Summary Report
Future Thinking on Carved Stones in Scotland: Workshop 1
Digital recording of carved stones for research: Where are we and where can we go?

Preamble

The workshop, which took place on Thursday 12 February 2015, at the Glasgow School of Art Digital Design Studio, was the first of four Royal Society of Edinburgh-funded workshops. Together, these aim to stimulate research into all aspects of carved stones in Scotland to promote an increased awareness of their interest, significance and value. The specific objective of this workshop was to bring academics and heritage specialists together to share information and best practice on the digital recording of carved stones, particularly those of the early medieval period. By doing so, it was hoped that this workshop would contribute to a research agenda for carved stones in Scotland and establish links that could form the basis of future collaborations. This included laying the groundwork for an international research network on digital applications in research on early medieval inscribed monuments.

Participants

The workshop was organized by Katherine Forsyth (University of Glasgow) and attended by:

- Marcus Abbott - ArcHeritage, York
- Dr Laila Kitzler Åhfeldt - Runes and Rune-stones Project, Riksantivarieämbietet, (State Heritage Service), Gotland, Sweden
- Jamie Barnes - University of Glasgow
- Dr Tertia Barnett - University of Edinburgh
- Dr Gareth Beale - Centre for Digital Heritage, University of York
- Dr Edel Bhreathnach – Discovery Programme, Dublin
- Dr Susan Buckham - Kirkyard Consulting (NCCSS)
- Anouk Busset - University of Glasgow/University of Lausanne
- Dr Katherine Forsyth - University of Glasgow (NCCSS)
- Dr Sally Foster - University of Stirling (NCCSS)
- Dr Stuart Jeffrey - Digital Design Studio of the Glasgow School of Art
- Dr Alick Leslie - Conservation Science Manager, Historic Scotland
- Colin Muir - Conservation, Historic Scotland
- Dr Kirsty Owen - Cultural and Natural Resources Team, Historic Scotland
- Dr Jeff Sanders - Society of Antiquaries of Scotland, ScARF project
- Robert Shaw - Discovery Programme, Dublin
- Dr Nora White - Dublin Institute for Advanced Study
- Dr Lyn Wilson - Digital Documentation Manager, Historic Scotland

Workshop format
The workshop fell into two parts. The first half comprised a series of cases studies to illustrate examples of current practice in Sweden, Ireland and Scotland to help answer the question *'where are we?'* in relation to digitally recording carved stones. Case studies covered a range of topics including:

- The methods to analyse carved stones using digital recording e.g. groove analysis
- The format and compilation of thematic datasets and digital resources
- The technological (and also logistical) processes involved in digital data capture, processing and dissemination
- The range of specific goals an organisation might have for carrying out digital recording of carved stones
- And the experience of using digital materials from academic and community perspectives

Together, the presentations help to tease out the range and nature of collaborative working, the different stages reached within building and applying datasets, and the potential for digital technologies to improve the quality of carved stones records and the outcomes this might offer for studying carved stones. Selected case studies raised the question of the extent to which the specific nature of digital records might present a barrier to their wider uptake and use and touched upon some of the public values ascribed to digital records and carved stones.

The presentations were as follows:
- 3D-Scanning of Rune Stones and Picture Stones in Sweden by Dr Laila Kitzler Åhfeldt
- Irish Inscribed Stones Project by Dr Nora White
- Digital Recording of Carved Stones: Ogham in 3D and Beyond by Robert Shaw, Gary Devlin and Aaron Deevy
- Scanning Stones, Digital Recording and Analysis by Colin Muir

- Dupplin, Dunadd and Digital Design: a field epigrapher's view by Dr Katherine Forsyth
- Digital Replication, Context and Engagement by Dr Stuart Jeffrey
- Wemyss Caves by Marcus Abbott
- Digital Documentation and Scientific Analysis of Carved Stones by Dr Lyn Wilson and Dr Alick Leslie

Open discussions formed the second part of the workshop to explore *'Where can we go?'* through digitally recording carved stones. Initially, participants considered this question in relation to defining a research strategy before identifying options for future collaborations and funding bids.

Workshop findings
The matrix below summarises the issues identified during the course of the workshop under four overarching themes – *understanding, protecting* and *valuing* carved stones and the *systemic challenges* of digital recording of carved stones. Discussion touched upon several recurring themes. These included the importance of dialogue between communities (academic research and teaching, technical, conservation and local community groups) to create synergies that benefit the quality of record making and interpretation and enhance the social values placed upon digital resources and physical heritage. The accessibility of information was repeatedly cited as an important factor, playing fundamental part of the social value of digital records and being crucial to increase available resources and to avoid duplication of effort. Discussion highlighted the extent of knowledge built up over the last twenty years but recognised the necessity of:

- Taking further steps in the framing of research questions
- Identifying the potential of technology to help answer these questions
- Engaging more fully with the diversity of existing communities to ensure the most fruitful interdisciplinary collaboration.

Table 1

UNDERSTANDING	
Where are we?	*Where do we want to go?*

STRENGTHS
 	
1. Much knowledge
 	
Creation of digital resources
 	
2. Growing body of scan data, with this bank of existing data still valid for research purposes
3. Examples of complete, thematic, searchable datasets, which also include associated landscape, historic and other records
4. Willingness and desire of relevant bodies to scan more
 	
Application of technology
 	
5. Range of recording techniques, with experience being built up for identifying best digital 'tool' for particular tasks
6. Layering of scientific analysis onto 3D models
 	
Application of digital data
 	
7. Appreciation of the limits of existing data for research and the value of digital recording
    a. As being more suitable to recording scripts on more than stone face and objects
    b. For reassessing carvings (e.g. to compare current interpretations of designs to those in historic records, to recognise original and subsequent carvings and to distinguish between a stone's natural and carved features)
    c. To capture previously inaccessible information
    d. To provide evidence of historic processes of change to stone condition
    e. To generate more versatile records that can be more easily manipulated and have the capacity to be repurposed (e.g. to study condition or replicas to develop commercial opportunities)
    f. For logistical research benefits e.g. 3D printing for 'virtual repatriation' and non-field-based study
	Reassess current data
	25. Review existing scanned material and identify its research potential (including review of process histories, 'capturing' some of existing creative responses)
	26. In particular, read inscriptions better (bringing in the historic plaster casts, etc.)
	
	Develop new research frameworks
	27. Recognise and develop the different scales of analysis that digital technologies can contribute to: carvings (e.g. details of inscriptions), monuments (nature and materiality of the whole monument and its carvings), and landscape (e.g. 'reinstating' carved stones in their landscape – phenomenological potential, etc.)
	28. As a matter of course if something is going to be scanned, what research questions might be asked of it?
	
	Carry out research on specific theme / bodies of material
	29. Literacy on the fringe of the Roman Empire
	30. Use digital technologies to create a 21st-century equivalent to *The Early Christian Monuments of Scotland*
	31. Explore potential of groove analysis for

g. To aid the enhancement of details (e.g. reverse weathering)

h. To 'de-familiarize' objects and thereby facilitate improved interpretations of carved detail, notably inscriptions

i. To enable stones to be placed within a landscape setting

j. To simulate conditions e.g. lighting

Research developments

8. Groove analysis shows potential for digital technologies to help us understand early medieval carvings, in particular the actions of individual artisans

9. Growing awareness of existence and research value of pre-digital records and replicas

10. Beginning to see an increase in interdisciplinary research, with analysis informed by multidisciplinary studies

WEAKNESSES

Inaccessible information

11. Relatively little is published, or is in 'soft' or 'grey' literature

12. No centralised inventory of 3D scans

13. Some thematic studies have hit a ceiling in understanding that requires more digital data to break

14. Scans often archived as individual items, rather than being part of a wider body of information without any linking mechanisms

Work not research driven

15. Existing recording strategies are mainly conservation and communications-led, rather than research driven

16. Conservation priorities, unlike research, tend to be piecemeal rather than thematic and comprehensive

Technical and academic divide

17. Practice is being technically led and technologies are not developing to the needs of researchers

18. It is difficult for technical experts and academics to talk at the same level. Skills deficit and absence of clearly framed research questions are contributory factors to the communications barrier

19. Data capture and processing doesn't tend to include academic support alongside the required

British, Irish and Manx material (Scotland: scan all incised early medieval monuments - Pictish Class I and 'Class IV' crosses - and also inscriptions)

32. Impact of carved stone studies on research, teaching and conservation communities

33. Explore theme of memory, landscape and monuments using historic literary descriptions of moving through the landscape

34. How ogham stones functioned as markers of memory, power and territoriality (also themes of inheritance and ancestors)

35. Biographies of stones in terms of later interventions and through historical records

Better understand potential of technology

36. Establish if drawings can be generated from scans?

37. Capacity for technology to assist with edge enhancement ('wind back' weathering) recognising inscriptions and profile analysis.

38. Compare and 'formalise' data-processing histories

39. Rich intelligence modelling

Workshops and networks

40. Workshops and networks are a valuable mechanism for knowledge transfer and to draw out potential research partners and share expertise and collate resources collectively

technological input

20. Data processing is a subjective act that can be better informed through dialogue between technical and academic specialists. This can also ensure adequate resolution for research questions and at the same time help refine research questions

Lack of (early medieval) research q**uestions**

21. Are these not being asked because data is not available to frame them, but is data not available because research community is not saying this is what we want to know?
22. Do barriers exist because digital resources not used for teaching? So this blocks the framing of questions?
23. Limited research of carved stones as if we are in the landscape to see different seasons, lighting, to remove blocking views, and track through landscape, although this potential for individual stones and landscape is recognised. Still need to explore more fully the value of what this re-contextualising can tell us
24. Lack of awareness of inter-disciplinary opportunities between researchers using same data sets and researching the same themes

Table 2

PROTECTING	
Where are we?	*Where do we want to go?*
STRENGTHS 41. Scanning validates the object scanned 42. Non-contact/destructive way of creating accurate replicas 43. Largely, non-destructive means to assess stone condition and to identify current problems and historic deterioration and repairs 44. Can confirm material type and identify original surface treatments (e.g. gilding, painting) 45. 3D printed models assist reconstruction through the advantage of 'virtual repatriation' of fragments and capacity for comparison to monuments held in other collections / at other sites 46. On-site and on-line digital representations can allow visitors to 'see' carvings where physical access may be difficult **WEAKNESSS** 47. Inaccessibility of data limits protection	54. Define agendas and be more strategic as well as long-term 55. Communicate/reflect on/publish more of the conservation-led 3D work and learning points etc. arising 56. More investigative recording using layered data 57. Involving others/crowdsourcing in long-term monitoring

48. 'Fashion' for commissioning scans, which are then not followed up or made freely available 49. Resource issue for monitoring condition by tracing differences in surface detail from meta-data scans, particularly of larger monuments and sites 50. Some digital resources designed to support conservation aren't yet at application and evaluation stages. 51. Not widely utilised for on-going monitoring 52. Potential for digital recording to become 'a double-edged sword' if preservation by record arguments bolstered at the expense of conserving physical remains 53. Conservation knowledge not making it into publications	

Table 3

VALUING	
Where are we?	*Where do we want to go?*
STRENGTHS **Collaborative engagement** 58. New engagements with creators and communities 59. Case studies of digital resources designed collaboratively between community groups and professionals with heritage and technical expertise **Increasing awareness of social value** 60. Increasing reflection on the nature of the relationships between community groups, digital heritage professionals and the outputs they have created 61. Case studies indicate some of the social values invested in replication and 3D models as both the physical production of digital materials and original artefacts 62. Case studies of digital resources designed for academic and public audiences 63. Growing appreciation of value of examples of pre-digital recording technologies **WEAKNESSES** **Limits of community engagement** 64. Current lack of wider uptake of digital material, with digital heritage not drawing people in	**Reach communities** 74. Recognise breadth of communities that can benefit and don't be shy to include academic in this! 75. Trace new engagement online for impact assessment **Create resources** 76. More community-led projects 77. Create educational tools for tertiary and secondary education. Note wide-ranging value of early medieval scan resources for schools to make 3D models from **Research** 78. Research social values 79. Research implications for value and

emotionally	negotiation of authenticity
65. Are teachers not using digital resources because they don't know they exist or are relevant or is this because of a skills deficit?	80. Tell the stories
66. There is over 20 years of research and development of digital visualisation technologies in archaeology and heritage but expert forms of knowledge and/or professional priorities still dominate - with top-down projects of mixed success	**Mechanisms**
67. Missing communities to engage with	81. Extending audiences: schools, local authorities, policy-makers, media

68. Multiple and diverse nature of 'communities' (local, academic / research, technological and artisans but also creative community and policy makers) means:
    a. expertise exists across many groups and therefore engagement needs not to just focus on own community
    b. different requirements might need to be catered for in public-facing data
	82. Enable creative digital communities, for example through, 'heritage jam'-style events - to utilise creativity and publish results

69. Questions about sustainability of community engagement with digital material over time, even of community-led initiatives	
70. Case studies of digital resources aimed at academic and public audiences are not all at community engagement or evaluation stages	
Limited appreciation of social value	
71. Insufficient knowledge of the range of public values (e.g values associated with knowledge, identity, bequest and distinctiveness)	
72. Uncertain implications of digital technologies for the 'authentic originals'	
73. Accessibility of digital data and resources plays a huge part of values ascribed	

Table 4

SYSTEMIC ISSUES	
Where are we?	*Where do we want to go?*
STRENGTHS **Longevity and increasing accessibility of data**	**Information management**
83. Data is technically repurposable/recyclable where licensing allows	100. Central register of scans and where they are.
84. Technologies continue to emerge, including making data available online in more user-friendly formats	101. Aspire to link records held in different data banks, collections and information systems, possibly by using an OS grid reference or CANMORE numlink

85. Historic Scotland scan data may be made available on case-by-case basis to researchers
86. Generally, commercial value of digital data overrated, many institutions now making freely available

Ability to quantify resources needed

87. Manpower and other resources can be quantified against recording tasks to assist project design and funding

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WEAKNESSES

Fragmentation of work

88. But how do we know what surveys already exist? Information is held in diverse locations, and not all surveys are necessarily reported in CANMORE. *Discovery and Excavation Scotland* and OASIS are not updated quickly enough to act in place of a central inventory. There is a risk of duplication of recording.
89. One-off/piecemeal scanning programmes = fragmented sector

Barriers to sharing information and expertise

90. Gulf between technical expertise and many of the researchers with the questions to ask
91. School and University teachers not using the resource (aware of it but skills deficit, and technicians not engaging sufficiently with teachers/researchers)
92. Shifting perceptions about digital data to demonstrating that its more than 'glorified photocopies'
93. Questions about sustainability of data and access to it over time
94. Licensing/IPR as barrier to access and sharing
95. Proprietorial and commercial concerns as barrier to access and sharing
96. Data sensitivity for some information in public domain – e.g. military information, proprietary interest.
97. Accessibility and format of data (for different users)
98. Need to bring archivists into the 'community' of stakeholder groups as management of digital data is a different kettle of fish to other types of

102. Easy fix: make CANMORE searchable for all 3D scans (i.e. record what has been scanned and by whom and where data is lodged) and ensure all scans are reported to CANMORE
103. Archive scans as part of a wider body of information
104. Common archiving standards
105. Allow more creative uses of data
106. Develop coding and file formats in an open format that can be shared
107. Knowledge transfer between technical specialists and academics [accepting these are not mutually exclusive ….]

Publication and dissemination of information

108. There is a need to find ways to make information developed through current recording and research more widely available, particularly for information developed by conservation practice. To give longevity to workshops such as this. Also extend audiences via policy makers and media

Improve resourcing

109. Stop reinvention of the wheel
110. For each unit of spend, ensure designed outcomes for research, conservation, communities, etc.
111. Clarify funders

Knowledge transfer

112. Critical for strengthening funding applications - if you can illustrate some initial work has been done this can increase chances of securing funding.
113. To construct research projects and framework e.g. ogham/runes
114. Transfer of technical expertise. Develop joint research

information

99. Long-term curating of material as digital recording generates a lot of information, some websites disappear so have to make a sustainable archive format but also where and cost? How consistently is Archaeology Data Service being used, for example. If valuable have to think of long-term preservation

Limited resources

100. Intermittent funding
101. Specific format of technologies depends on external companies and there is the need for robust open source software. For example, there isn't an open format coding and file format that can be shared
102. Specific format of technologies depends on external companies and there is the need for robust open source software

projects on specific bodies of material or themes
115. Develop joint post-graduate, post-doctoral programmes

Increase collaborative working

116. Collaboration in the field can assist with determining what to scan, the parameters of a scan and an awareness of the original setting
117. Greater active engagement between the different technical and research communities to envision the places that technology can go and to keep on top of emerging theories and techniques
118. Identify the research communities and their questions to extend interdisciplinary research communities