

Royal Irish Academy-Directed Archaeological Research for World Heritage Sites_Report

Title:	Mr.
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Surname:	Dempsey

Year of Award:	2016/17
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Project Title:	Rathcroghan Field System Survey
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1. Background (please provide details of your research background)

Gary has a background Heritage Studies (BA Hons. GMIT 2010), Irish Studies (MA NUIG 2011) and International Heritage Visualisation (MSc. SimVis GSA 2013). He is currently Event Officer for Virtual Heritage Network Ireland. His work as Lead Environment Designer and Historical Researcher with RealSim includes digital simulation projects for Medieval Galway (Galway Museum), Clonmacnoise (RTE), Spike Island(Spike Island Development Company), as well as lead researcher and designer on several heritage council supported 3D projects in Galway and Kilkenny.

Gary has also developed several community focused digital recording projects in Roscommon (Roscommon3D) recording Cross-Slabs (2015) and more recently Sheela-na-gigs (2017) and Crucifixion Plaques (2017 w. Orla Power UCC). In Counties Meath, Kildare, Tipperary he has worked with community groups providing heritage advice and digital recording for local collections. Gary has also provided digital heritage training to the IAI and Virtual Heritage Network. Previous research works include the mapping of distribution and etymology of the placenames 'Bully's Acre' published in Archaeology Ireland. His main archaeological interest has been in the area of Rathcroghan focusing on pitfields, and aerial mapping. Publication include Archaeology Ireland (2012, IQUA field guide (No. 30, 2012) as well as others.

4. Please outline the central objectives of the research

The Rathcroghan Complex as identified by Waddell (et al 2010, p1) covers 4 sq miles (6.6sq km) incorporating six townlands. The Rathcroghan Field System Survey extends the survey area to 14.6sq km incorporating 19 townlands. This expansion was based on the availability of LiDAR data and orthographic imagery collected by blue sky surveys for the Ordnance Survey Ireland, and the Discovery Programme (2006). A detailed unmanned aerial survey was carried out by Western Aerial Survey over the core area (c5.4km) at a height of 75m in order to produce a high resolution digital surface model for the area. This survey was flown between March and August 2017.

The project aims to draw together the existing archaeological knowledge for the Rathcroghan region, and examine the extent of the historic field systems identified. The core focus of research for the Rathcroghan areas has largely been its named monuments (Knox 1911, 1914; Herity 1983, 84; Waddell 1983, 88, 2010). Herity (1988) provided the first extensive examination of the field systems of Rathcroghan, with Brady (et al 2012) updating this research during the Medieval Rural Settlement Project. The objective of this project to examine Herity's work alongside the survey of the Discovery Programme and determine form, function and suggested chronology for the field systems using interactive 3D environment modeling to display and analyse features and make this

5. Please describe the primary methodology used in conducting the research

Orthographic photos were taken using a Phantom DJI Inspire UAV, flown at a height of 75m. The survey was divided into multiple survey areas and flown over a period between March and August 2017, when weather conditions were suitable. The flights produced in excess of 7000 images over an area of c.5.k sq km. A small section to the south of Daithi's Mound was discluded from the survey at the request of the landowner. The images were processed using Pix4D software with ground control points recorded around the border of the survey area. DSM tiff files were then analyzed using Globalmapper and Relief Visualisation Tool box to highlight the surface for natural and archaeological features.

LiDAR mapping (OSI 2006) was used to generate a DTM which was processed in Globalmapper. The LiDAR was used to add additional ground control points to the DSM after initial processing in Pix4D. The survey was then converted into a RAW file format and imported into Unity3D to create an interactive environment simulation. These models were compared to OSI historical mapping in Globalmapper and field maps produced.

The SMR records for Co. Roscommon were acquired from the National Monuments Service in ERSI ArcInfo (E00) format and converted to .CSV format using Globalmapper and Microsoft Excel. These records were then divided into individual class types. The CSV files produced were loaded into Unity3D using custom scripting by RealSim Ltd. Additional analysis was carried out using Globalmapper and Snuffler to analyze Geophysical data provided by NUI Galway.

Please feel free to upload any documents to illustrate your research activities e.g. additional information, photos, graphs, charts.



[2015_DigiMaps-25Inch.jpg](#)[2015_DigiMaps-6Inch.jpg](#)



[2015_DigiMaps-6InchClassic.jpg](#)[2015_DigiMapsModernBoundaries.jpg](#)



[2015_DigiMapsWithFleldbouandaris.jpg](#)[2015_DigiMaps_CivilParishes.jpg](#)



[2015_DigiMaps_Townlands.jpg](#)[Cronology_Examination_Mucklaghs_V004.jpg](#)



[FutureDesign_RadialMenu.jpg](#)[Geo-accurate Sun Tool -RCMound.jpg](#)



[HeightTool_RC_CorrectedforVertExaggeration.jpg](#)[LIDAR UAV Compare.jpg](#)



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[Searchfunction_RathcroghanMound.jpg](#)[SiteVlew_Mucklaghs.jpg](#)



[UAV_Errors_NEGShading.jpg](#)

6. Please outline the findings of your research and/or milestones achieved (did you achieve the primary objectives - if not, what did you learn from the process)?

The survey area covers 165 features, 25 redundant records and 210 Geological features. 36 new features were identified from the LIDAR survey and a further 24 features from the UAV DSM model. These were compared with Herity (1988) and Brady (et al 2012), with some overlap. Two unrecorded features on DSM model, and have been tentatively identified as barrows. The DSM model also confirms the existence and extension of features identified in geophysical survey (Waddell et al 2010).

An examination Ordnance survey mapped field systems show a large division of land between the 6inch and 25inch mapping, with notable exceptions in the townlands of Glenballythomas and Tobermory where larger enclosures predominate. Significant division of land occurs between the 25inch map and the modern field system, indicated by the building of a number of houses in the area c. 1930's. The early field system is mainly confined to n-east and s-east of Rathcroghan mound, and not counting some anomalies appears largely medieval in date. These field systems appear to ignore Townland boundaries with 'roads' connecting spring. Field boundaries were examined at Relignaree showing distinct overlapping 'bank' structures which may indicate a chronology for field divisions. Generally the field system indicates two phases of medieval field lines including the enclosure of relignaree, with prehistoric monuments underlying these systems. The 3D environment simulation will provide an interactive tool for land planning within the areas and will be deposited in NUI Galway, Rathcroghan Heritage Centre and with Roscommon Co. Co. in due course.

7. Publication details (please outline any plans for publication of your research both nationally or internationally)

A number of interesting narratives are appearing within the research. We are planning a number of publications to highlight these features.

Images generated from the Digital Surface Model data have been submitted to an upcoming publication in *Emania* by Joe Fenwick (NUI Galway). The article predates the present survey and reflects work carried by Fenwick, the images provided support theories derived from additional geophysical surveys at Rathcroghan Mound. The article does not represent the current research but makes reference to and identifies the ongoing Rathcroghan research

The Rathcroghan Field System Survey represents the first time such a survey has been applied at this scale. The incorporation of low altitude orthographic photography, LIDAR, topographical modeling and 3D environment simulation for the examination of archaeological features has not been conducted this scale before (14spKM). A paper will be submitted to *Archaeology Ireland* before the end of the year highlighting the survey and its benefits.

A number of longer focused papers will be submitted to suitable journals to discuss the larger research findings, suitable journals identified at this stage include

Journal of Irish Archaeology - General Overview of Methodology, Findings, Discussion and suggested further research

Medieval Archaeology (The Society for Medieval Archaeology) - General Overview of Methodology, Focus on Medieval Field System with reference to its impact on modern field systems

Journal of Archaeological Science - Detailed Discussion on Methodology and benefits of Environment Simulation

A number of talks and public lectures have been identified as possible platforms for dissemination and initial expression of interests discussed with organizers

NUI Galway Lunchtime Lecture Series (NUI Galway Archaeology Department)
Rathcroghan Conference (Rathcroghan Visitor Centre)
Roscommon Heritage Week - Demonstration of 3D Model (Nollaig Feeney - Roscommon Heritage Officer)

We would also be happy to engage with any RIA publications or public events as requested.

A selection of 3D models are being made freely available online as part of the Roscommon3D project. These can be accessed at (<https://sketchfab.com/roscommon3d/collections/rathcroghan>) Models generated under this project are displayed with a Rathcroghan3D and RIA logos. These models will remain freely accessible. This project will also be linked to HeritageMaps.ie in due course as part of Digital Heritage Age's digital project Roscommon3D.

3D Environment Simulation. A version of the finished 3D simulation model will be presented to interested parties including Roscommon County Council and Rathcroghan Visitor Centre.

A report of new features discovered during the survey is being prepared which will be forwarded to Michael Moore (NMS).