserve, and share the world's most valuable artefacts and locations through virtual reality. The World Heritage Initiative empowers nations to preserve their cultural artefacts and historical sites for future generations and bring these sites into classrooms and homes.

Myths and Megaliths: From the Darkroom to the Oculus Rift
Howard Goldbaum, University of Nevada, Reno

Documentary media, including photographic, audio, video, and virtual reality environments created during a project extending for 37 years, will be shown and discussed. The significance of immersive media as a component of heritage documentation and the projected trends in these technologies will be considered. Attendees will be invited to experience virtual reality environments presented on a head mounted device.

Biography: Howard Goldbaum is an Associate Professor at the Reynolds School of Journalism at the University of Nevada, Reno. Prior to that, he worked as a photojournalist, photography professor, and multimedia producer. His long-term research project investigates the ancient monuments of Ireland and their folklore, where he deploys virtual reality imaging to document the monuments and their landscapes (<http://voicesfromthedawn.com>). He has worked as a consultant in multimedia and digital imaging and has won numerous awards for his work. He is the creator of the All Around Nevada website (<http://www.allaroundnevada.com>) and the co-author of a book of historic railroad 3D photographs (<http://waitingforthecars.com>).

Digital Interaction and Museums (Part 2)

Sounding Dublin: Mapping Contemporary Popular Music Experience and Promoting Music Tourism

Áine Mangaoang, Dublin City University

Mapping Popular Music in Dublin is a twelve-month research project based at St Patrick's College, DCU (funded by Fáilte Ireland). Led by John O'Flynn and Áine Mangaoang, the project employs key concepts of 'mapping', 'place', 'sound(s)' and 'scene(s)' as adapted from comparable international popular music studies that consider the interplay between local culture industries, heritage and tourism (Jóhannsdóttir 2006; Cohen 2007). This presentation focuses on our work-in-progress, detailing the project's initial findings from extensive digital ethnographic research carried out to date, and problematises the practice of translating these findings into virtual cultural heritage platforms as a tool for tourist promotion.

Biography: Áine Mangaoang is a Postdoctoral Research Fellow at St Patrick's College, Dublin City University. A Visiting Professor in Musicology and New Media at the Iceland Academy of Arts, Reykjavik and Associate Fellow in the Higher Education Academy, she received her PhD from the University of Liverpool where she was the Institute for Popular Music Scholar (2010–14). She serves on the executive boards for the International Association for the Study of Popular Music and the Society for Music Education Ireland. She has published in the areas of audiovisual and digital media, music and rehabilitation in prison, music education and cultural tourism.

Tracing Seán Ó Riada's Projects in a Digital Context

Patrick Egan, University College Cork

The Seán Ó Riada DAH Project is a prototype version of an immersive display, which over time aims to achieve two distinct objectives:

1. to facilitate scholarly analysis of the Seán Ó Riada special collection by processing and organising digital representations of archival material and
2. to provide analysis of key projects in Ó Riada's career that remain unexplored by other scholars. An online representation of this model is available at: www.music.ucc.ie/oriada/interface.php.

Biography: Patrick Egan is a second year PhD student in Digital Arts and Humanities (DAH) at University College Cork, where he combines his experience as an ethnomusicologist, web developer and musician to explore music from a digital humanities perspective. He is founder of the website, "Outreach Ethnomusicology" www.o-em.org.

Opportunities and Theoretical Challenges of Low-Cost Visualisation and Interaction Technologies for Digital Heritage Data

Pim van Bree & Geert Kessels, LAB1100

Interactive installations can grow in technical complexity and contextual immersion with the advances made in technologies and the increasing availability of digital heritage data. We present a challenge with epistemological implications when more control is given to the user to further interaction than what can be distilled or even abstracted from historical sources. How could you animate a letter sent from Berlin to Bordeaux with only the sending date known, with no information on when it was received, or how long the letter was under way? Also, how should a visitor be able to interact with this installation?

Biography: LAB1100 is a research and development firm established in 2011 by Pim van Bree and Geert Kessels. Their joint skill set in new media, history and software development allows them to conceptualise and develop complex software applications. Working together with universities and research institutes, LAB1100 has built digital research platforms and interactive data visualisations.

Exploring Online Cultural Heritage. Integrating Queries through Tangible User Interfaces on the Web

Javier Pereda, University of Southampton

This paper presents a Web based Tangible User Interface to explore Cultural Heritage knowledge. It discusses novel approaches to assist users to conceptualise and deliver complex queries to Linked Data repositories. The paper discusses information engagement challenges currently raised in the Cultural Heritage sector (CH) on the Web. Moreover, it introduces Europeana as a case study where Linked Data repositories are used to offer users the opportunity to explore vast sets of knowledge in museums, libraries and archives across Europe.

Biography: Javier Pereda is a Web Scientist with a Background in Graphic Design, Marketing and Visual Communication. His research focuses primarily in the development of Tangible User Interfaces to explore information. Most of his case studies are heavily based on Cultural Heritage examples. One of his main research aims is to explore how to enhance engagement with digital content thus promoting constructivist and independent learning.

The Digital and Beyond

History at the Next Level: Commercial Video Games as Academic Virtual Heritage Objects

Joshua Savage, Maynooth University

This paper examines commercial video games in comparison to 3D visualisations created in academic contexts. It covers both the current state of virtual heritage environments and the psychological experience of interacting with virtual space, including examples of commercial software that guide learning effectively for different purposes. As a case study, the commercial software Verdun is compared to academic virtual heritage objects, with the conclusion that Verdun succeeds as a virtual heritage object precisely because it is a video game, and that its goals could not be achieved as effectively were it designed as a more traditional 3D visualisation.

Biography: Joshua Savage is a researcher, writer, educator and graphic designer who has recently completed an MA in Digital Humanities at Maynooth University. His areas of interest include digital preservation, user interaction with built environments and the application of video games in academia. He has previously presented work at the conference *Using Video Game Technology to Enhance Teaching and Learning* in Massachusetts, USA. Before coming to Ireland, Joshua worked as an education and design consultant for the software program JogNog, a public school teacher in Shizuoka Prefecture, Japan and a psychology researcher at Harvard University.

The Digital Heritage Paradox

Wim Hupperetz, University of Amsterdam

The complex, layered and dynamic aspects of heritage objects and sites on the one hand, and technically sophisticated but static and simplifying visualisations on the other hand have resulted in a paradox; a paradox that can potentially frustrate both academics and the general public. Virtual reconstructions of ancient objects, buildings, sites and even complete cultural landscapes are derived by a wide range of specialised interpretative steps and decisions. These reconstructions are increasingly used both as a research tool and as a means to transfer academic knowledge to the wider public. However, the ways in which archaeological reconstructions are made and the degree to which archaeological, architectural or historical evidence, interpretation and – often an important aspect – sheer imagination play a role, usually is not made explicit. With the increased use of reconstructions in academic debate, the demand for clear guidelines and ‘annotations’ in the construction and use of virtual reconstructions has grown correspondingly. Visual reconstructions operate on the nodes of interaction between research on heritage, public history, the heritage perspective (with related questions of cultural belonging) and the visualisation domain. It is time to address the need for new integrated and multidisciplinary approaches, and create opportunities based on heritage reflection to improve research agendas and research tools.

Biography: Wim Hupperetz is a director of the Allard Pierson Museum, the archaeology museum of the University of Amsterdam, the Netherlands. He studied Ancient History and Provincial-Roman Archaeology at Radboud University in Nijmegen. In 2004, he defended his PhD thesis at the University of Tilburg - *On the Memory of a Street – Eight Hundred Years of Living in the Visserstraat in Breda*. He is a heritage specialist in the field of museology, Roman and Late Medieval archaeology, castles, housing culture, cultural landscapes and urban environments, and is focused on adding extra value by means of digital and virtual media and adopting a multidisciplinary approach. Specialising in the development of concepts and research on historical and archaeological exhibitions, he advises on heritage policy related to museology, archaeology, cultural landscapes and urban environments. His multidisciplinary approach combines archaeology, historical archival research and architectural history. He founded a northern European museum network (COBBRA) and is involved in several EU-funded projects that aim to provide heritage professionals with technological tools for the creation of digital museums and smart exhibits.

The ACCORD Project: Community Co-production, Authenticity and Authority

Stuart Jeffrey, Glasgow School of Art (GSA), Alex Hale, RCAHMS, Siân Jones, University of Manchester, Cara Jones, Archaeology Scotland & Mhairi Maxwell, (GSA)

The ACCORD project explores the opportunities and implications of digital visualisation technologies for community engagement and research through the co-creation of three-dimensional models of heritage sites and objects. Techniques such as laser scanning, 3D modelling and 3D printing have remained firmly in the domain of specialists and expert forms of knowledge and/or professional priorities frame their use. Expressions of community-based social value are rarely addressed through their application and neither are the implications for engagement, authenticity and authority. ACCORD sought to investigate these issues through the co-design and co-production of permanently archived and open-access research assets which integrate co-produced digital models, user generated contextual data and statements of social value. The project's notion of heritage was entirely community defined, allowing the participation of diverse groups. Core to ACCORD is the fact that recording activity can increasingly be undertaken by a broad range of non-professional groups, especially through the growing accessibility and ubiquity of digital technology. Furthermore, this engagement could allow us to overcome some of the barriers to engagement with digital outputs, both practical and conceptual, that have become so apparent in recent years. Funded by the UK's AHRC, ACCORD was a 12 month partnership between the Digital Design Studio at the Glasgow School of Art, Archaeology Scotland, the University of Manchester and the RCAHMS.

Biographies: Stuart Jeffrey is a Research Fellow in International Heritage Visualisation at the Digital Design Studio of The Glasgow School of Art. He studied a combined honours degree in Computer Science and Archaeology at the University of Glasgow where, in 2003, he also completed his PhD in three-dimensional modelling of Early Medieval sculpted stones. His work covers all aspects of heritage visualisation and the use of new technologies to create records, analyse, interpret, re-interpret and represent every form of heritage from built to intangible. He has published extensively on diverse topics in archaeology and computer science, including Medieval sculpted stones, archaeological informatics, visualisation techniques, digital preservation, resource discovery and reuse, linked data, natural language processing and the use of social media in archaeology. He is a member of the Chartered Institute for Archaeologists and a Fellow of the Society of Antiquaries of Scotland.

Alex Hale has worked as an Archaeological Investigator at RCAHMS since 2000. He has published three books, numerous academic and popular articles. Alex has managed archaeological field survey, recording and research projects across Scotland, from St Kilda to Bute, and the Lothians to East Renfrewshire. Since 2011, Alex has been increasingly involved with research projects that have co-design, co-production and community collaboration at their core. Much of this research has been funded through the Arts and Humanities Research Council (AHRC) Connected Communities programme and has resulted in some diverse, fascinating and high impact projects. Alex is a member of the Chartered Institute of Archaeologists and a Fellow of the Society of Antiquaries of Scotland.

Siân Jones is a Professor of Archaeology and Heritage Studies at the University of Manchester. Her research focuses on the archaeology of identity and the politics, meanings and values surrounding historic monuments, buildings and places. She has carried out applied research focusing on cultural significance and conservation. She has also undertaken wider research on the relationship between cultural heritage and the production of authenticity, memory, identity and place. Siân's publications include: *The Archaeology of Ethnicity* (Routledge), *Early Medieval Sculpture and the Production of Meaning, Value and Place* (Historic Scotland) and the co-authored monograph, *A Fragmented Masterpiece: recovering the biography of the Hilton of Cadboll cross-slab* (Society of Antiquaries of Scotland). She has also recently edited a special edition of the *International Journal of Historical Archaeology on Memory, Oral History and Archaeology* (2012).

Cara Jones is a project manager at Archaeology Scotland. Based in Scotland for the last ten years, Cara has worked as a field archaeologist, heritage consultant, development control archaeologist and currently co-manages Archaeology Scotland's Adopt-a-Monument scheme. Through her work with Adopt-a-Monument, Cara works with over 40 community heritage groups, helping local communities take an active role in conserving and promoting their local heritage and archaeology. Cara oversees the Adopt-a-Monument Outreach Programme which seeks to expand current heritage demographics. Cara is currently chair of the Chartered Institute for Archaeologists Scottish Group and sits on the ClFA Advisory Council. In 2012 Cara co-edited and co-authored 'Reconsidering Archaeological Fieldwork: exploring on-site relationships between theory and practice'.

Mhairi Maxwell is an archaeologist and is currently a research developer in the Digital Design Studio (DDS) in the Glasgow School of Art (GSA). Prior to this, she was the research assistant on the ACCORD (Archaeology Community Co-production of Research Data) project for 12 months until March 2015, led by Dr Stuart Jeffrey (DDS, GSA) and with partners at Archaeology Scotland, the RCAHMS (Royal Commission for Ancient and Historical Monuments) and the University of Manchester. After completing her PhD at Bradford University in 2012, Mhairi was the Glenmorangie Research Officer at the National Museum of Scotland conducting innovative research on the Early Medieval period working with artists, craftspeople and digital technology.

Restoring the Digital Old Minster of Winchester

Paul Reilly, Stephen Todd & Andrew Walter, University of Southampton

The Old Minster of Winchester was remarkable in 1984 for being the earliest animated virtual tour of a computer-generated solid model of an archaeological interpretive visualisation. The 'movie' was the product of an innovative collaboration between archaeologists and computer scientists specialising in 3D computer modelling and graphics systems. In its day the solid modelling technology used to generate this landmark in archaeological visualisation (Winsom) was cutting edge (see Burridge et al 1989, Reilly 1989), and the project garnered the attention of broadcasters and the press, as well as academic audiences. Thirty years on, and buried under layers of now unsupported code, the project was still considered worthy of digital restoration to pave the way for digital curation. This paper will give a brief account of how the Old Minster of Winchester model was originally developed and how it was subsequently retrieved and restored some three decades later. We will draw out some lessons learned.

Biographies: Dr Paul Reilly has published widely in archaeological computing, particularly in the field of visualisation and virtual archaeology. He has also worked and consulted extensively in the IT and Communications Industry. A former chair and now a life member of the international CAA organisation, his primary research interests today revolve around the relationship between archaeology in the field and its digital embodiment. In particular, how and where these digital embodiments are created, manipulated, transformed, presented, and interpreted, and the philosophical and social impacts of digital technology on our understanding of the nature of archaeology and how that knowledge is represented in the digital. His most recent works explore the possibilities and implications of additive manufacturing to virtual archaeological theory and practice.

Stephen Todd studied mathematics at Oxford. He then had a career at IBM; mostly database, computer graphics and visualisation at the United Kingdom Scientific Centre (UKSC) in Peterlee and Winchester. His work at the UKSC included early applications of database and visualisation to protein chemistry and archaeology during the 1980s. He later worked in commercial messaging at the IBM Hursley Laboratories. He is currently Visiting Professor at Goldsmiths. This mainly involves staging international Computer Art exhibitions with artist William Latham and Stephen's son Peter.

Andrew Walter worked in engineering R&D for ten years, then joined the IBM UK Scientific Centre in Winchester working in graphics research. As part of this role he directed the making of "The Old Minster, Winchester" and later a very wide range of projects from video enhancement to capturing archaeological positional data using a Polhemus 3D sensor. He retired in 2010 and is now occupied with numerous light engineering projects including mentoring 6th form student robotics. Some of these projects involve his 3D printer, and the OpenSCAD software, which has proved useful for bringing the Old Minster Constructive Solid Geometry model back to life.

The Battle of Mount Street Bridge: Digital Simulation for Historical Research

Susan Screibman & Costas Papadopoulos, An Foras Feasa, Maynooth University

This paper discusses the use of gaming technologies in historical research and explores the potential, as well as the challenges, that specialists face during their development. The case study is a project carried out by a diverse group of researchers entitled Contested Memories: The Battle of Mount Street Bridge. The project focuses on a battle that took place on Wednesday, 26th April 1916 during the week of the Easter Rising. This particular battle, between a small group of Irish Volunteers and Sherwood Foresters sent to Dublin to put down the rebellion is used here to investigate to what extent a networked virtual world of this historic battle can enable alternative forms of research, help in the interpretive process, and assist knowledge production for both general audiences and specialists.

Biography: Susan Schreibman is Professor of Digital Humanities and Director of An Foras Feasa at Maynooth University. Her research in the Digital Humanities ranges from text encoding and the creation of digital scholarly editions, to more recent interests in Virtual Worlds and Datamining. In Irish poetic modernism, she has focused on the life and work of the Irish poet, literary and art critic Thomas MacGreevy (1893–1967). Over the past decade she has held several leadership positions in digital humanities/libraries centres; Trinity Long Room Hub Senior Lecturer in Digital Humanities (2011–2014); the Director of the Digital Humanities Observatory (2008–2011), a national digital humanities centre developed under the auspices of the Royal Irish Academy. Previously, she was Assistant Dean for Digital Collections and Research, University of Maryland Libraries (2005–2008), and Assistant Director of the Maryland Institute for Technology in the Humanities (2001–2004). She is the founding editor of several web-based projects, including Letters of 1916, The Thomas MacGreevy Archive, Irish Resources in the Humanities, and the Versioning Machine, a tool to edit and visualise multiple versions of deeply-encoded text.

Dr Costas Papadopoulos (BA in History and Archaeology, MSc in Archaeological Computing - Virtual Pasts, PhD in archaeological computing) is currently a Postdoctoral Research Fellow at An Foras Feasa, Maynooth University, Ireland. He specialises in 3D visualisation methods and technologies for recording, capturing, researching, and disseminating archaeological and cultural heritage data. In particular, his research, teaching and publications to date are primarily related to digital reconstructions, formal three-dimensional analyses of past built spaces, light in archaeology, Augmented Reality, and Computational Imaging, examining both the practical aspects of modern technologies and the theoretical dimension of such approaches. He has published his work in a monograph, edited volumes, conference proceedings and academic journals. His most recent edited volumes are: *Thinking beyond the Tool: Archaeological Computing and the Interpretive Process* (2012, Archaeopress) and *Archaeological Research in the Digital Age* (2015, IMS-Forth). He is currently working on the *Oxford Handbook of Light in Archaeology* (Oxford University Press).

The Battle of Mount Street Bridge: 2D Modelling & Artificial Intelligence - Problems and Perspectives

John Buckley, Dún Laoghaire Institute of Art, Design and Technology

This paper details some of the approaches and problematics to modelling and visualising the urban environment of Mount St. Bridge and Northumberland Rd. in 1916 Dublin at the time of the Easter Rising. Through a combination of high resolution digital laser scans of the contemporary street and available historical photographic documents and available maps from the period, it was possible to faithfully model the site of one of the fiercest battles of the Rising. Once created the model presents its own problems in relation to historical legibility as a tool to aid greater understanding of the conflict. The implementation of a generalised simulation of the various fighting companies of the 2/7th and 2/8th Battalions sent to quell the uprising is achieved using 'off the shelf' Artificial Intelligence tools from the videogames industry normally used to simulate 'first-person-shooter' video games. While effective in rendering the temporal flow of the battle, these tools in turn further problematise the use of gaming technologies for the purposes of historical enquiry.

Biography: John Buckley is an artist, researcher and educator, lecturing in 3D Modelling, Real-time Rendering and VFX on the BA in 3D Design, Modelmaking and Digital Art in IADT Dun Laoghaire, where he also supervises Masters by Research in Visual Arts Practice and Cyberpsychology. His practice is focused on virtual and augmented reality technologies, videogames and real-time visualisation and his research interests are in the philosophy, politics and modalities of perception in digital cultures. He is currently a doctoral researcher in the Graduate School of Creative Arts & Media (GradCAM), pursuing a PhD in the political economy of massively multiplayer online videogames and has published in the area of social media and immaterial labour. John graduated from NCAD with an MA in Fine Art Media and BA in Printmaking & History of Art.

3D Analysis and Interpretation

Using 3D and Network Analysis to Model Visitor Movement at Machu Picchu, Peru

Will Megarry, University College Dublin and The Johns Hopkins University

This paper explores ways to optimize movement around the Inca citadel of Machu Picchu, Peru. Using a combination of infrared sensors, 3D modelling, visitor observation, network analysis and mobile and web based GIS platforms, it offers a toolkit to assess and improve movement around one of the most visited sites in South America, while protecting both the sanctuary and visitor experience. Results are part of a 2015 Carrying Capacity and Limits of Acceptable Change study undertaken by Cultural Site Research and Management, Baltimore.

Biography: Dr Will Megarry is an archaeologist, GIS practitioner and current Government of Ireland/ Marie Skłodowska Curie Elevate Research Fellow. He is currently based at Cultural Site and Research Management (CSRM) Baltimore where he is also a visiting scholar in the Department of Applied Mathematics and Statistics at The Johns Hopkins University. His current research interests include world heritage site management using geospatial technologies and exploring the use of remotely sensed data for archaeological site prediction in marginal landscapes. He has worked all over the world including Ireland, the United Kingdom, Greece, the USA, Eastern Europe and Peru. He is currently working on projects in California, the Shetland Islands and Crete.

Historic Building Information Modelling (HBIM) of the Four Courts and Henrietta Street, Historic Classical Buildings in Dublin City

Maurice Murphy & Conor Dore, Dublin Institute of Technology

These case studies form part of an overall project to develop a prototype recording and documenting system for the conservation, maintenance and management of historic properties, based on HBIM. The HBIM process consists of the survey of existing structures using remote sensing followed by the mapping of parametric and information rich objects onto a geometric framework based on the remote survey data. The parametric objects which represent the architectural elements are built using a geometric descriptive language and are based on historic architectural documents (architectural rules and shape grammars). In addition these rules and grammars are exploited to procedurally model parts of the structures to speed up and automate parts of the process. The resultant HBIM can then be used for automatically producing conservation documentation and analysis of historic structures in addition to visualisation.

Biographies: Dr Maurice Murphy PhD, MPhil, Chartered Building Engineer is a lecturer and researcher in building conservation and computer graphics in the College of Engineering and Built Environment in the Dublin Institute of Technology. He was awarded his PhD by the Department of Civil, Structural & Environmental Engineering, School of Engineering, Trinity College Dublin, in September 2012. In the DIT, he leads a research group in the application of new technology for digital surveying and modelling for the conservation of historic buildings. He has over 30 years' experience in building surveying and conservation and has led and participated in a number of EU programmes in the area of Cultural Heritage.

Conor Dore is a PhD student in the School of Surveying and Construction Management at the Dublin Institute of Technology. His current research focuses on developing methods for digital recording and 3D modelling of historical buildings. He previously completed a BSc degree in Geomatics at the Dublin Institute of Technology along with working for a surveying and GIS software development company.

Historic Building Information Modelling (HBIM) as a Potential Tool for Adaptive Reuse

Evelien Dirix, Raymond Lemaire International Centre of Conservation

The following research is the result of a Master's thesis at the Raymond Lemaire International Centre for Conservation (KU Leuven, Belgium), submitted in June 2015. The research was made possible by the help of Dr Maurice Murphy and the support of the Dublin Institute of Technology. Historic Building Information Modelling has surpassed its origin in BIM the past few years by state-of-the-art research in the field of architecture conservation, cultural and digital heritage. The thesis investigated the possibilities of HBIM on the novel topic of adaptive reuse of former religious buildings. One such building, the neo-classical former St. George's church (northern Dublin inner city), was chosen as a subject since it has recently been converted into office space (Maguire 2009). For this particular case study, HBIM was utilised as a time-based representation of historical documents including two 3D-models showing the pre- and post-conversion state of the building. A specific methodology for the analysis of the church was compiled in cooperation with Dr Maurice Murphy.

Biography: Evelien Dirix has recently graduated with an Advanced MSc in Conservation of Monuments and Sites from Raymond Lemaire International Centre for Conservation (KU Lueven, Belgium). She previously obtained an MA in Art Studies (Art History) at the KU Lueven. From September until the end of November 2014, she held an internship in the School of Surveying and Construction Management at the Dublin Institute of Technology. Under the guidance of Dr Maurice Murphy, she was introduced to Historic Building Information Modelling. Out of this internship grew the idea to combine the topic of adaptive reuse of former places of worship with HBIM for her MSc research thesis.

Small Changes, Big Results: 4D Monitoring of Stone Decay

John Meneely, Queen's University Belfast

Traditionally, condition assessments of buildings and especially measurement of surface change on historic structures was time-consuming, small scale and relied on mechanical techniques that risked damaging the surface. In search of improvements in surface analysis and data density, this research trialled the use of 3D laser scanning systems to accurately and non-destructively monitor stone decay across a range of scales. Using orthodox and developing geostatistical approaches to the analysis of DEMs produced from this data has increased the understanding of decay processes involved and the scale at which they operate. This can only improve the accuracy of predictive models.

Biography: John Meneely is a geologist from the School of Geography, Archaeology and Palaeoecology at Queen's University Belfast. He has over 20 years' world-wide experience in using a variety of 3D technologies to map, monitor and visualise the built and natural environment across a wide range of spatial and temporal scales. His recent research and publications have focused on using 3D laser scanning to study the catastrophic decay of building stone under complex environmental regimes and the digital documentation of heritage sites for a number of geological, geographical, archaeological, managerial and educational applications. Examples of his past and present projects can be found at www.facebook.com/1manscan.

Technological Advances in the Study of Cranial Morphology

Olivia Chernet & Manon Galland, University College Dublin

Cranial morphology is a great source of information, being the final picture of the combined effect of genetics, behaviour and the environment. The virtualisation of cranial morphology began with the collection of simple linear measurements, but new technologies have provided us with the ability to collect three dimensional landmark data, surface scans and even virtual models of internal structures. This results in valuable tools enabling the disentanglement of morphology-determining factors and a consequent better understanding of the past, as illustrated by our studies of the Neolithic transition.

Biographies: Starting with an undergraduate degree in Natural Sciences at UCL, Olivia Chernet then went on to do a Biosystematics research Master's at the Natural History Museum (London), where she became interested in quantitative analysis of shape. She is now working towards a PhD in the UCD School of Archaeology, studying morphological changes of the human skull in the period succeeding the Neolithic transition in Central Europe.

Manon Galland is a physical anthropologist currently working as a Postdoctoral Research Fellow on a project funded by the Irish Research Council titled "From hunters to farmers: the evolution of human populations preceding the emergence of agriculture" at University College Dublin's School of Archaeology, and as an Associate Researcher at the Museum national d'Histoire naturelle, Département Hommes, Natures, Sociétés, UMR 7206 CNRS (Paris, France). Her main research interests are: the morphological variability of *Homo sapiens*, the origin and dispersals of modern humans, the impact of climatic and dietary effects, the peopling of the Americas, the transition to farming, the geometric morphometrics, modelling approach.

3D Scanning, Contact Digitising and Advanced 3D Digital Modelling for the reconstruction and Analysis of Boats and Ships

Pat Tanner, University of Southampton

This paper discusses a methodology created to develop and analyse the hydrostatic and hydrodynamic characteristics of a reconstructed hull form. To this end the physical boat model was 3D laser scanned and virtually modelled using commercially available CAD modelling software. Each individual component is solid modelled in the computer software and assigned a material. This enables the software to calculate important factors such as centre of gravity and density and establish a floatation condition for the vessel. This also enables the examination of external influences such as ballast, cargo, and crew, wind load on rigging and hull and sea conditions.

Biography: Pat Tanner has been building, repairing and sailing boats for over 20 years, and is currently working on the Traditional Boats of Ireland Project to record and document the disappearing maritime heritage. His projects completed to date include documenting a large number of traditional Irish vessels, as well as digital reconstructions of the 16th century Drogheda Boat for the Underwater Archaeology Unit of Ireland, the Newport (Wales) Medieval Ship, the Grand Hotel Shipwrecks in Stockholm and the Poole Iron Age Logboat. He is currently undertaking a research PhD in Maritime Archaeology at the University of Southampton.

Posters

Visualisation and 3D Modelling as Tools for Constructive Analysis of Historic Buildings in the Province of Alicante, Spain

Juan Carlos Pérez-Sánchez, Beatriz Piedecausa-García, José Manuel Mateo-Vicente, Raúl Tomás Mora-García & Vicente Raúl Pérez-Sánchez, University of Alicante

Throughout the eighteenth century many temples were built in the province of Alicante (Spain) in which regional and inherited constructive techniques were tested. In these buildings it is possible to find common features in the materials, geometry and constructive systems used. The little documentation on these historic buildings from an architectural point of view makes it impossible to reach a comprehensive constructive knowledge of their component parts. Therefore, increasing the use of digital tools by virtualization and 3D modelling of the built heritage is necessary to obtain essential information of building elements before a constructive intervention.

Biographies: Juan Carlos Pérez-Sánchez is a building engineer with an MA and PhD from the University of Alicante. His 2012 doctoral thesis focused on the architecture of religious temples. He has had several articles published on building systems in international journals (JCR) and has participated in national/international conferences in the field of construction. He is the author of 3 patents and is a participant in various research projects in the field of Materials and Construction Systems, both public and private. He is Director of the Research Group: Materials and Construction Systems for Buildings, and Director of the Degree in Building Engineering and the MA in Building Management at the University of Alicante.

Beatriz Piedecausa-García is the recipient of the undergraduate Special Prize in Architecture (2009) and the Masters of Construction Management Special Prize (2013), as well as a number of fellowships awarded during the course of her PhD in Architecture (2012). Her research interests are related to natural radioactivity (in construction materials and indoor conditions) and traditional architecture (historical and excavated). She has published both research projects (national and international) and conferences proceedings in the field of architecture. Her teaching experience spans from 2008 to the present and covers a range of subjects within the Department of Architectural Constructions and the Department of Building and Urbanism at the University of Alicante .

José Manuel Mateo-Vicente is a graphic designer with a degree in Building Engineering. He is a member of the research group Materials and Construction Systems for Buildings where he has developed patents, organized exhibitions and participated in conferences in the field of teaching and constructive research. He has extensive teaching experience in courses on virtualization and building assets in various institutions (including the University of Alicante) as well as courses on interior design and 3D modeling. He has worked as a Project Manager (administration, monitoring of work, budgets, measurements, certifications, valuations and refurbishment projects), and collaborator in various architectural companies as well as working freelance.

Raúl Tomás Mora-García has a degree in Building Engineering and an MA in Building Management. He has worked in the building sector for 10 years both freelance and in private enterprise. His professional experience has been focused in the area of material construction of buildings, cost control and deadlines, measurements, budgets and real estate appraisal. He is a lecturer in the faculty of Building Engineering at the University of Alicante and uses his experience in the building sector to inform his teaching.

Vicente Raúl Pérez-Sánchez has a degree in Building Engineering and a Ph.D. from the University of Alicante. He teaches a number of subjects in the Building Engineering degree course (Introduction to Construction, Construction History, Construction of non-structural elements, Technical Projects and Final Project) and the MA in Construction Management (Building Economic Management). His doctoral thesis was on Construction Economy (2015) and he has published several articles on these types of building systems. He has participated in various conferences in the field of construction and research projects about Materials and Construction Systems for Buildings, both public and private. Building Engineer for different building companies, with extensive professional experience.

KindAReal: Discover Dublin

Frank Lynam, Trinity College Dublin

This poster showcases kindAReal (www.kindreal.com), an iPhone app and website project that has been developed by the author to democratise the creation of and access to content about Irish cultural heritage sites. kindAReal users are empowered to create their own heritage site tours that contain georeferenced image, audio and text information. Tours can then be downloaded onto the iOS app and their content accessed using a context-aware Augmented Reality-enabled live camera view. kindAReal's objective is to positively affect the experience that we have of Irish heritage sites by using Augmented Reality and geospatially aware mobile technology to deliver relevant information as and when it is of most value.

Biography: Frank Lynam (BA in Ancient History and Archaeology and Italian, MPhil in Mesopotamian Archaeology) has more than a decade of experience working in R&D in the technology sector. He completed his BA at Trinity College Dublin where he read Ancient History and Archaeology and Italian. He studied Mesopotamian archaeology and the archaeology of South Asia during his MPhil in Archaeology at the University of Cambridge. He is currently in his final year of the 4-year Digital Arts and Humanities PhD programme at Trinity College Dublin. His doctoral research considers the Archaeological Semantic Web primarily from the perspective of user.

The Discovery Programme

The EU '3D-Icons' project aims to create highly accurate 3D models and a range of other materials (images, texts and videos) of iconic and internationally important monuments and buildings across Europe and to provide access to this data online. Over 130 monuments and buildings from Ireland, including decorated high crosses, the island monastery of Skellig Michael, the passage tombs of Knowth and Newgrange, and the ceremonial landscape of Tara are featured in this digital collection. In addition to making content available online, this data has the potential to be of benefit to such sectors as education, tourism, the creative economy, conservation and monitoring of cultural heritage sites. The site (www.3dicons.ie) will continuously be updated with new sites and functionality to enhance your experience.

Biography: The Discovery Programme is a national archaeological research body supported by the Heritage Council. It conducts advanced analysis of Irish Archaeology and pursues its goals by identifying 'gaps' in our knowledge or areas where intense research is required or would be valuable. A dedicated project team is then employed for a suitable period to pursue the topic in question. It promotes interdisciplinary research involving experts in the humanities (anthropologists, historians, linguist) and the sciences (particularly the sciences that study the landscape and environment of the past; paleoenvironmental, osteoarchaeological, geological, flora and fauna). It engages with constantly evolving new technologies in digital imaging and surveying techniques and promotes their introduction into the operation of Irish archaeological more generally. It develops outreach activities to communicate the results of its projects to the general public as well the academic community. These activities include the publication of scientific books and papers and collaborative outreach projects with national cultural institutions, third and fourth level institutions, local authorities and local heritage partnerships. The Discovery Programme is funded through the Heritage Council and EU research grants.

Keynote Talks

3D Interpretation and Presentation of Cultural Heritage: Case Studies from the Scottish Ten Project

Lyn Wilson, Historic Environment Scotland

The Scottish Ten Project has set out to digitally document in 3D Scotland's five UNESCO World Heritage Sites and five international sites over the last five years. Using state-of-the-art digital technologies, including 3D laser scanners, a highly accurate record has been created by the team for each of the ten sites. Once this 3D data has been acquired, it can be used for a range of purposes, including conservation monitoring and heritage management. The 3D data lends itself particularly well to interpretation and preservation of heritage sites. This paper will discuss case studies from Scotland and other countries where the Scottish Ten is contributing to communicating heritage stories through digital platforms.

Biography: Lyn is the Digital Documentation Manager at Historic Environment Scotland, and also manages the Scottish Ten project in partnership with The Glasgow School of Art (www.scottishten.org). Her primary areas of interest lie in the scientific application of 3D digital documentation within the historic environment, emerging technologies in heritage science and historic-BIM. She is a passionate advocate of applied science and technology within the heritage sector. A heritage scientist with 20 years' experience, Lyn gained her BSc (Hons) in Archaeology from the University of Glasgow in 1997. She received an MA (1999) and PhD (2004) from the University of Bradford, specializing in Computational Archaeological Science

Virtually Real or Really Virtual: towards a Heritage Metaverse

Jeremy Huggett, University of Glasgow

Leon Wieseltier recently summarised his critique of modern culture as "Too much digital, not enough critical thinking, more physical reality". Certainly the hype surrounding the impending mainstreaming of Virtual Reality can seem to prioritise the digital above the critical. As we are at a pivotal point in the development of VR, it provides an important opportunity to consider the emergence of virtual heritage and its potential futures. What are our objectives and where do the challenges lie?

Biography: Jeremy Huggett is a Senior Lecturer in Archaeology at the University of Glasgow. He has worked in the area of archaeological computing for thirty years, and is particularly interested in the nature, development, impact, and implications of information technologies in relation to the archaeological discipline and their effects on our understanding of the past. He blogs at www.introspectedigitalarchaeology.wordpress.com/.

Participant List

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Badzmierowska, Karolina, Trinity College Dublin

Bevivino, Michael Ann, University College Dublin

Bonsall, James, Institute of Technology, Sligo

Boyd, Caroline, Trinity College Dublin

Boyes, Nicolas, Nicolas Boyes Stone Conservation Ltd

Brady, Karl, Underwater Archaeology Unit

Breen, Richard, Maynooth University

Brennan, Cormac

Buckley, John, Dún Laoghaire Institute of Art, Design and Technology

Byrne, Jonathan, U3D and University College Dublin

Cahill, John, Office of Public Works

Carniel, Flavio, The Norwegian University of Science and Tecnology

Campbell, Eve

Chambers, John, Maynooth University

Cheronet, Olivia, University College Dublin

Clancy, Alice, University College Dublin

Colbert, Kate, University College Cork

Corns, Anthony, The Discovery Programme

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Daras, Petros, The Centre for Research and Technology, Hellas

Deevy, Aaron, The Discovery Programme

Dempsey, Gary, RealSim Ltd

Denard, Hugh, Trinity College Dublin

Destell, Francois, Dublin City University

Devlin, Gary, The Discovery Programme

Dirix, Evelien, Raymond Lamaire International Centre for Conservation

Dockery, Brian, Office of Public Works

Dore, Conor, Dublin Institute of Technology

Dowling, Simon, Dowlings Pharmacy

Duffy, Martin, University College Dublin

Egan, Louise, Theatre Royal

Egan, Patrick, University College Cork

Finlay, Judith, National Museum of Ireland

Finn, Ellen, Trinity College Dublin

Fleming-Farrell, Dara, Trinity College Dublin

Galland, Manon, University College Dublin

Galvin, Colette

Gamarra, Beatriz, University College Dublin

Geoghegan, Anthony, Institute of Technology, Sligo

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Goldbaum, Howard, University of Nevada, Reno

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Harpur, Christopher, Dún Laoghaire Institute of Art, Design and Technology

Harvey, Dee, Unfolding City

Hoban, Piaras, Irish Traditional Music Archive

Holland, Aveen, Maynooth University

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Jeffrey, Stuart, The Glasgow School of Art

Jones, Cara, Archaeology Scotland

Jones, Jessica, University College Cork

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Kelly, Beatrice, The Heritage Council

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Laefer, Debra, U3D and University College Dublin

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Lynam, Frank, Trinity College Dublin

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McDonald, Claire, Waterford Institute of Technology

McGrath, Evelyn, Dark Optic

McHugh, Sally, NUI Galway

McLoughlin Davis, Clare, Trinity College Dublin

Maher, Daniel, National Museum of Archaeology, Malta

Mangaoang, Áine, Dublin City University

Markidou, Eleni, Trinity College Dublin

Mateo-Vicente, José Manuel, University of Alicante

Maxwell, Mhairi, The Glasgow School of Art

Mazzanti, Chiara, Reliqua

Meegan, Eimear, University College Dublin

Meeres, Sophia, University College Dublin

Megarry, Will, University College Dublin and The Johns Hopkins University

Meneely, John, Queen's University Belfast

Merrigan, Brian, University College Dublin

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Moran, James, EON Reality

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